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P R E F A C E

Your Excellency, Director General of Indonesia Health Workers, Ministry of Health, Republic of Indonesia, Drg. Arianti Anaya, MKM, The Respectable Head of the Jambi Provincial Health Office, Dr. MHD Fery Kusnadi, Gynecologist, The Honorable Director of the Indonesian International Education Foundation (IIEF), Mrs. Diana Kartika, and the Testing Manager of IIEF, Mrs. Wiati Rahayu, The Honorable Director of Health Polytechnic of Jambi, Dr. Rusmimpong, S.Pd, M.Kes, Vice Director One, Dr. Pahrur Razi, MKM, Vice Director Two, Dr. Netha Damayanthie, M.Kep, Vice Director Three, Dr. Gusti Lestari Handayani, M.Kes, The Honorable Chairman of UPK-SDMK Jambi, Dr. Solha Elrifda, M.Kes, Respected invited speakers, distinguished guests, Academics of Jambi Health Polytechnic, and beloved participants from all over the world attending on-site and via Zoom meeting, Thank you for joining today's conference.

The theme of the conference is **THE ROLE OF UNIVERSITY IN TRANSFORMING DIABETIC CONTROL: FUTURE AND RESEARCH CHALLENGES**. Producing scientific article manuscripts for lecturers to be included in proceedings in Scopus-indexed journals such as The Indonesian Journal of Public Health, and Sinta-indexed journals including Jurnal Ilmu Kesehatan dan Bidan Cerdas (Health Polytechnic, Ministry of Health Palu), Jurnal Teknologi Laboratorium (Health Polytechnic, Ministry of Health Yogyakarta), Jurnal Gema Lingkungan Kesehatan (Health Polytechnic, Ministry of Health Surabaya), Journal of Health Promotion and Behavior, and the Journal of Epidemiology and Public Health (Universitas Sebelas Maret). The participants' numbers are approximately two thousand five hundred.

We hope to provide an inspirational and educational platform for all attendees through this seminar. We will discuss various relevant topics related to the seminar theme with the experts. We hope this event can offer a deep understanding and spark productive discussions. On this occasion, let us make this seminar a valuable learning event. Let us absorb new knowledge, share experiences, and enrich our insights together. Ladies and gentlemen, before I conclude this speech, allow me to express my gratitude to all parties who have contributed. Thank you to the speakers who have agreed to be here, to the committee that has worked hard to prepare the event, and of course, thank you to the attendees present here. Enjoy this conference.

Chairperson

Egy Sunanda Putra., M.Gz

WELCOME REMARK

Assalamualaikum wr wb,

Good morning everyone,

I am pleased to welcome you to the third International Conference of the Health Polytechnic of Jambi, 2024, under the theme **THE ROLE OF UNIVERSITY IN TRANSFORMING DIABETIC CONTROL: FUTURE AND RESEARCH CHALLENGES**. Your Excellency, Director General of Indonesia Health Workers, Ministry of Health, Republic of Indonesia, Drg. Arianti Anaya, MKM, The Respectable Governor of Jambi, Mr. Dr. H. Al Haris, S.Sos., M.H, represented by the Head of Jambi Province Health Service, Dr. Fery Kusnadi Sp. OG, The Honorable Director of IIEF (Indonesian International Education Foundation), Mrs. Diana Kartika, and Testing Manager of IIEF, Mrs. Wiati Rahayu, Respected invited speakers and guests, All academics of Jambi Health Polytechnic and beloved participants from all over the world, Thank you for attending today's conference. All praise to Allah SWT, who grants us mercy and blessings to gather here at this International Conference. May sholawat and salam be upon our prophet Muhammad SAW, and may we be blessed with his Syafaat in the Yaumul Akhir. Aamiin ya Robbal Alamin.

On behalf of Jambi Health Polytechnic, I would like to express our deepest gratitude to all of the invited speakers:

- ☐ Dr. dr. Harimat Hendarwan, M.Kes (Research Organization for Health, BRIN, Indonesia)
- ☐ Professor Dr. Ramli Musa (International Islamic University, Malaysia)
- ☐ Asst. Prof. Dr. Tippamas Chinnawong (Faculty of Nursing, Prince of Songkla University, Thailand)
- ☐ Prof. Bhisma Murti, MPH, MSc., PhD (Universitas Sebelas Maret, Indonesia)
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- ☐ Dr. Gusti Lestari H, M.Kes, Dr. Abbasiah, M.Kep, Dr. Rosmaria Br, Manik, M.Keb (Lecturer, Researcher, Center of Excellence Health Polytechnic of Jambi)

This international conference is also held in collaboration with the Human Resources Development Unit (UPKSDMK) Jambi, which is accredited A and integrated with the Ministry of Health's Learning Management System (LMS).

At this moment, we will also sign a cooperation agreement with IIEF to organize the TOEFL ITP test, thereby creating opportunities for lecturers, students, and the general public to improve and measure their English proficiency. This will further enhance international collaboration in the field of health.

Ladies and gentlemen, we hope this platform provides you with new ideas and fosters innovative partnerships to enhance your efforts in transforming diabetic control. Through science, technology, and innovation, we aim to address future research challenges and empower communities toward self-reliance in preventing non-communicable diseases. We anticipate that the outcomes of this conference will support the Health Transformation initiatives launched by the Ministry of Health.

This aligns with our vision to produce health professionals who are prepared to compete globally and contribute significantly to diabetic control and management. Following this, we hope that the Governor of Jambi, Dr. H. Al Haris, S.Sos., M.H, may officially open the International Conference.

Once again, I sincerely welcome you all to the third International Conference of the Health Polytechnic of Jambi 2024. Please enjoy all the conference activities.

Thank you and Wabillahi taufiq wal hidayah,
Wassalamualaikum wr wb.

Director of Health Polytechnic of Jambi

Dr. Rusmimpong, S.Pd., M.Kes

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URIC ACID/HDL RATIO (UHR) IN HYPERTENSION PATIENTS WITH COMPLICATIONS AND WITHOUT COMPLICATIONS

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ABSTRACT

Background: Uric acid can cause functional and structural changes in blood vessels that allow hypertension to occur, but there are many other triggering factors that can cause an increase in uric acid levels such as age, genetics, gender and others. Likewise with HDL levels, HDL has the ability to move cholesterol and atheroma in the arteries and transport it back to the liver for excretion and reuse. This causes high HDL levels to protect a person from cardiovascular disease and low HDL will increase the risk of heart disease and hypertension. The study aims to see the average picture of the results of the uric acid/HDL Ratio (UHR) examination in patients with hypertension with complications and without complications in Jambi City.

Method: This study used descriptive observational method with cross sectional research design. The sampling technique was carried out by purposive sampling with the inclusion and exclusion criteria. The samples of this study were 60 hypertension patients at the Putri Ayu Health Center. UHR examination was carried out in February-June 2024 at the Jambi Province Regional Health Laboratory Center using the Dialab tool.

Result: The results showed that the average UHR results in patients with hypertension with complications and without complications obtained (0.820) p value > (0.05).

Conclusion: Based on the results obtained, it can be concluded that there is no significant difference between UHR levels in hypertension patients with complications and without complications.

Keywords: Hypertension; Uric Acid; HDL; UHR

INTRODUCTION

Hypertension is one of the most common degenerative diseases and has a high mortality rate and affects a person's quality of life and productivity (Masriadi, 2016). Hypertension or high blood pressure is an increase in systolic and diastolic blood pressure above 140/90 mmHg on two measurements with an interval of five minutes in a state of rest / calm. Long-term (persistent) increases in blood pressure can damage the kidneys (kidney failure), heart (coronary heart disease) and brain (causing stroke) if not recognized early and treated appropriately (Kemenkes RI, 2014).

Risk factors for hypertension are divided into two categories, some can be controlled and some cannot be controlled. Controllable risk factors include obesity or overweight, unhealthy lifestyle and lack of physical activity,

smoking, unhealthy diet, and consuming too much high sodium food. alcohol consumption, stress, diabetes and increased uric acid (hyperuricemia) (Bell K et al, 2015).

Uncontrolled hypertension will cause various complications, including myocardial infarction, coronary heart disease, congestive heart failure, stroke, hypertension encephalopathy, chronic kidney failure and hypertension retinopathy. Of the various complications that may arise if the affected is the kidney organ, kidney function will be disrupted so that the rate of removal of metabolic waste including uric acid is disrupted. This will cause a buildup of uric acid so that there will be an increase in uric acid levels (Nuraini, 2015).

Uric acid is a purine catabolism process that produces nitrogen compounds, the process of purine catabolism occurs due to two things,

namely from purines contained in food and from endogenous DNA nucleic acids. Uric acid in large quantities is excreted by the kidneys, but can also be excreted through the gastrointestinal tract, but in small amounts (Prayogi, 2017). Increased uric acid levels are caused by the body producing large amounts of uric acid while the excretion of uric acid through the urine has decreased. About 20-30% of gout sufferers are caused by purine synthesis that does not run normally, triggering an increase in uric acid levels (Chris Tanto, 2014).

The balance between production and secretion can determine the amount of uric acid levels in the blood. If the balance is disturbed, it can cause an increase in uric acid levels, which is usually called hyperuricemia (Rajagukguk et al., 2021). Hyperuricemia is a condition where a person has uric acid levels above normal values caused by excessive production and inefficient excretion of uric acid in the kidneys (Li et al, 2020). Based on Fitria's research (2015) states that there is a significant relationship between hyperuricemia and hypertension. This study is also in line with Novitasari et al (2018) which states that there is a significant relationship between hyperuricemia and hypertension. However, there are other triggering factors that cause an increase in uric acid levels such as genetics/family history, excessive intake of purine compounds, excessive alcohol consumption, obesity, hypertension, impaired renal function and certain medications (especially diuretics).

Hypertension is often accompanied by metabolic changes such as impaired glucose tolerance, hyperinsulinemia, obesity, humoral changes (increased plasma renin activity, catecholamines, aldosterone) and followed by hemodynamic changes (left ventricular hypertrophy, and impaired diastolic function). Metabolic changes that occur are caused by one of the factors influenced by low levels of High Density Lipoprotein (HDL) (Syahril et al, (2019).

HDL is one type of lipid profile and is a good fat. HDL works to transport bad cholesterol from the blood vessel endothelium so that there is no accumulation of cholesterol in the blood vessel endothelium and then transported to the liver and then disposed of through the digestive tract (Kuang H et al, 2018). HDL is referred to as good cholesterol because it can remove excess bad cholesterol from blood vessels to the liver for disposal so as to prevent thickening of the walls of blood vessels or prevent the process of arteriosclerosis (Kasron, 2015).

HDL has the ability to move cholesterol and atheroma in the arteries and transport it back to the liver for excretion and reuse. This causes high HDL levels to protect a person from cardiovascular disease and low HDL will increase the risk of heart disease and hypertension. The risk of coronary heart disease (CHD) and hypertension increases by 2 to 3% for every 1.0 mg/dl decrease in HDL cholesterol (Andini, 2013). This study is in line with Syahril et al (2019) which states that HDL levels have a significant relationship with the incidence of hypertension, in people who have low HDL levels are 10 times more at risk of developing hypertension compared to people who have normal HDL levels.

Based on research conducted by Gulali Aktas et al (2022) stated that the median uric acid to HDL ratio (UHR) in poorly controlled hypertension was significantly higher than well-controlled hypertension. Other research also shows that people with low HDL cholesterol levels have high uric acid levels.

METHODS

This study used descriptive observational method with cross sectional research design. The sampling technique was carried out by purposive sampling with the inclusion and exclusion criteria. The samples of this study were 60 hypertension patients at the Putri Ayu Health Center. UHR examination

was carried out in February-June 2024 at the Jambi Province Regional Health Laboratory Center using the Dialab Autoanalyzer.

RESULTS AND DISCUSSION

This study was conducted on patients with hypertension with a total of 60 respondents at the Putri Ayu health center. Sampling and examination were carried out on May 06 - June 22 2024. The parameters observed were uric acid levels and HDL levels in hypertension patients. Respondents were then grouped based on the characteristics of the respondents sourced from the questionnaire sheet. An overview of the characteristics of respondents can be seen in the table below.

Table 1. Characteristics of respondents with hypertension

Characteristic		Frequency	Presentation
Gender	Man	17	28.3 %
	Woman	43	71.7 %
	Total	60	100.0 %
Age	<46	2	3.3 %
	>46	58	96.7 %
	Total	60	100.0 %
Complication status	Complication	24	40 %
	Non	36	60 %
	Total	60	100.0 %

Research respondents based on gender are sgrouped into 2 categories, namely men and women. Based on table 4.1, the results of the analysis of the characteristics of respondents based on gender show that the number of female respondents (71.7%) is more than respondents with male gender (28.3%). Based on age, research respondents were grouped into 2 categories, namely <46 years and >46 years. The analysis showed that the age group >46 years had a higher percentage (96.7%) than the age group <46 years (3.3%). Based on complications, respondents with a history of no complications had a high percentage (60%) compared to respondents who had a history of heredity (40%).

3.1. Overview of UHR in Hypertension Patients with Complications and Without Complications

The data in this study were analyzed to determine the average results of UHR examination in hypertension patients with complications and without complications at the Putri Ayu Health Center, Jambi City in 2024. Previously, the Normality Test was carried out on uric acid levels and HDL levels and the results showed a $p\text{-value} > 0.05$ which showed that uric acid levels and HDL levels were normally distributed and then continued with the T test to see differences. While for UHR in the Normality Test is not normally distributed so it is continued with the Mann Whitney test.

3.1.1. UHR for Hypertension Patients in Jambi City in 2024

The research data were analyzed descriptively to see the average UHR in hypertension patients with complications and without complications at the Putri Ayu Health Center in Jambi City in 2024 and the following results were obtained:

Table 2. Average Uric Acid, HDL, UHR in patients with hypertension at the Putri Ayu Health Center in Jambi City in 2024

Variable	N	Median	Mean	Min	Max	Std. Deviation
Uric acid	60	4.700	5.015	2.10	10.60	1.81620
HDL	60	45.50	47.41	24.00	88.00	13.7844
UHR	60	0.0967	0.1143	0.03	0.26	0.05260

Based on the table above, it can be seen that the average percentage value of uric acid levels is in the normal range (3.4-7.0mg/dl) for men and (2.4-5.7) for women. while the average percentage of HDL levels is below the normal range (>55mg/dl) for men and (>65) for women. And the average value of the percentage of UHR in Hypertension patients in Jambi City in 2023, which is 0.1143.

3.1.2. UHR in patients with hypertension

The data from the study were analyzed using an independent T test to see the picture of UHR in Hypertension patients with

complications and without complications so that the following results were obtained:

Table 3. Average Uric Acid, HDL, UHR in patients with hypertension at the Putri Ayu Health Center, Jambi City in 2024

Variable	n	Mean	Std. Deviation	Std. Error Mean	P. value
Complications	24	5	2.16363	0.44165	0.218
Without complications	36	4.7	1.52954	0.25492	

The table above shows that the average uric acid level is higher in hypertension patients with complications. And statistical tests show a p value > 0.05 , which means there is no significant difference in uric acid levels in hypertension patients with complications and without complications.

Table 4. Average HDL levels in patients with hypertension with complications and without complications

Variable	n	Mean	Std. deviation	Std. Error Mean	P. value
Complications	24	55.33	15.76917	3.21887	0.000
Without Complications	36	42.13	9.23395	1.53899	

The table above shows the average HDL level is higher in patients with hypertension with complications. and statistical tests show a p value < 0.05 which means there is a significant difference between HDL levels with complicated and uncomplicated hypertension patients.

Table 5. Average UHR in patients with hypertension
Mann Whitney Test

Variable	n	Mean	P.Value
Complication	24	29.88	0.820
Without Complications	36	30.92	

Based on the table above, it can be seen that hypertension patients without complications have a higher average UHR (0.1192) The results analyzed with Mann whitney obtained an P value (0.820). $P > 0.05$ so it can be concluded that there is no significant difference between UHR levels in hypertension patients with complications and without complications.

CONCLUSION

The results of the research that has been carried out regarding the examination of UHR in patients with hypertension with complications and without complications in 2024 can be concluded, there is no significant difference between UHR in patients with hypertension with complications and without complications p value $> (0.05)$.

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CONFLICT OF INTEREST

The author affirms the absence of any conflict of interest.

REFERENCES

- Andini, J, N. P. (2013). The relationship of High Density Lipoprotein (HDL) levels to blood pressure control in hypertension patients at the internal medicine polyclinic of Dr. Cipto Mangunkusumo Hospital Jakarta. J FK UI, 5(2), 2.
- Bell K, June Twiggs, Bernie R, O. (2015). Hypertension: The Silent Killer: Updated JNC-8 Guideline Recommendations.
- Chris Tanto & Liwang, Frans et al. 2014. Kapta Selekt Medical. Jakarta: Media Aesculapius.
- Fitria, F. D. (2015). The Relationship of Hyperuricemia with Hypertension in Pauh Health Center Patients in Padang City. <http://scholar.unand.ac.id/12509/>
- Gulali, Aktas, Khalid Atiqah, Kurtkulagi Ozge, Duman Taslamacioglu Tuba, Bilgin

- Satilmis, Kahveci Gizem, Tek Atak Meryem Burcin, Sincer Isa, G. Y. (2022). Poorly controlled hypertension is associated with elevated serum uric acid to HDL-cholesterol ratio: a cross-sectional cohort. 297–302. <https://doi.org/10.1080/00325481.2022.2039007>
- Indonesian Ministry of Health. (2014). Hypertension Pusdatin. 1–7. <https://doi.org/10.1177/109019817400200403>
- Kasron, 2015. Heart Defects and Diseases Prevention and Treatment. Yogyakarta: Nuha Medika
- Kuang H, Yang F, Zhang Y, Wang T, Chen G. Dampak Komposisi Nutrisi Telur dan Konsumsinya pada Homeostasis Kolesterol. 2018;2018.
- Li, L., Zhang, Y., & Zeng, C. (2020). Update on the epidemiology, genetics, and therapeutic options of hyperuricemia. *American Journal of Translational Research*, 12(7), 3167–3181.
- Masriadi. (2016). Epidemiology of non-communicable diseases.
- Muhammad Syahril Rafsanjani, Asriati, A., Kholidha, A. N., & Alifariki, L. O. (2019). The Relationship of High Density Lipoprotein (HDL) Levels with the Incidence of Hypertension. *Journal of Medika Profession: Journal of Medicine and Health*, 13(2), 74-81. <https://doi.org/10.33533/jpm.v13i2.1274>
- Novitasari, A., & Tatius, B. (2014). Hyperuresemia Increases Risk of Hypertension Hyperuresemia Increases Risk of Hypertension. *University of Muhammadiyah Semarang*, 2025, 1-7.
- Nuraini, B. (2015). Risk Factors of Hypertension. 10–19.
- Prayogi, G.. (2017). Uric Acid Levels in Menopausal Women. *Journal of Health Analyst*, 5-10.
- Rajagukguk, T., Wiratma, D. .W. Y., Aritonang, E. (2021). Examination of Uric Acid Levels in Elderly Patients with Hypertension at Bandung Medan Hospital. *Anatomica Medical Journal*, 4(2), 54-57. <https://doi.org/10.30596/amj.v4i2.7928>.

STUDY OF URINARY LEUKOCYTE ESTERASE AND NITRITE EXAMINATION IN URINARY TRACT INFECTION PATIENTS IN JAMBI CITY IN 2024

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ABSTRACT

Background: Urinary tract infection is a condition of infection due to the growth and development of bacteria and other organisms in the urinary tract (Pardede, 2018). Most urinary tract infections are caused by *E. Coli* bacteria. One of the screening methods to confirm the diagnosis of UTI is a urine dipstick test which is able to detect leukocyte esterase as an indicator of pyuria and nitrite as an indicator of bacteriuria.

Methods: This type of research is descriptive research with a *cross-sectional approach*. This study aims to determine the results of leukocyte esterase and urine nitrite examination in patients with urinary tract infections in Jambi City in 2024. This research was conducted in March-June 2024 with a total sample of 30 urinary tract infection sufferers from several hospitals/health centres in Jambi City using a *purposive sampling technique*. From research conducted on UTI sufferers, positive results for leukocyte esterase were obtained with 1+ and +2 for 12 people (40%) and 3+ for 6 people (20%).

Results: The results were positive for nitrite as many as 17 people (57%) and negative for nitrite as many as 13 people (43%). There were 17 people (57%) who were positive for leukocyte esterase and positive for nitrite, namely 9 people for leukocyte esterase 1+ which were positive for nitrite (75%), and 8 people who were positive for leukocyte esterase 2+ with nitrite (67%).

Conclusion: Meanwhile, 13 people (43%) obtained positive results for leukocyte esterase and negative for nitrite, namely 3 people (25%), 3 people (25%) for esterase 1+ leukocyte 2+, 4 people (33%), 4 people for nitrite negative leukocyte esterase 2+, and esterase leukocyte 3+ who were negative for nitrite were 6 people (100%).

Keywords: Urinary Tract Infection, Leukocyte esterase, Nitrite

INTRODUCTION

One of the diseases that most often attacks the urinary system is urinary tract infection. Urinary tract infections are a health problem that is increasing every year. According to the World Health Organization (2013), the number of people suffering from urinary tract infections worldwide is around 8.3 million people and is expected to continue to increase to 9.7 million people. In 2019, the number of deaths due to UTI globally reached 236,790 people (Yang X, et al, 2022). In one study, around 13,000 people died from urinary tract infections in the United States, which was 2.3 % of the death rate (Maulani, D. & Siagian, E., 2021).

The prevalence of urinary tract infection cases in Indonesia is still quite high. It is estimated

that the number of Indonesian people suffering from urinary tract infections is 222 million. According to the Ministry of Health of the Republic of Indonesia (2016), the number of UTI sufferers in Indonesia is 90-100 cases per 100,000 populations per year or around 180,000 new cases per year (Widiyastuti, FS, & Soleha, TU, 2023).

infections are more common in women than in men, because women's urethra is shorter so microorganisms from outside can more easily enter the bladder. This is in line with research by Kumala I., et al (2022) that UTIs are dominated by women, with the number of female respondents (68.47%) being greater than men (31.53%). The high risk of women suffering from UTIs is due to the short urethra and the humidity level in the feminine area which is a favorable condition for bacteria to

grow and reproduce. So bacteria can climb into the urinary tract starting from the urethra and then to the bladder (Triwbowo, G., 2015). Urinary tract infection is a condition of infection due to the growth and development of bacteria and other organisms in the urinary tract (Pardede, 2018). Most urinary tract infections are caused by *E. Coli* bacteria. Other bacteria that can cause UTIs are *Enterobacter* sp., *Enterococcus faecalis*, Methicillin -resistant *Staphylococcus Aureus*, *Klebsiella pneumonia* and *Pseudomonas* as well as *Kandida sp* fungal infections (Widiyastuti, FS, & Soleha, TU, 2023).

Urine culture examination is *the gold standard* for determining the presence of microorganisms that cause UTI and the amount of colonization is $\geq 100,000$ CFU/ml. The disadvantages of urine culture include that it takes a long time and is quite expensive and is not available in all laboratories. This causes delays in treatment so that new diagnostics are needed that can replace urine culture (Malau UN, & Adipireno P, 2019). One of the screening methods to confirm the diagnosis of UTI is a urine dipstick test which is able to detect leukocyte esterase as an indicator of pyuria and nitrite as an indicator of bacteriuria. The leukocyte esterase urine *dipstick* test can detect the esterase enzyme produced by leukocytes in the urine. The conversion of nitrate to nitrite occurs due to bacteria that produce the enzyme nitrate reductase. This examination can provide results quickly, cheaply and easily (Malau, UN, & Adipireno, P., 2019).

In previous research, the results showed that 17 people (18.48%) were positive for leukocyte esterase, and 27 people (29.35%) were positive for nitrite and statistically there was a relationship between the presence of leukocyte esterase and nitrite and UTI based on urine culture (*p-value* 0,00) (Tuntun, M., & Aminah, S., 2021). Another study, on 50 patients with urinary tract infections who had catheters installed at RSUD Dr. H Abdul Moeloek

Lampung showed that the results of the urinalysis examination showed that the number of positive leukocyte esterase was 32 (64.0 %). Meanwhile, in the nitrite examination, more negative results were obtained, namely 43 (86.0 %) (Kumala, I., et al, 2022).

METHODS

This type of research uses a descriptive method with a *cross-sectional approach*. Examination of leukocyte esterase and urine nitrite using dipstick and automatic methods using a urine analyzer.

This study used a sample of patients diagnosed with urinary tract infections at several community health centers/hospitals in Jambi City in 2024. Using purposive sampling technique.

RESULTS AND DISCUSSION

Table 1. Respondent characteristics based on age and gender

	Characteristics	Frequency	Percentage
Gender	Male	13	43.3%
	Female	17	56.7%
Age	Late Adolescence (17-25 years)	4	13.3%
	Early Adulthood (26-35 years)	7	23.3%
	Late Adulthood (36-45 years)	5	16.7%
	Early Elderly (46-55 years)	7	23.3%
	Late Elderly (56-65 years)	6	20.0%
	Seniors (>65 years)	1	3.3%
	Total	30	100%

Based on table 1, it can be seen that the age characteristics are dominated by early adults (26-35 years) and early elderly (46-55 years), namely (23.3%). Based on gender, the female category has a higher percentage (56.7%) than the male category, namely (43.3%). From table 2, it is known that the highest number of leukocyte esterase positive leukocyte esterase was 1 (1+) 70 leu/MI and positive 2 (2+) 125 leu/MI, amounting to 12 people each (40%). And the fewest positive

leukocyte esterase 3 (3+) 500 leu/MI were 6 people (20%).

Table 2. Frequency distribution of the number of leukocyte esterase in urine of UTI sufferers

Leukocyte esterase	Frequency	Percentage (%)
1+ (70 leu/μl)	12	40
2+ (125 leu/μl)	12	40
3+ (500 leu/μl)	12	40

From table 3, it is known that the highest number of nitrite results was positive, amounting to 17 people (57%). Meanwhile, 13 people (43%) had negative nitrite results.

Table 3. Distribution of nitrite frequency in the urine of UTI sufferers

Nitrite	Frequency	Percentage (%)
Negative	13	43
Positive	17	57

Table 4. Frequency distribution of leukocyte esterase and nitrite counts in the urine of UTI sufferers

Test		Nitrite		Total
		Neg	Post	
Leukocytes esterase	Post 1	3 (25%)	9 (75%)	12 (100%)
	Post 2	4 (33%)	8 (67%)	12 (100%)
	Post 3	6 (100%)	0 (0%)	6 (100%)
	Total	13 (43%)	17 (57%)	30 (100%)

The results of research on the description of leukocyte esterase and urinary nitrite in Urinary Tract Infection (UTI) sufferers conducted on 30 samples showed that the majority of respondents were female, namely 17 people (56.7%). This is in line with research conducted by (Kumala, I et al. , 2022) that there are more UTI sufferers found in women compared to men, influenced by the condition of the urethra which is short and anatomically close to the vagina, periuretral glands and rectum, as well as the level of humidity in the feminine area. which is a favorable condition for bacteria to grow and reproduce, so that bacteria can move up the urinary tract from the urethra to the bladder. Meanwhile, in men, there are fewer, namely 13 people (43.3%), urinary tract infections rarely occur because their urethra is longer and also because of the presence of prostatic fluid which has

bactericidal properties whose function is to protect against bacterial infections.

Based on table 1, the results of research which was attended by 30 respondents, dominated by early adults (26-35 years) and early elderly (46-55 years), namely (23.3%). The results of this research are in line with research conducted by (Tuntun, M. , & Aminah, S., 2021) the incidence of urinary tract infections increases in patients aged 40 years and over with the highest peak in the elderly group. As people get older , the function of the human body's organs decreases, the physiological function of the body's organs decreases, so that the older you get, the more susceptible you are to suffering from various diseases.

Based on the results of research conducted on the number of leukocyte esterase and urine nitrite in UTI sufferers, it was found that all 30 respondents were declared positive for leukocyte esterase (100%) with leukocyte esterase 1+ and 2+ totaling 12 people each (40%) and leukocyte esterase 3+ totaling 6 people (20%). The results of this study are in line with research by Kumala I et al (2022), which found that 32 respondents (46%) were positive for leukocyte esterase. Leukocyte esterase indicates the presence of leukocytes in the urine which can be a marker for urinary tract infections (Inayati & Falah K. , 2014). Some disadvantages of leukocyte esterase examination that cause false negative results, namely the use of antibiotics and high levels of ascorbic acid in the urine. Meanwhile, false positive results can be caused by several things, such as inappropriate sampling in women (urine contaminated with fluid from the vagina), the presence of trichomonas, oxidizing agents and formalin (Tuntun, M., & Aminah, S., 2021).

For nitrite positive results, there were 17 people (57%) and 13 people (43%) negative for nitrite. So there is theoretical agreement with research conducted by Guspa, BR et al., (2018) which found positive results for nitrite

of 26.2% in patients with urinary tract infections. The nitrite test in the dipstick test is based on the ability of bacteria to convert nitrate into nitrite with the help of the enzyme nitrate reductase, the enzyme nitrous oxide reductase and nitrous oxide reductase. The bacteria that are often found in urine are a group of Gram-negative bacteria (Tuntun, M., & Aminah, S., 2021).

Based on table 4, the frequency distribution of the number of leukocyte esterase and nitrite in the urine of UTI sufferers showed positive results for leukocyte esterase and nitrite in 17 people (57%), namely leukocyte esterase 1+ which was positive for nitrite, there were 9 people (75%), and leukocyte esterase 2+ which was positive for nitrite. There were 8 people (67%) positive for nitrites. UTI is a condition that indicates the presence of microorganisms in the urinary tract which is characterized by bacterial colonization in the urinary tract. Detection of leukocyte esterase is an indirect indication of bacterial infection. Pyuria, which is a condition where white blood cells are present in large numbers in the urine, indicates the possibility of a urinary tract infection (UTI). Meanwhile, nitrite is an indicator of bacteriuria, therefore positive leukocyte esterase and nitrite strongly indicate the presence of a urinary tract infection (Inayati & Falah K., 2014).

The results were positive for leukocyte esterase, negative for nitrite, 13 people (43%), namely leukocyte esterase 1+ which was negative for nitrite, there were 3 people (25%), leukocyte esterase 2+ which was negative for nitrite, there were 4 people (33%), and leukocyte esterase 3+ there were 6 people who were negative for nitrite (100%). Negative nitrite results cannot rule out the possibility of a UTI, because there are certain conditions that can cause negative nitrite results in patients with UTI, such as infections caused not by bacteria but by fungal infections such as *candida sp*, infected by bacteria that cannot produce nitrites such as *Pseudomonas sp*, or

Enterococci, whose nitrite test results are negative, or the urine examined is urine that has not been stored in the bladder for a long time, it takes >4 hours for the bacteria to convert nitrate into nitrite. Therefore, the examination must be continued with urine culture as the gold standard for UTI examination (Parwati, PA & Cahyani AAEE., 2023).

CONCLUSION

Based on the research results, it can be concluded that based on age, the highest number of respondents was dominated by early adults (26-35 years) and early elderly (46-55 years), namely (23.3%). Based on gender, the female category has a higher percentage (56.7%) than the male category, namely (43.3%). The results of leukocyte esterase in patients with urinary tract infections showed that all 30 respondents were positive for leukocyte esterase with 1+ and 2+ respectively 12 people (40%) and 3+ 6 people (20%). The nitrite results in patients with urinary tract infections were 17 people (57%) positive for nitrite and 13 people (43%) negative for nitrite. Positive results for leukocyte esterase and positive for nitrite were obtained by 17 people (57%), namely 1+,(+) nitrite by 75%, and 2+,(+) nitrite by 67%, while positive results for leukocyte esterase and negative nitrite were obtained by 13 people (43%), namely 1+, (-) nitrite by 25%, 2+, (-) nitrite by 33%, and 3+, (-) nitrite by 100%.

It is hoped that future researchers will need to carry out urine cultures on people with urinary tract infections so they can find out the type of bacteria that is infecting them and help determine antibiotics for treatment.

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CONFLICT OF INTEREST

The author declares there is no conflict of interest.

REFERENCES

- Guspa, Bilma Riasari, Muji Rahayu, and Indranila Kustarini Samsuria. "Relationship of Urine Dipstick and Urine Flow Cytometry with urine culture in Urinary Tract Infections (UTI)." *Young Medika Media* 3.1 (2019).
- Inayati I, Falah K. 10Leukocyte esterase urinalysis diagnostic test on urine culture in urinary tract infection (UTI) patients with urethral catheterization, Syifa. *Medika* . 2014 ;4 (2):100. Doi: 10.32502/sm.v4i2.1406.
- Kumala, I., Triswanti, N., Hidayat, H., & Terta, RL (2022). Description of the results of a urinalysis examination in a patient with a urinary tract infection who had a catheter installed in the internal medicine inpatient room at Dr. RSUD. H. Abdul Moeloek Lampung Province. *Malahayati Medical Journal* , 6 (1).
- Malau, UN, & Purwanto Adipireno. "Correlation test for leukocyte esterase and nitrite with urine culture in urinary tract infections." *Medical Science Digest* 10.1 (2019).
- Maulani, D., & E. Siagian. (2022). Relationship between Knowledge and Urogenital Hygiene with Urinary Tract Infections. *Journal of Professional Nursing Research*, 4(4), 1269-1280.
- Pardede, SO et al., 2018. Consensus on Urinary Tract Infections in Children. Jakarta, Indonesian Pediatrician Association (IDAI).
- Parwati, PA, AA Ayu EC 2023. Assessment of Urine Dipstick Results (Nitrite and Leukocyte Esterase) as a Predictor of Bacteriuria. Surabaya: *The Journal of Muhamadiyah Medical Laboratory Technologist*. Vol: 6, No. 1 (108-114).
- Triwbowo, G. (2015). A rational approach to urinary tract infection therapy in USILA (elderly). *Journal of the Medical Sciences (Medicine Periodicals)*,
- Tuntun Maria, & Siti Aminah. "Relationship of Urine Dipstick Results (Leukocyte Esterase, Nitrite and Glucosuria) with the Incidence of UTI in Employees." *Journal of Health* 12.3 (2021): 465-471.
- Yang X, Chen H, Zheng Y, Qu S, Wang H, Yi F. Disease burden and long-term trends of urinary tract infections: A worldwide report. *Front Public Health*. 2022 Jul 27;10:888205. Doi: 10.3389/fpubh.2022.888205. PMID: 35968451; PMCID: PMC9363895.

COMPARATIVE STUDY OF NEUTROPHIL LYMPHOCYTE RATIO (NLR) IN PULMONARY TUBERCULOSIS PATIENTS WITH AND WITHOUT DIABETES MELLITUS

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ABSTRACT

Background: Tuberculosis (TB) lungs is disease infection which caused by *Mycobacterium Tuberculosis* (M.TB) bacteria. The risk of pulmonary TB can increase in people with diabetes mellitus (DM). The occurrence of infection is closely related to response immune. Pulmonary TB infection causes inflammation resulting in changes in the immune system in the form of an increase in the number of neutrophils (neutrophilia) and a decrease in the number of lymphocytes (lymphocytopenia). Chronic inflammation is also experienced by DM sufferers due to hyperglycemia which damages the endothelium and triggers a cellular response resulting in an increase in NLR. This study aims to determine the overview of NLR in pulmonary TB patients with DM.

Method: This type of research is descriptive research with a *cross sectional approach*. This research uses a *convenience sampling technique*. This research was conducted in month April-June 2024 with A sample of 40 TB patients without DM and TB patients with DM from several health centers center in Jambi City.

Result: The result shows the average number of NLR in pulmonary TB without DM which is 1,60 and in pulmonary TB with DM the average was 2,59. Results of *Mann Whitney test* with mark p-value = 0.006 ($p < 0.05$)

Conclusion: NLR in pulmonary TB with DM is higher than NLR in pulmonary TB without DM.

Keywords: pulmonary TB without DM, Pulmonary TB with DM, NLR

INTRODUCTION

Pulmonary tuberculosis (pulmonary TB) is a lung infection caused by the bacteria *Mycobacterium Tuberculosis* (M.TB) and is still a health problem throughout the world. Pulmonary TB is the main cause of death due to infectious diseases with high morbidity and mortality rates. Based on data from *the World Health Organization* (WHO), pulmonary TB cases are often found in developing countries with low and middle income. Some of them are India, Indonesia, China, the Philippines, Pakistan, Nigeria, Bangladesh and the Democratic Republic of the Congo (WHO, 2022).

WHO report In 2022, it is estimated that there will be 10.6 million cases of pulmonary TB with a death rate of 1.3 million people in the world (WHO, 2022). Indonesia is ranked second as a contributor to pulmonary

TB morbidity after India with 969,000 sufferers (Kemenkes RI, 2022). The Central Statistics Agency (BPS) reported that in Jambi Province, 12,682 people were found suffering from pulmonary TB and 1,942 of them were in Jambi City (BPS, 2022).

The risk of pulmonary TB can increase in people with diabetes mellitus (DM), in fact, according to WHO, in 2019 it is estimated that there will be 0.35 million cases of TB lungs caused by DM (WHO, 2022). The Jambi City Health Service recorded that in 2022 there were 91 pulmonary TB patients with DM (Dinkes, 2022). Research conducted by Arliny (2015) shows that DM is an important risk factor for pulmonary TB and can influence clinical and treatment response, and even increase the risk of developing drug-resistant pulmonary TB (MDR TB).

DM patients have a low immune system which can trigger an increase in latent

pulmonary TB to active pulmonary TB. DM also has a negative impact on the results of pulmonary TB treatment because it causes a delay in the microbiological response and a higher initial burden of mycobacterial numbers as well as a longer sputum conversion time, causing a higher recurrence rate. DM sufferers may also be at risk of failure in pulmonary TB therapy compared to patients who do not suffer from DM. On the other hand, pulmonary TB infection can also cause glucose intolerance, triggering hyperglycemia which will worsen glycemic control and can result in DM in susceptible people (Arliny, 2015; Lin et al., 2019; Mihardja et al., 2016).

According to Lin et al. (2019) an increased risk of pulmonary TB occurs in both type 1 and type 2 DM, however type 2 DM accounts for more than 95% of patients worldwide so that the public health burden due to comorbid diseases from type 2 DM is much greater. This is in accordance with the research results of Utomo et al. (2016) which shows that there is a significant relationship between type 2 DM and extensive pulmonary TB lesions ($p=0.03$). Type 2 DM is known to increase the risk of pulmonary TB lesion status by 5.25 times.

Pulmonary TB infection causes inflammation resulting in changes in the immune system in the form of an increase in the number of neutrophils (neutrophilia) and a decrease in the number of lymphocytes (lymphocytopenia). The results of the comparison between neutrophils and lymphocytes are more sensitive in the incidence of bacterial infections when compared with the total white blood cell count. The comparison of the number of neutrophils and lymphocytes, which has become known as *the Neutrophil Lymphocyte Ratio* (NLR), has become a new marker of inflammation that has the potential to determine the presence of chronic inflammation which can be detected simply, efficiently and reliably because of its stability and high sensitivity. Chronic inflammation is also

experienced by DM patients due to hyperglycemia which will damage the endothelium (endothelial dysfunction) and trigger a cellular response resulting in an increase in NLR (American Diabetes Association, 2015; Azab et al., 2014; Y.-H. Lin et al., 2015; Nurdin et al., 2021).

Research conducted by Ngahane et al., (2020) stated that there was a significant increase in NLR in pulmonary TB patients compared to the control group. This is in line with research by Jeon et al., (2019) which obtained an average NLR value in the pulmonary TB group, which was 4.37, higher than the healthy group. NLR was also significantly higher in Type 2 DM patients who experienced complications. In research conducted by Nurdin et al., (2021), the results of NLR examinations in Type 2 DM sufferers were obtained, namely that 26 samples (86.67%) had increased NLR and four samples (13.33%) had normal NLR.

The research data above shows an increase in NLR experienced by pulmonary TB patients and DM patients due to the body's response to inflammation. This is what underlies the author's interest in conducting research to try to see the picture of NLR in pulmonary TB patients suffering from DM.

METHODS

This research is a study with a cross-sectional design. Sampling using convenience sampling techniques was carried out on pulmonary TB patients at several Community Health Centers in Jambi City. The number of samples in this study was 40 samples consisting of 20 pulmonary TB patients without DM and 20 pulmonary TB patients suffering from DM who were undergoing treatment at 9 health centers in Jambi City (Payo Selincah, Kenali Besar, Talang Bakung, Talang Banjar, Tanjung Pinang, Simpang Kawat, Paal Merah I, Paal V and Pakuan Baru).

The patient filled out and signed a consent form as a research respondent before the interview. Next, a sample of the patient's venous blood is taken. The specimen is examined using a Hematology Analyzer (Sysmex XN-450). Statistical data were analyzed using the Mann Whitney test using the statistical program for social science (SPSS.23).

RESULTS AND DISCUSSION

In this study, observations were made on examination data from 20 pulmonary TB patient without DM and 20 pulmonary TB patient with DM respondents.

3.1 General characteristics of research Subjects
The characteristics of the respondents involved can be seen below:

Table 1. Respondent characteristic table

Characteristics	Pulmonary TB without DM		Pulmonary TB with DM	
	N	%	N	%
Gender				
▪ Man	10	50%	10	50%
▪ Woman	10	50%	10	50%
Age				
▪ 15 – 64	19	95%	17	85%
▪ ≥ 65	1	5%	3	15%
Length of treatment for TB				
▪ ≤ 2 months	8	40%	10	50%
▪ > 2 months	12	60%	10	50%
Duration of Suffering for DM				
▪ < 5 years	-	-	9	45%
▪ > 5 years	-	-	11	55%

Analysis characteristics of respondents in pulmonary TB patients without DM and pulmonary TB with DM, namely gender, both have the same percentage, namely men (50%) and women (50%). Based on age, respondents with pulmonary TB without DM and pulmonary TB with DM were dominated by the age group 15-64 years old. Analysis of the length of treatment in TB patients showed respondents with treatment duration >2 months more (60%) than respondents with duration of treatment ≤ 2 months (40%), while in TB patients with DM respondents had the same percentage with duration of treatment ≤ 2

months (50%) and > 2 months (50%). Based on the length of DM treatment, TB patients with DM were dominated by treatment duration >5 years (55%).

3.2 Description of NLR in patients Pulmonary TB with and without DM

Table 2. Neutrophils to lymphocyte ratio based on respondent

Variable	N	Mean	Std. Deviation	P value
TB without DM	20	1,60	0,95	
TB with DM	20	2,59	1,51	0.006

Based on the table above, it can be seen that pulmonary TB patients suffering from DM have the highest average NLR (2.59). The results were analyzed using the *Mann Whitney test* and obtained a p value = 0.006. The *p value* is smaller than *alpha* (α) 0.05, so it can be concluded that there is a significant difference between the average NLR in pulmonary TB patients suffering from DM and without DM as indicated by the higher NLR in pulmonary TB patients suffering from DM.

Pulmonary TB infection causes inflammation resulting in changes in the immune system in the form of an increase in the number of neutrophils (neutrophilia) and a decrease in the number of lymphocytes (lymphocytopenia). The results of the comparison between neutrophils and lymphocytes are more sensitive in the incidence of bacterial infections when compared with the total white blood cell count. (Azab et al., 2014; Y.-H. Lin et al., 2015; Nurdin et al., 2021).

The relationship between NLR and infection also exists in chronic inflammation suffered by DM patients. Hyperglycemia results in impaired neutrophil function so that comotactic, phagocytic and bacterial killing power decreases. DM is associated with decreased cellular immunity, T lymphocytes and neutrophils, decreased T-helper1 (Th1) cytokine response, TNF alpha production, IL-1 beta and IL-6 production found in TB-DM compared to non-DM. Th1 cytokines are vital in controlling and inhibiting M.TB. The

decrease in the number and function of T lymphocytes causes the susceptibility of DM to develop into TB (Santos et al., 2018; Woelansari et al., 2024).

The results of research conducted on the average NLR based on respondent status showed that the average NLR in pulmonary TB patients with DM was 2.59, higher than the average NLR in pulmonary TB patients without DM, which was 1.60. These results are in line with research conducted by Dewi et al., (2018) which stated that the NLR in TB patients was known to be higher in patients with poor glycemic control. This condition can occur because NLR is related to glycemic control and pulmonary TB infection, so it has an impact on cell increased neutrophils (neutrophilia) And cell lymphocytes decrease (lymphocytopenia) (American Diabetes Association, 2015; Azab et al., 2014; Dewi et al., 2018; Y.-H. Lin et al., 2015; Nurdin et al., 2021).

TB patients with DM experience high levels of depression of cellular immunity, with the presence of fewer T lymphocytes and decreased capacity compared to patients with TB alone. DM causes a decrease in the phagocytic power of macrophages, which can affect the body's defences. This is supported by the observation that uncontrolled DM sufferers can experience a more destructive increase in TB and a higher death rate. (Faurholt-Jepsen et al., 2011; Niazi et al., 2012).

Higher NLR is a potential marker of inflammation and can lead to the severity of TB disease, insulin resistance and type 2 diabetes. Hyperglycemia was found to be associated with suppression of innate and adaptive immune responses in TB-DM patients due to the absolute number of total T and B lymphocytes, CD8⁺ T lymphocytes, and NK cells were found to be lower. Higher levels of pro-inflammatory cytokines were observed in TB-DM patients compared with non-DM patients before and during anti-tuberculosis

therapy (Abakay et al., 2015; Lou et al., 2015; Prada-Medina et al., 2017)

Mann Whitney test carried out, it showed that there was a significant difference and obtained a p value = 0.006. The p value is smaller than alpha (α) 0.05, so it can be concluded that there is a significant difference between the average NLR in pulmonary TB patients suffering from DM and those without DM as indicated by the higher NLR in pulmonary TB patients suffering from DM. These results are in line with research conducted by Woelansari et al., (2024) stating that there is a relationship between NLR values in TB DM patients.

CONCLUSION

The results of research that has been carried out regarding NLR examination in pulmonary TB patients between those without DM and those with DM, it was found that the average NLR in pulmonary TB patients without DM was 1.60 and the average NLR in pulmonary TB patients with DM was 2.59. It can be concluded that there is a significant difference between NLR in pulmonary TB patients with DM and without DM. Future researchers are advised to continue research by examining other types of leukocyte cells and covering a wider research area so that they can describe the population evenly.

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CONFLICT OF INTEREST

There is no potential conflict of interest in this research.

REFERENCES

- Abakay, O., Abakay, A., Sen, H. S., & Tanrikulu, A. C. (2015). The Relationship Between Inflammatory Marker Levels and Pulmonary Tuberculosis Severity. *Inflammation*, 38(2), 691–696. <https://doi.org/10.1007/s10753-014-9978-y>
- American Diabetes Association. (2015). 2. Classification and diagnosis of diabetes. *Diabetes Care*, 38(January), S8–S16. <https://doi.org/10.2337/dc15-S005>
- Arliny, Y. (2015). Tuberkulosis Dan Diabetes Mellitus Implikasi Klinis Dua Epidemik. *Jurnal Kedokteran Syiah Kuala*, 15(1), 36–43.
- Azab, B., Camacho-Rivera, M., & Taioli, E. (2014). Average values and racial differences of neutrophil lymphocyte ratio among a nationally representative sample of United States subjects. *PLoS ONE*, 9(11). <https://doi.org/10.1371/journal.pone.0112361>
- BPS. (2022). Kasus Penyakit Provinsi Jambi 2022. BPS. <https://jambi.bps.go.id/indicator/30/1383/1/kasus-penyakit.html>
- Dewi, P. U., & Wulani, V. (2018). Perbandingan gambaran radiografi toraks penderita tuberkulosis paru disertai komorbid diabetes mellitus yang terkontrol dan tidak terkontrol dengan penderita tuberkulosis paru non diabetes mellitus (Kajian berdasarkan nilai neutrophil lymphocyte ratio). 58–59.
- Dinkes Kota Jambi. (2022). Data Pasien Tuberkulosis Yang Menderita Diabetes Mellitus. Dinkes Kota Jambi
- Faurholt-Jepsen, D., Range, N., PrayGod, G., Jeremiah, K., Faurholt-Jepsen, M., Aabye, M. G., Changalucha, J., Christensen, D. L., Pipper, C. B., Krarup, H., Witte, D. R., Andersen, A. B., & Friis, H. (2011). Diabetes is a risk factor for pulmonary tuberculosis: A Case-Control study from Mwanza, Tanzania. *PLoS ONE*, 6(8), 4–8. <https://doi.org/10.1371/journal.pone.0024215>
- Jeon, Y. La, Lee, W. I., Kang, S. Y., & Kim, M. H. (2019). Neutrophil-to-Monocyte-Plus-Lymphocyte Ratio as a Potential Marker for Discriminating Pulmonary Tuberculosis from Nontuberculosis Infectious Lung Diseases. *Lab Medicine*, 50(3), 286–291. <https://doi.org/10.1093/labmed/lmy083>
- Kemenkes RI. (2022). Program Penanggulangan Tuberkulosis. *Kemenkes RI*, 1–156. https://tbindonesia.or.id/pustaka_tbc/laporan-tahunan-program-tbc-2021/
- Lin, Y., Harries, A. D., Kumar, A. M. V., Critchley, J. A., Crevel, R. van, Owiti, P., Dlodlo, R. A., & Dejgaard, A. (2019). Management of Diabetes Mellitus-Tuberculosis: A guide to the essential practice. In *International Union Against Tuberculosis and Lung Disease*.
- Lin, Y.-H., Chen, C.-P., Chen, P.-Y., Huang, J.-C., Ho, C., Weng, H.-H., Tsai, Y.-H., & Peng, Y.-S. (2015). Screening for pulmonary tuberculosis in type 2 diabetes elderly: A cross-sectional study in a community hospital. *BMC Public Health*, 15, 3. <https://doi.org/10.1186/1471-2458-15-3>
- Lou, M., Luo, P., Tang, R., Peng, Y., Yu, S., Huang, W., & He, L. (2015). Relationship between neutrophil-lymphocyte ratio and insulin resistance in newly diagnosed type 2 diabetes mellitus patients. *BMC Endocrine Disorders*, 15(1), 4–9. <https://doi.org/10.1186/s12902-015-0002-9>
- Mihardja, L., Lolong, D. B., & Ghani, L. (2016). Prevalensi Diabetes Melitus Pada Tuberkulosis Dan Masalah Terapi. *Jurnal Ekologi Kesehatan*, 14(4), 350–358. <https://doi.org/10.22435/jek.v14i4.4714.350-358>

- Ngahane, M., B. H., Ebenezer, A. T., Eveline, N. D., Raïssa, M. N. E., Fernando, K. L., Lum, C. V., & Henry, N. L. (2020). Diagnostic Value of Leukocyte Count Abnormalities in Newly Diagnosed Tuberculosis Patients. *Open Journal of Respiratory Diseases*, 10(01), 1–10. <https://doi.org/10.4236/ojrd.2020.101001>
- Niazi, A. K., & Kalra, S. (2012). Diabetes and tuberculosis: A review of the role of optimal glycemic control. *Journal of Diabetes and Metabolic Disorders*, 11(1), 9–12. <https://doi.org/10.1186/2251-6581-11-28>.
- Nurdin, N., Kalma, K., Hasnawati, H., & Nasir, H. (2021). Profil Nilai Neutrophil Lymphocyte Ratio (NLR) Pada Penderita Diabetes Melitus Tipe-2. *Jurnal Media Analis Kesehatan*, 12(1), 64. <https://doi.org/10.32382/mak.v12i1.2070>
- Prada-Medina, C. A., Fukutani, K. F., Kumar, N. P., Gil-Santana, L., Babu, S., Lichtenstein, F., West, K., Sivakumar, S., Menon, P. A., Viswanathan, V., Andrade, B. B., Nakaya, H. I., & Kornfeld, H. (2017). Systems Immunology of Diabetes-Tuberculosis Comorbidity Reveals Signatures of Disease Complications. *Scientific Reports*, 7(1), 1–16. <https://doi.org/10.1038/s41598-017-01767-4>
- Santos, M. L., Coeli, C. M., Batista, J. D. L., Braga, M. C., & Albuquerque, M. de F. P. M. de. (2018). Factors associated with underreporting of tuberculosis based on data from Sinan Aids and Sinan TB. *Revista Brasileira de Epidemiologia*, 21. <https://doi.org/10.1590/1980-549720180019>
- Utomo, R., Nugroho, H. K. H., & Margawati, A. (2016). Hubungan Antara Status Diabetes Melitus Tipe 2 Dengan Status Tuberkulosis Paru Lesi Luas. *Jurnal Kedokteran Diponegoro*, 5(4), 1536.
- WHO. (2022). Global Tuberculosis Report 2023. In *January: Vol. t/malaria/* (Issue March).
- Woelansari, E. D., Surabaya, P. K., & Surabaya, P. K. (2024). Correlation Of Neutrophil Lymphocyte Ratio (NLR) Value With Incidence Of Tuberculosis Disease In Patients With Diabetes Mellitus. 11(1), 18–22.

STUDY OF PLATELOCYTE COUNT ON PATIENT FEVER TYPHOID AT BAITURRAHIM JAMBI HOSPITAL

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ABSTRACT

Background: Typhoid fever is an infectious disease caused by the bacteria *Salmonella typhi*. The highest prevalence distribution of typhoid fever is aged 5-14 years (1.9%). Typhoid fever can cause thrombocytopenia. In typhoid fever, thrombocytopenia usually occurs in the second week (week of complications). Thrombocytopenia is caused by endotoxin from the *Salmonella typhi* bacteria. Study this is purposeful to find out the average – average picture and differences in quantity platelets on patient typhoid fever based on category age and duration of fever.

Method: Method used in this research was a cross-sectional method with an Independent T data analysis test using the IBM SPSS tool. The total sample was 30 people taken using purposive sampling technique.

Results: The results of statistical tests show that the average number of platelets by age category, the low platelet count is found at the age of 6 - 11 years (children) (155.437,50/ μ L) and the average high platelet count is found at the age of 12 - 25 years (teens) (226.071,43/ μ L). Meanwhile, the average number of platelets in the fever duration category was found to have a low platelet count, namely fever duration ≥ 7 days (141.071,43/ μ L) and a high average platelet count was found for fever duration < 7 days (229.812,50/ μ L).

Conclusion: There is a significant difference between age and duration of fever and the number of platelets in typhoid fever patients, namely that $p < \alpha$ (0.05) is indicated by the p-value based on age = 0.002 and the p-value based on fever duration = 0.000.

Keywords: Typhoid Fever; Platelets; Age; Duration of Fever

INTRODUCTION

Typhoid fever caused by salmonella typhi bacteria, where individuals have the potential to become infected through food or drink contaminated with these bacteria (foodborne disease). The *Salmonella typhi* bacteria that causes typhoid fever attacks mainly in the ileocecal area (part of the small intestine) with typical symptoms, namely experiencing fever for one week or more, digestive disorders, impaired consciousness and serious complications in the form of sepsis (Rahmat et al., 2019) . According to World Health data from the World Health Organization (WHO) 11 to 21 million cases of typhoid fever are estimated in 2020, along with approximately 128,000 to 161,000 deaths per year. Based on the Health Research and

Development Agency of the Republic of Indonesia (2018) , the prevalence of typhoid fever in Indonesia has reached 1.7%. The highest prevalence distribution is aged 5-14 years (1.9%).

Typhoid fever can cause thrombocytopenia. This condition prolongs healing of the disease (Febriani et al., 2019) . In typhoid fever, thrombocytopenia is common , with a reported incidence of up to 26% in children (Reesi et al., 2016). Thrombocytopenia in typhoid fever is caused by endotoxin from *Salmonella typhi* bacteria which stimulates products from macrophages to attack the bone marrow, this results in decreased production and maturation stages of platelets (Handayani, 2020) .In the development of typhoid fever, the second week is usually described as the week of complications. Thrombocytopenia is the most

common complication of typhoid fever (Widary et al., 2022).

Platelets are blood cells that play an important role in hemostasis. Platelets attach to the endothelial lining of torn blood vessels (wounds) by forming a platelet plug. Platelets do not have a nucleus, measure 1-4 μ , and their cytoplasm is blue with reddish-purple granules. The normal number of platelets is 150.000 - 400.000/ μ L (Kiswari, 2014).

Based on research conducted by (Situmorang et al., 2022), regarding the frequency distribution of platelet counts in typhoid fever patients, it shows that out of 33 samples of typhoid fever sufferers, 16 samples (48.5%) were found to have low platelet counts. There were 15 samples with normal platelet counts (45.5%). There were 2 samples with high platelet counts (6.1%). So the highest number of platelets in typhoid fever sufferers are samples with low platelet counts and the lowest are samples with high platelet counts.

METHODS

This type of research uses a descriptive method with a cross-sectional approach, examining platelet counts using an automatic method using a Hematology Analyzer.

This study used a sample of patients diagnosed with typhoid fever in the inpatient ward of Baiturrahim Hospital, Jambi City in 2024. Using a purposive sampling technique.

RESULTS AND DISCUSSION

Based on table 1. of 30 respondents, it shows the distribution with age characteristics, the 6 - 11 year old category (children) has a higher percentage (53.3%) compared to category age 12 – 25 years (adolescents) (46.7%). Respondents with male gender have a smaller percentage (40%) than the female gender category (60%). Length of hospitalization < 7 days has a smaller percentage (23.3%) than length of stay $\geq$ 7 days

(76.7%). The fever duration category < 7 days had a higher percentage (53.3) than the fever duration category $\geq$ 7 (46.7%).

Table 1. Characteristics of Respondents

Characteristics	Frequency	Percentage (%)
Age	n=30	
6 – 11 years (children)	16	53,3
12 – 25 years (teen)	14	46,7
Gender	n=30	
Male	12	40
Female	18	60
Length of Hospitalization	n=30	
< 7 day	23	76,7
$\geq$ 7 day	7	23,3
Duration of Fever	n=30	
< 7 day	16	53,3
$\geq$ 7 day	14	46,7

Table 2. Description of platelet count in inpatients with typhoid fever based on age

Variable	N	Mean	Min	Max	Std. Deviation	P-value
6-11 years	16	155437,50	105000	204000	33206,362	0.002
12-25 years	14	226071,43	106000	298000	65297,502	
Total	30	188400,00	105000	298000	61369,767	

Table 3. Description of platelet count in inpatients with typhoid fever based on fever duration

Variable	N	Mean	Min	Max	Std. Deviation	P-value
< 7 day	16	229812,50	159000	298000	50141,425	0.000
$\geq$ 7 day	14	141071,43	105000	189000	31266,754	
Total	30	188400,00	105000	298000	61369,767	

Results of platelet count research on Typhoid fever patients were conducted on 30 samples, it was found that the majority of respondents were female, namely 18 people and the number of male respondents was 12 people. This is in line with research conducted by Mustofa et al. (2020) typhoid fever can occur in all genders, both women and men and this is not an indication that the incidence of typhoid fever is more in women than men, it is possible that more patients who are hospitalized are women. Typhoid fever is closely related to personal hygiene and poor food hygiene, as well as a dirty environment so that typhoid fever can happen to anyone.

Based on table 1, it was found that the most respondents were in the 6 - 11 year age category (children) with a percentage (53.3%) compared to the 12 - 25 years age category (adolescents), namely the percentage (46.7%) The results of this study are in line with research conducted by Rahmat et al. (2019)

which states that there is an age group of children. Often snacking at school or outside the home, at this age children still pay less attention to personal hygiene and have the habit of snacking carelessly which can basically cause the transmission of typhoid fever.

The characteristics of respondents with the highest length of stay were respondents with a length of stay < 7 days, namely 23 people, compared to the number of respondents with a length of stay $\geq$ 7 days, namely 7 people. This is in line with research conducted by Laode et al. (2021) the length of treatment time can be used as a measure of the performance of a hospital's health services. The length of patient treatment can assess the efficiency of a health service, where the average length of treatment that is considered efficient according to medical service standards is 3 - 5 days.

This research aims to determine the description and differences in platelet counts in typhoid fever patients based on age and duration of fever. Based on the results of data analysis, the average was obtained average platelet count in age category 6 - 11 years (children) lower, namely 155.437,50/ μ L, while the average age 12 - 25 years (teenagers) is higher, namely equal to 226.071,43/ μ L. Statistically, from the results of the independent T test, it was found that there were significant differences between the two age categories, this was indicated by the p.value = 0.002. The results of this study are in line with research conducted by Umami et al. (2023), namely the results of platelet counts in typhoid fever where thrombocytopenia occurs more frequently in the <12 year age category compared to the 12 - 25 year age category. At the age of <12 years, children are very susceptible to various diseases, while the immune system in typhoid fever sufferers can affect the number of platelets in the body (Umami et al., 2023). If the immune system of a typhoid fever sufferer is good enough then the hematology results were still within normal limits. (Handayani & Mutiarasari,

2017). Thrombocytopenia is relatively common in typhoid fever, with a reported incidence of up to 26% in children - child (Reesi et al., 2016).

Based on the results of data analysis, it was found that the average number of platelets in the category of fever duration < 7 days was higher, namely 229.812,50/ μ L. Meanwhile, in the category of fever duration $\geq$ 7 days it was lower, namely 141.071,43/ μ L. Statistically, from the results of the independent T test, it was found that there was a significant difference between the two categories of fever duration, this was indicated by the p.value = 0.000. This is in line with research by Widary et al. (2022) which states that the platelet count at the start of typhoid fever usually does not decrease so drastically that it is found that the platelet count is within normal limits. In the development of typhoid fever, the second week is usually described as the week of complications. Thrombocytopenia is the most common complication of typhoid fever. The results of this research are also in line with research by Febriani et al. (2019), namely someone who experiences a fever duration of <7 days, the platelet count is still within normal limits, compared to someone who experiences a fever duration of $\geq$ 7 days. This is because the amount of endotoxin in the body of a typhoid fever sufferer affects the duration of the fever. If the amount of endotoxin is still small or has not reached the toxic limit, then the effect of endotoxin is not too bad, indicating that the typhoid fever patient has a fever duration of <7 days. Endotoxin will have a bad impact if the amount is large enough. The amount of endotoxin present in the bodies of typhoid fever sufferers varies, causing variations Platelet counts vary too.

Endotoxin itself is a toxin complex that is only found in the cell walls of gram-negative bacteria such as salmonella typhi which can cause fever (Hashmi & Thakur, 2019). Low platelets in typhoid sufferers are caused by the endotoxin of the Salmonella typhi bacteria

which stimulates macrophages to release their products, namely cytokines (interleukins and tumor necrosis factor) and mediators (histamine, bradykinin, serotonin). The products released by macrophages will attack the bone marrow. As a result of the attack on the bone marrow, the production of the number of platelets and the stage of platelet maturation is reduced (decreased) which can cause thrombocytopenia (Handayani, 2020). Factors that influence differences in the number of platelets in each patient's blood sample include different immune systems, different nutritional intake, the presence of other diseases, duration of illness, vaccination and administration of antibiotics Widary et al. (2022).

CONCLUSION

Based on the results of research describing the number of platelets in typhoid fever patients at Baiturrahim Hospital Jambi, it can be concluded that the average number of platelets in typhoid fever patients based on age is in category 6 - 11 years (children) is lower, namely 155.437,50/ μ L compared to the age category 12 - 25 years (teenagers) namely 226.071,43/ μ L. The average number of platelets in typhoid fever patients based on fever duration in the < 7 days category was higher, namely 229.812,50/ μ L compared to the duration of fever with the category $\geq$ 7 days namely 14.,071,43/ μ L. There are significant differences between age and duration of fever with platelet count in typhoid fever patients.

It is hoped that future researchers will be advised to add or expand other variables such as antibiotic categories, history of other diseases, and length of stay. For typhoid fever patients, they can maintain the body's immune system by eating healthy foods and consuming fruit as well as maintaining personal hygiene and the surrounding environment.

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CONFLICT OF INTEREST

The author declares there is no conflict of interest.

REFERENCES

- Febriani, S., Rosyidah, DU, Hernawan, B., & Risanti, E. (2019). The relationship between leukocyte levels and platelet levels and duration of fever in pediatric typhoid fever patients. *BIOMEDIKA, Faculty of Medicine Journals*, January 2018, 978–984.
- Handayani. (2020). *Systematic Review: Relationship between Immunoglobulin Macroglobulin (IgM) and Immunoglobulin Gamma (IgG) with Thrombocytopenia in Typhoid Fever*. 1–13.
- Handayani, NPDP, & Mutiarasari, D. (2017). Characteristics of Age, Gender, Fever Level, Hemoglobin, Leukocyte and Platelet Levels of Typhoid Fever Sufferers in Pediatric Patients at Anutapura Hospital in 2013. *MEDIKA TADULAKO, Medical Scientific Journal*, 4 (2), 30–40. Jurnal.untad.ac.id/jurnal/index.php/MedikaTadulako/article/view/9285.
- Hashmi, F., & Thakur, A. (2019). *Bacterial Endotoxin Test using the Gel-Clot Method*. April, 564–567.
- Kiswari, R. (2014). *Hematology & Transfusion* (C. Sally & R. Astikawati (eds.)).
- Laode, MISP, Nasruddin, H., Surdam, Z., Nurelly, & Syahril, E. (2021). Characteristics of typhoid fever patients at Ibnu Sina Hospital Makassar. *Wal'afiat Hospital Journal*, 02 (02), 141–148.
- Mustofa, FL, Rafie, R., & Salsabilla, G. (2020).

- Characteristics of Typhoid Fever Patients in Children and Adolescents. *Sandi Husada Health Scientific Journal* , 12 (2), 625–633. <https://doi.org/10.35816/jiskh.v12i2.372>
- Rahmat, W., Akune, K., & Sabir, M. (2019). Typhoid Fever Complicated by Sepsis: Definition, Epidemiology, Pathogenesis, and a Case Report. *Journal of the Medical Profession (MedPro)* , 3 (3), 264–276.
- Reesi, A. M., Stephens, G., & McMullan, B. (2016). Severe thrombocytopenia in a child with typhoid fever: a case report. *Journal of Medical Case Reports* , 10 (1), 1–4. <https://doi.org/10.1186/s13256-016-1138-6> .
- Republic of Indonesia Health Research and Development Agency. (2018). 2018 National Riskesdas Report.pdf. In *Balitbangkes Publishing Institute* (p. p. 156).
- Situmorang, PR, Simanullang, TR, & Bangun, SR (2022). Analysis of Leukocyte and Platelet Counts in Typhoid Fever Patients at Santa Elisabeth Hospital Medan in 2022. *PANNMED Scientific Journal (Pharmacist, Analyst, Nurse, Nutrition, Midwifery, Environment, Dentist)* , 17 (3), 527–532. <https://doi.org/10.36911/pannmed.v17i3.1488>.
- Umami, M., Karneli, K., Refai, R., Hermansyah, H., Mutholib, A., & Nurhayati, N. (2023). Portrait of the Number of Platelets in Typhoid Fever Sufferers at the Siti Khadijah Islamic Hospital, Palembang City. *Journal of Medical Laboratory and Science* , 3 (1), 10–17. <https://doi.org/10.36086/medlabscience.v3i1.1665>
- Widary, BL, Danuyanti, IGAN, & Zaetun, S. (2022). Correlation of Widal Titer with the Number and Platelet Index of Typhoid Fever Sufferers in West Lombok Regional Health Centers. *Andalas Health Journal* , 10 (3), 138. <https://doi.org/10.25077/jka.v10i3.1792>
- World Health Organization. (2020). Typhoid and other invasive salmonellosis. *Online*, 1–13. http://www.who.int/immunization/monitoring_surveillance/burden/vpd/WHO_SurveillanceVaccinePreventable_21_Typhoid_R2.pdf?ua=1

DEVELOPMENT OF EDUCATIONAL MEDIA WITH ANIMATED VIDEOS TO INCREASE KNOWLEDGE OF PREGNANT WOMEN ABOUT PRE-ECLAMPSIA AT THE SIMPANG IV SIPIN HEALTH CENTER

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ABSTRACT

Background: Preeclampsia and eclampsia are two types of high blood pressure during pregnancy that negatively affect those affected or the fetus conceived. Animated video development is the process of designing and creating animation using relevant techniques and tools to tell a story, entertain or educate an audience. The purpose of the study is to using animated videos to increase the knowledge of pregnant women about Pre-eclampsia.

Method: The research design is development research using the Richey and Klein-method with pre-experimental research with a One-Group Pretest-Posttest design. Richey and Klein which includes planning, namely the analysis of needs, goals and objectives, the creation of story boards, production, namely developing story boards, character designs and animation making, evaluation, namely evaluation methods, data analysis and interpretation of results. The subjects in this study were all pregnant women who visited the Simpang IV Sipin Health Center totalling 32 people.

Results: The results of the validation test of animation video media development with Material Experts and Media Experts found that the development of animation videos was feasible to be tested. The results of the pretest with a mean value of 5.38 and the posttest with a mean value of 9.97, it can be seen that after being educated using animated video media about Pre-Eklamsia, the respondents' knowledge increased by 4.59 with a P Value of $0.00 < 0.005$. There is an effect of the use of educational video media on the improvement of knowledge.

Conclusion: The conclusion of educational development using animated video media can increase the knowledge of pregnant women about Pre-Eclampsia.

Keywords: Development; Educational Media; Animation Video; Knowledge

INTRODUCTION

Preeclampsia is still a threatening problem in pregnancy, especially in developing countries. This disease of preeclampsia is the leading cause of maternal death in the world. Health in pregnant women has an impact that can extend to various aspects of life and is one of the parameters of the nation's progress in the implementation of health services to the community related to the maternal mortality rate (AKI) and infant mortality rate (AKB). (Riya, 2021).

The World Health Organization (WHO) said that the incidence of preeclampsia ranged from 0.51%-38.4% in the world and had an impact on the country seven times more. develop when juxtaposed with cases of preeclampsia in developed countries. In addition, the number of people with preeclampsia is around 128,273/year or around 5.3% in Indonesia. Severe preeclampsia and eclampsia in Indonesia account for 30-40% of maternal mortality, while several hospitals in Indonesia have identified bleeding as the main cause of

maternal mortality (Ministry of Health of the Republic of Indonesia, 2018).

Meanwhile, according to the Jambi City Health Office, preeclampsia and eclampsia are ranked second by 13% as medical factors that contribute to the direct cause of death of pregnant women after bleeding. The Simpang IV Sipin Health Center is one of the health centers with the highest number of cases of hypertension in pregnancy in Jambi City, with 14 cases and a prevalence of (2.52%) of the total target of 555 pregnant women (Izza et al., 2022) Animated video development is the process of designing and creating animation using relevant techniques and tools to tell a story, entertain or educate an audience. The development of Knowledge and Technology in the field of education is known as education, which is an electronic media-oriented education system.

Through the use of media, a more effective teaching-learning process will be created because media is an intermediary between learning resources that can improve the quality of the process. The purpose of educational media is to provide a different and varied learning experience so that it stimulates students' interest in learning.

METHOD

The Research *and Development* (R&D) development method is used with the *Richey and Klein* method approach which is a development model. Richey and Klein stated that the focus of design and development research is analytical from start to finish, which includes planning, production, and *evaluation*. Producing a knowledge media in the form of an animated video about pre-eclampsia in pregnant women at the Simpang IV Sipin Health Center and continued with an effectiveness study with 32 respondents using a pre-experimental approach with a One-Group Pretest-Posttest Research Design design. Data analysis using the T-Dependent test.

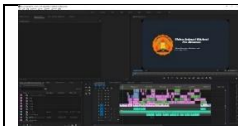
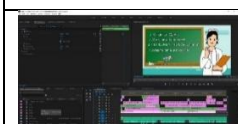
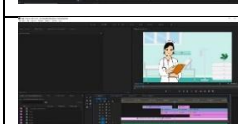
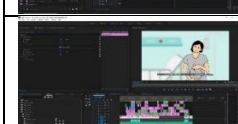
RESULTS AND DISCUSSION

Development

1. Planning Stage

Based on the results of the needs analysis through an interview with the head of the KIA room of the Simpang IV Sipin Health Center, the implementation of education to pregnant women often uses leaflets, posters and PPTs, has never used animated video media and they want educational media to be based on an information system such as animated videos.

Table 1. Animation Video Making Process

	Bumper opening editing process at 00:00-00:24
	The initial scene editing process when pregnant women come to health services at 00.26-00.42 minutes
	The process of editing the scene of pregnant women checking the tension and explanation of Pre Eclampsia at 00.43-01.12 minutes
	The process of editing the scene of the causes and symptoms of Pre Eclampsia at 01.13-01.54
	Impact Editing Process and Prevention of Pre-Eclampsia in Minutes 01.55-02.37
	The process of editing scenes of classification, complications and management of Pre Eclampsia at 02.38-03.18 minutes
	The process of adding voice recordings
	The final and closing scene editing process is at 03.18-03.50 minutes

2. Production Stage

The results of the character creation process (drawing and coloring) using the Medibang application with the Wacom Brand Tablet Pen. The editing process uses the adobe premiere application with an inter

core i3 3240 CPU specification computer, ASUSTeK Computer INC mainboard with 8GB 799.8 MHz RAM and VGA readon RX 560 series.

3. Evaluation Stage

The results of the validation test of animation video media development to Material Experts and Media Experts were found that the development of animation videos is worthy of trial.

Effectiveness Test Research

Data collection was carried out at the Simpang IV Sipin Health Center from June 10 to June 12, 2024. The number of pregnant women at the Simpang IV Sipin Health Center was recorded as 32 pregnant women. The data is provided through direct interviews and filling out questionnaires carried out by pregnant women. The following are the results of bivariate analysis to 32 pregnant women using the T-Dependent test.

Table 2. Pregnant women's knowledge about Pre Eclampsia pretest and posttest

Knowledge pre eclampsia	n	mean	Mean difference
Pretest	32	5.38	4.59
posttest	32	9.92	

Based on the table above, it can be seen that the knowledge before being given education using the animation video media about Pre Eklamsia (Pretest) has a mean value of 5.38 and after being given the animation video media about Pre Eklamsia (Posttest) the mean value increases to 9.97. It can be seen that after being educated using animated video media about Pre Eklamsia, the respondents' knowledge increased by 4.59.

CONCLUSION

The research design is development research using *the Richey and Klein* method with pre-experimental research with the One-Group Pretest-Posttest design. Richey and Klein which includes planning, namely the

analysis of needs, goals and objectives, the creation of story boards, production, namely developing story boards, character designs and animation making, evaluation, namely evaluation methods, data analysis and interpretation of results.

The results of the validation test of animation video media development with material experts and media experts show that the development of animation videos is worthy of testing.

Education using animated video media is effective in increasing pregnant women's knowledge about Pre-Eclampsia.

ACKNOWLEDGMENT

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CONFLICT OF INTEREST

There was no conflict of interest in this article.

REFERENCE

- Alwan, N. A., & Mulla, R. M. (2019). Understanding pre-eclampsia: A guide for healthcare professionals. Health Press.
- Brown, J. S., & Green, A. M. (2021). The impact of educational media on pregnant women's knowledge of pre-eclampsia. *Journal of Maternal Health*, 45(3), 234-245.
- Izza, N., Kusdiyah, E., Maharani, C., Program, M., Medicine, S., Medicine, F., Health, I., Jambi, U., & Program, D. (2022). Overview of Characteristics and Risk Factors of Preeclampsia in Jambi City Health Center in 2017-2021. *Journal of Medical Studies*, 2(2), 38-60.

- Lee, C. H., & Kim, J. H. (2023). Impact of animated videos on pre-eclampsia awareness among expectant mothers. *Journal of Obstetric Education*, 45(3), 201-213. Retrieved from <https://www.journalofobstetriceducation.org/articles/impact-animated-videos>
- Marbun, U., & Irnawati Irnawati. (2023). Education and Prevention of Preeclampsia in Pregnancy. *Abdimas Polsaka*, 2, 64–69: <https://abdimas.polsaka.ac.id> [accessed 01 January 2024].
- Mashuri, D. K., & Budiyo. (2020). Development of Animation Video Learning Media for Volume Building Space Materials for Elementary School Class V. *Journal of Elementary School Teacher Education Research*, 8(5), 893–903.
- Nguyen, A. T., Smith, J. K., & Patel, R. S. (2022). The effectiveness of animated educational videos in improving prenatal care knowledge among pregnant women. *International Journal of Pregnancy Education*, 11(2), 89-102. <https://doi.org/10.1097/ijpe.2022.00345>
- Riya, R. (2021). Factors Associated with the Incidence of Preeclampsia in Pregnant Women in the Third Trimester at the Talang Bakung Jambi Health Center. *Midwifery Health Journal*, 6(1), 1.
- Smith, J. A., Brown, L. K., & Green, M. R. (2024). Educational media with animated videos to increase knowledge of pregnant women about pre-eclampsia. *Journal of Maternal Health Education*, 29(3), 145-157. <https://doi.org/10.1016/j.jmhe.2024.04.002>
- Sugiyono. (2016). Quantitative, Qualitative and R&D Research Methods Bandung: PT Alfabeta.

NUTRITIONAL EDUCATION ON INCREASING NUTRITIONAL KNOWLEDGE AND ATTITUDES AMONG ADOLESCENTS

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ABSTRACT

Background: Adolescence is a transition period from childhood to young adulthood. Adolescence is a period that is vulnerable to nutritional problems. Schools are one of the places to make efforts to prevent nutritional problems in adolescents. Adolescent nutritional problems include those related to nutritional status (undernutrition and overnutrition), lack of knowledge about adolescent nutrition. Nutritional problems at school can be prevented or anticipated by providing education about adolescent nutrition to adolescents at school.

Method: The method used in this activity is quasi experimental with a pre-post test group design. Participants in the activity were 30 students. Data on knowledge and attitudes about adolescent nutrition were obtained by distributing questionnaires before and after providing education. The pre post test results were analyzed using a paired t test.

Results: Increase in average knowledge about adolescent nutrition before education from 61.5 to 85.5. Increase in average attitudes about adolescent nutrition before education from 65.5 to 87.2. There are differences in the average knowledge and attitudes about adolescent nutrition before and after providing education.

Conclusion: Providing education about adolescent nutrition influences knowledge and attitudes about adolescent nutrition.

Keywords: Education; Nutrition; Adolescent

INTRODUCTION

Adolescents are young individuals aged between 10 and 19 years old. Globally, there are 1.8 billion adolescents, constituting the largest generation of young persons and about 90% of them reside in low-middle income countries (LMIC). Adolescence, when growth spurts occur, may expose them to malnutrition (WHO, 2002). Adolescence is an important period where there is a transition from child to adult.

Adolescence is a period that is vulnerable to nutritional problems. Schools are one of the places to make efforts to prevent nutritional problems in adolescents. Adolescent nutrition problems include those related to nutritional status (undernutrition and overnutrition), lack of knowledge about adolescent nutrition, anemia, lack of skills in measuring nutritional status.

They gain 20% to 25% of their height and up to 50% of their ideal weight. To support this rapid growth, there is a need for increased demand of energy, protein, minerals and vitamins (Mokhtari, et al.2017). Sufficient nutrient intake of both macro and micronutrients is essential at this stage to meet the increased demand due to speedy growth, sexual maturation and menstruation.

Globally undernutrition deficiency is a risk factor contributing to the burden of disease among adolescents (Black et al, 2013). The prevalence of iron deficiency among younger adolescent girls is 22.3%, and 24% among older adolescent girls.

Anemia is a condition of hemoglobin and hematocrit at low levels that cause the body to experience hypoxia as a result of decreased ability to transport oxygen from the blood. Adolescence also is a unique point of intervention as people of this age group are

more receptive to changes in lifestyle that may determine their life course later (Bakrania, 2018).

Previous studies showed that adolescents have poor knowledge, attitudes. Providing them with knowledge about malnutrition could prevent them from malnutrition and related illnesses later in life. Studies have recommended the provision of nutritional education and behavioral change intervention in order to prevent and reduce malnutrition among adolescents.

METHODS

This research uses a quasi-experimental method, namely by providing education about adolescent nutrition. The research sample was 30 students. The data taken is knowledge and attitudes about adolescent nutrition. Before providing nutrition education, teenagers are given a pre-test and after providing balanced nutrition education, a post-test is carried out to determine changes in students' knowledge. Data analysis used the independent t test.

RESULTS AND DISCUSSION

The research results showed that based on gender characteristics, 60% of respondents were male and 40% female. Based on knowledge data, the data obtained showed an increase in adolescent nutritional knowledge, namely from 61.5 to 85.5. Increase in average attitudes about adolescent nutrition before education from 65.5 to 87.2.

Table 1. Bivariate analysed

Knowledge	Mean	Mean difference	p
Pretest	61.5	24	0.0001
Posttest	85.5		
Attitudes	Mean	Mean difference	p
Pretest	65.5	21.7	0.0002
Posttest	87.2		

From table 1 above, it is known that there is an influence of providing adolescent nutrition education on increasing students' knowledge ($p < 0,05$). There is an influence of

providing education about balanced nutrition on teenagers' attitudes about teenage nutrition ($p < 0,05$).

The review was intended to identify the characteristics of the effect of health and nutrition education intervention aimed at improving knowledge, attitudes. The review systematically identified and summarized the characteristics of the effect of health/nutrition education intervention in improving knowledge, attitudes and practices of adolescents on malnutrition (Razzak et al, 2016).

Evidence exists that the use of theory in developing health education modules with effective learning skills effectively improved knowledge, attitudes and practices, thereby possibly decreasing the risk factors associated with pre-adolescent and adolescent malnutrition (Gallotta et al, 2016). Interventions to improve knowledge, attitudes, practices and the nutritional status of adolescent have significantly improved nutritional status and healthy behaviors among adolescents.

Health education intervention on malnutrition will improve the health status of adolescents now, when they become adults, and for the optimal growth and development of their offspring to prevent the cycle of intergenerational transmission of malnutrition in adolescents. The effectiveness of the intervention in this review concurs with evidence from systematic reviews that showed statistically significant improvement in knowledge, attitudes and practices.

The purpose of this study was to assess whether this school-based nutrition education programme is effective to improve adolescents' knowledge, attitudes and behaviour in relation to nutrition in rural areas (Wang et al, 2015).

The results showed that some of adolescents' knowledge, attitudes and behaviour in relation to nutrition improved significantly after this 6-month nutrition education, which demonstrates that this

nutrition education program is effective to promote adolescents' nutrition in rural areas of China. These findings are consistent with the results of previous studies, which showed that school-based nutrition interventions can play a major role in dietary change among adolescents because the amount of time young people spend at school and the large percentage of food they consume there, parental influence on diet decreases and the food provided in schools and the influence of peers become more important.

CONCLUSION

Providing education about adolescent nutrition influences knowledge and attitudes about adolescent nutrition.

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CONFLICT OF INTEREST

Authors declared no conflict of interest with those involved in this study.

REFERENCES

- Adesina, A. F., Peterside, O., Anochie, I., & Akani, N. A. (2012). Weight status of adolescents in secondary schools in port Harcourt using Body Mass Index (BMI). *Italian Journal of Pediatrics*, 38(1). <https://doi.org/10.1186/1824-7288-38-31>.
- Astuti, Rini Wuri, Isti Suryani. 2020. Edukasi Kelompok Sebaya sebagai Pencegahan Anemia Gizi Besi pada Remaja. *Jurnal Nutrisia*. Vol.22, No.1(Maret) 2020.
- Badan Penelitian dan Pengembangan Kesehatan. 2019. Laporan Nasional RISKESDAS 2018. http://labmandat.litbang.depkes.go.id/images/download/laporan/RKD/2018/Laporan_Nasional_RKD2018_FINAL.pdf.
- Bakrania, S.; Ghimire, A.; Balvin, N. Bridging the Gap to Understand Effective Interventions for Adolescent Well-Being: An Evidence Gap Map on Protection, Participation, and Financial and Material Well-Being in Low-And Middle-Income Countries; UNICEF Office of Research-Innocenti: New York, NY, USA, 2018; pp. 1–63.
- Black, R.E.; Victora, C.G.; Walker, S.P.; Bhutta, Z.A.; Christian, P.; De Onis, M.; Ezzati, M.; Grantham-Mcgregor, S.; Katz, J.; Martorell, R.; et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet* 2013, 382, 427–451.
- Labatjo, R. 2024. Pelatihan Edukator Sebaya Sebagai Upaya Pencegahan Masalah Gizi Pada Remaja. *Jurnal Masyarakat Mandiri*. Vol. 8, No. 1, February 2024, Hal. 976-984.
- Muchtar, F., Sabrin., Devi Savitri Effendy., Hariati Lestari, Hartati Bahar. 2022. Pengukuran status gizi remaja putri sebagai upaya pencegahan masalah gizi di Desa Mekar Kecamatan Soropia Kabupaten Konawe. *Abdi Masyarakat*. Vol. 4. No. 1. Juni 2022.
- UNICEF. The State of the World's Children 2011-Executive Summary: Adolescence an Age of Opportunity; UNICEF: New York, NY, USA, 2011; ISBN 9789280645552.
- World Health Organization. The Optimal Duration of Exclusive Breastfeeding: Report of an Expert Consultation: Geneva, Switzerland 28–30 March 2001; World Health Organization: Geneva, Switzerland, 2002; pp. 1–10. Available online: https://www.who.int/nutrition/publications/infantfeeding/WHO_NHD_01.09/en/

THE EFFECT OF NUTRITIONAL EDUCATION WITH VIDEO MEDIA ON KNOWLEDGE, ATTITUDES AND ACTIONS TEENAGERS ON BALANCED NUTRITION AT SMPN 2 TABANAN

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ABSTRACT

Background: The diet of teenagers are not proportional and does not implement balanced nutrition, thereby increasing the risk of being overweight, overweight and obese. According to several studies, teenagers' lack of knowledge about nutrition, attitudes and eating habits that are not in accordance with balanced nutrition causes unbalanced eating patterns in teenagers. To overcome this problem, innovative interventions are needed, one of which is education using video media. The aim of this research is to determine the differences in knowledge, attitudes and actions of teenagers regarding balanced nutrition at SMPN 2 Tabanan before and after education using video media.

Method: This type of research is quasi-experimental with a One Group Pretest-Posttest design with a sample size of 43 samples. Data was collected by filling out a questionnaire and then analyzed using the Wilcoxon test.

Results: The results showed that the average knowledge score before and after the intervention was 40.61 to 68.16. The average attitude score before and after the intervention was 76.49 to 79.86. The average action score before and after intervention was 61.54 to 70.30. Based on the results of the Wilcoxon test, it is stated that there is an influence of nutrition education using video media on knowledge, attitudes and actions with a p-value <0.05.

Conclusions: Suggestions that can be made are the use of video media as a student learning media and nutrition education media.

Keywords: Nutrition education; video media; balanced nutrition; knowledge; attitudes; actions

INTRODUCTION

Adolescence is a transition period from childhood to adulthood. The period of growth and development that is occurring in adolescents must be accompanied by adequate food consumption (Ministry of Health of the Republic of Indonesia, 2021). A baseline survey conducted by UNICEF in 2017 showed that adolescents experienced changes in their diet and their physical activity levels. Teenagers spend most of their free time on unproductive activities. Teenagers who regularly consume cakes, moist bread, fried foods and crackers constitute a third of the population, while the other third consume factory-made snacks or processed foods (Ministry of Health, 2017).

The diet of teenagers are not proportional and does not implement balanced

nutrition, thereby increasing the risk of being overweight, overweight and obese. According to data from the 2018 Basic Health Research in Bali Province, teenagers aged 10-14 years consume fruit and vegetables every week with a proportion of 1-2 portions 68.87%, 3-4 portions 13.23%, more than 5 portions 3.06 %, and not consuming 14.83%. The results of research by Emi Tariandini (2018) showed that 79 samples (88.8%) consumed fast food frequently, and 10 samples (11.2%) had the frequency of fast-food consumption classified as infrequent.

According to several studies, teenagers' lack of knowledge about nutrition and eating habits that are not in accordance with balanced nutrition cause unbalanced eating patterns in teenagers. One of the indirect causes of malnutrition in teenagers is their lack of knowledge about balanced nutrition.

However, nutritional education can increase knowledge so that it can prevent malnutrition and meet nutritional needs. One way to prevent nutritional problems in teenagers is to provide nutritional education. With the help of media, nutrition education can simplify and clarify the audience's understanding of what is being conveyed. This can also help educators in delivering material (NRD Safitri & Fitranti, 2016).

In conducting education, various types of media can be used, one of which is video media. Based on research Sartika & Purnanti, (2021) The results showed that video educational media is more effective because it can use the senses of sight and hearing. Education in this research was carried out in stages, namely 3x and 1x every week. This research was conducted on junior high school teenagers because they are still growing, so knowledge and attitudes regarding balanced nutrition are needed to achieve optimal health so that the nation's next generation will be better.

This research aims to determine the effect of nutrition education using video media on teenagers' knowledge, attitudes and actions regarding balanced nutrition at SMPN 2 Tabanan.

METHODS

This type of research is a quasi-experiment with a One Group Pretest-Posttest design. This research was carried out in January - March 2024, with the research target being class VIII students at SMPN 2 Tabanan aged 12-15 years. The sample size was calculated using the Slovin formula with a deviation degree of 15% and 10% estimated drop out, resulting in a sample size of 43 samples. Sampling used probability sampling techniques, with inclusion criteria: registered as a class VIII student for the 2023/2024 academic year and willing to be a research sample. The exclusion criteria were students who were not present during data collection

and students who withdrew from being the research sample.

The data collected consisted of respondent characteristics (gender, age and parents' occupation), pretest and posttest data on knowledge, attitudes and actions of the sample regarding balanced nutrition. The pretest and posttest data will each be presented as a percentage and then categorized into Good = 76%-100%, Fairly good = 56%-75%, Not good = 40%-55% and Bad = <40%.

This research was carried out by providing intervention 3x once a week with the first week's material regarding teenagers and adolescent nutritional adequacy. The second week is with material on balanced nutrition guidelines and general messages on balanced nutrition and the third week is with material on balanced nutrition tumpeng and the contents of my plate.

Data on sample characteristics and pretest were carried out before the first intervention and posttest were carried out after the third intervention. For each intervention given, the sample will fill out a Google form to ensure the sample has watched the video. This research has been approved by the Denpasar Ministry of Health Polytechnic Ethics with number DP.04.02/F.XXXII.25/0693/2023.

Data analysis using statistical programs. Normality test analysis using Kolmogorof-Smirnov in SPSS to determine whether the data is normally distributed or not. Descriptive analysis is used to determine the distribution and percentage of pretest and posttest scores. Wilcoxon test analysis was used because the data in this study was not normally distributed.

RESULTS AND DISCUSSION

3.1 Sample Characteristics

Sample characteristics were categorized into several categories, namely, gender, age and parental occupation. Based on the results of data collection, it was found that

most of the samples were female, namely 24 people (44%), with the largest sample age being 14 years, 23 people (53%). And judging from the parents' occupation, most of the sample's parents worked as private employees, 19 samples (44%).

Table 1. Distribution of Sample Characteristics

Characteristics	n	%
Gender		
Man	19	44.0
Woman	24	56.0
Amount	43	100.0
Age (Years)		
13	18	42.0
14	23	53.0
15	2	5.0
Amount	43	100.0
Parents' job		
Civil servants	6	14.0
Self-employed	14	33.0
Private employees	19	44.0
Farmer	3	7.0
Laborer	1	2.0
Amount	43	100.0

3.2 Sample Knowledge

The increase in knowledge scores after being given nutrition education using video media shows that the sample received and understood the information via video so that there was an increase in scores where before the intervention the sample's knowledge was in the good category by 0% to 33% after the intervention. Can be seen in the following table:

Table 2. Distribution of Changes in Sample Knowledge

Knowledge	Before		After	
	n	%	n	%
Good	0	0.0	14	33.0
Fairly good	2	5.0	21	49.0
Not good	18	42.0	8	19.0
Bad	23	53.0	0	0.0
Total	43	100.0	43	100.0

The difference in the average knowledge score before and after the intervention was 27.55 from the average score before the intervention of 40.61 to 68.16 after the intervention. This research is also in line with research (Ramadhanti et al., 2022) which states that knowledge before the intervention was good (25%) and poor (75%), after being given the intervention there was an increase in knowledge, namely good (91.7%) and poor good (8.3%) with an average knowledge value

before intervention of 68.75 and after intervention increasing to 86.04.

Table 3. Differences in Sample Knowledge Before and After Intervention

Knowledge	n	Mean	p-value
Before	43	40.61	0.001
After	43	68.16	

This research obtained a p-value of 0.001 ($p < 0.05$) based on the Wilcoxon test analysis which showed that the hypothesis was accepted, namely that there was a difference in knowledge before and after nutrition education with video media about balanced nutrition, which means that nutrition education with video media had an effect on teenagers' knowledge about balanced nutrition. This is in line with research (Suprpto et al., 2022) that the results of the Wilcoxon statistical test have increased with a p-value of 0.000 (≤ 0.05) which shows the influence of video media education on the knowledge of Sandi Karsa Makassar Polytechnic students.

3.3 Sample Attitudes

The results of this study show that the sample's attitude has improved, where before the intervention the sample's attitude was in the good category by 70% to 86% after the intervention. In line with Syakir (2018) who says that when someone has heard information several times, an attitude will develop as a result of creating understanding. Because attitude is a person's reaction or response that is still closed to stimuli or objects as well as ways of evaluating things around them, so the experience they have is one of the determining factors in changing their attitude.

Table 4. Distribution of Sample Attitude Changes

Attitude	Before		After	
	n	%	n	%
Good	30	70.0	37	86.0
Fairly good	13	30.0	6	14.0
Total	43	100.0	43	100.0

The difference in the average attitude score before and after the intervention was 3.37 from the average score before the intervention of 76.49 to 79.86 after the intervention. This research is also in line with

research (VA Safitri et al., 2021) who stated that the attitude before the intervention was good (58.3%) and not good (41.7%), after the intervention there was an increase, namely good (91.7%) and not good (8.3%).

Table 5. Differences in Sample Attitudes Before and After Intervention

Attitude	n	mean	p-value
Before	43	76.49	0.001
After	43	79.86	

This study obtained a p-value of 0.001 ($p < 0.05$) based on the Wilcoxon test analysis which showed that the hypothesis was accepted, namely that there were differences in attitudes before and after nutrition education with video media about balanced nutrition, which means that nutrition education with video media had an effect on teenagers' attitudes about balanced nutrition. This is in line with research (Hidayah et al., 2022) which states that there is a difference in the average attitude score before and after the intervention ($p=0.001$) so it can be concluded that education using video media can influence attitudes.

3.4 Sample Actions

The sample's actions after being given nutrition education using video media increased from previously the sample in the good category by 19% to 47%. This shows that the sample has understood the information in the video so that it is manifested in attitudes/reactions which then form actions or habits according to the information conveyed in the video.

Table 6. Distribution of Changes in Sample Actions

Action	Before		After	
	n	%	n	%
Good	8	19.0	20	47.0
Fairly good	19	44.0	13	30.0
Not good	11	26.0	10	23.0
Bad	5	12.0	0	0.0
Total	43	100.0	43	100.0

The difference in the average action score before and after the intervention was 8.76 from the average score before the intervention of 61.54 to 70.30 after the intervention. This is in line with research (Yusriani & Agustini, 2020) which states that actions before the intervention were good

(45%) and after the intervention it was 98%.

Table 7. Differences in Sample Actions Before and After Intervention

Action	n	mean	p-value
Before	43	61.54	0.001
After	43	70.30	

This research obtained a p-value of 0.001 ($p < 0.05$) based on the Wilcoxon test analysis which shows that the hypothesis is accepted, namely that there is a difference in actions before and after balanced nutrition education with video media, which means that nutrition education with video media has an effect on teenagers' actions regarding balanced nutrition. This is in line with research (Shopia et al., 2024) Obtaining results based on the Wilcoxon test showed that the experimental group showed that there was a significant influence between before nutrition education and after nutrition education with a p value of $0.000 < 0.05$ or there was an influence of nutrition education using video motion media on teenagers' balanced nutritional behavior.

Class VIII students at SMPN 2 Tabanan also received information about healthy, nutritious and balanced eating patterns in the PJOK (Physical Education, Sports and Health) subject in class VII. This can also increase students' actions, so that nutrition education using video media about balanced nutrition strengthens students' understanding and actions regarding balanced nutrition.

CONCLUSION

There are differences in the knowledge, attitudes and actions of teenagers before and after nutrition education using video media about balanced nutrition, which means that nutrition education using video media influences the knowledge, attitudes and actions of teenagers about balanced nutrition at SMPN 2 Tabanan.

The limitation of this research is that video media does not have an absolute influence on teenagers' actions regarding

balanced nutrition because it can also be influenced by the learning they have received. Suggestions for schools are to create regular educational programs using media and for researchers to use as a reference for further research by adding the variable of adolescent nutritional status.

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CONFLICT OF INTEREST

There is no conflict of interest in this research.

REFERENCES

- Hidayah, NM, Mintarsih, SN, & Ambarwati, R. (2022). Balanced nutrition education using video media on the knowledge and attitudes of young women. *Sport and Nutrition Journal*, 4(1), 1–6.
- Safitri, NRD, & Fitranti, DY (2016). The Effect of Nutrition Education with Lectures and Booklets on Increasing Nutritional Knowledge and Attitudes of Overweight Adolescents. 5(Volume 2), 374–380.
- Safitri, VA, Pangestuti, DR, & Kartini, A. (2021). The Influence of Educational Videos on Mothers' Knowledge and Attitudes in Exclusive Breastfeeding at the Bulu Lor Community Health Center 2021. *Indonesian Public Health Media*, 20(5), 342–348.
<https://doi.org/10.14710/mkmi.20.5.342-348>
- Sartika, QL, & Purnanti, KD (2021). Differences in Educational Media (Booklets and Videos) on Cadre Skills in Early Detection of Stunting. *Journal of Midwifery Science*, 3(1), 36–42.

<https://doi.org/10.31983/jsk.v3i1.6907>

- Sophia, R., Mahpolah, & Odah, SM (2024). The Effect of Balanced Nutrition Education with Motion Video Media on Knowledge Level, Balanced Nutrition Behavior and Junk Food Consumption Habits in Adolescents. *The Effect of Nutrition Education with Motion Video on Knowledge Level, Balanced Nutrition Behavior*. 6(1), 23–37.
- Suprpto, S., Mulat, TC, & Hartaty, H. (2022). Balanced Nutrition Education Using Video Media on Student Knowledge and Attitudes during the Covid-19 Pandemic. *Journal of Professional Nursing (KEPO)*, 3(1), 96–102.
<https://doi.org/10.36590/kepo.v3i1.303>
- Pritasari., Damayanti, Didit., & Tri Lestari, Nurgraheni. (2017). *Nutrition in the Life Cycle*. Republic of Indonesia Ministry of Health, 1-6.

HEALTH EDUCATION USING MEDIA SMART DIABETES SPINNER ON KNOWLEDGE AND ATTITUDES TO PREVENT DIABETES MELLITUS IN ELEMENTARY SCHOOL STUDENTS

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ABSTRACT

Background: Diabetes is a disease of high blood sugar levels (Hypoglycemia) due to abnormalities in insulin secretion. Diabetes mellitus claims millions of lives from various parts of the world because its complications are not treated properly. One important component to reduce the risk of complications in diabetes is prevention. One way to prevent diabetes mellitus is to use media smart diabetes spinner. This study aims to determine the effect of health education using media smart diabetes spinner on knowledge and attitudes in preventing diabetes mellitus in children at SDN 149/IV Jambi City.

Method: This type of research is quantitative with a pre-experiment research design, and a One group pre-test and post-test research design. The sample was taken using total sampling with a total of 34 respondents. Data analysis used the Shapiro Wilk test and the Wilcoxon signed rank test because the research respondents were ≤ 50 respondents.

Result: The average score for diabetes mellitus knowledge pre-test was 4.03 and post-test 8.32 and diabetes mellitus attitude pre-test 4.09 and post-test 8.21. The results of the study stated that there was a difference in the increase in diabetes mellitus knowledge and attitude scores given health education using media smart diabetes spinner with statistical test results with a value of $0.000 > 0.05$ (CI: 95%).

Conclusion: There is a difference between knowledge and attitudes for the pretest and posttest so that there is an influence of health education with media smart diabetes spinner in preventing diabetes mellitus on the knowledge and attitudes of children at SDN 149/IV Jambi City.

Keywords: Smart Diabetes Spinner; Knowledge; Attitude

INTRODUCTION

Diabetes Mellitus (DM) is a disease characterized by high blood sugar levels due to abnormalities in insulin secretion, insulin action or both. According to the World Health Organization (WHO), 70% of deaths worldwide are caused by non-communicable diseases, including diabetes mellitus which has been linked to the behavior of the younger generation with unhealthy lifestyles (Qifti et al., 2020). Diabetes Mellitus (DM) is a series of metabolic diseases that can be characterized by hyperglycemia or sugar

levels that exceed normal limits due to damage to insulin production, unethical insulin work or it can also be a problem with both (Putra et al, 2021). Diabetes mellitus has claimed millions of lives from various parts of the world because its complications are not treated properly. Factors associated with the risk of diabetes mellitus include age, gender, obesity, history of heart disease, hypertension, cholesterol and one of them is poor lifestyle which is the main risk factor to date (Kemenkes, 2023; Putra et al, 2022, Sunanda et al., 2023).

The results of Basic Health Research (Riskesdas, 2018), show that the prevalence

of diabetes mellitus in Indonesia based on doctor's diagnosis at age ≥ 15 years is 2%. According to Indonesian Health Survey Data (SKI, 2023), The prevalence of diabetes mellitus at all ages according to Jambi province is 0.9% with 11,588 cases, the highest cases occurred in DKI Jakarta 3.1% with 33,552 cases, while the lowest cases occurred in Papua Mountains 0.2% with cases 4,563 and for Indonesia the prevalence was 1.7% with 877,531 cases. The prevalence of diabetes mellitus according to characteristics is highest at age 65-74 years, 6.7% with 44,881 cases, while the lowest is at age $\leq$

1 year, 0.19% with 11,518 cases. Data from the Indonesian Pediatrician Association (IDAI) states that the incidence of DM in children aged 0 - 18 years has increased by 700% over a period of 10 years. The cause of type-1 DM is the interaction of many factors, including genetic predisposition, genetic environmental factors, as well as immunity and cells.

Results Riskesdas Jambi Province (2018) shows that the prevalence of diabetes mellitus based on a doctor's diagnosis at age ≥ 15 years according to the District/City of Jambi Province is 2,674 sufferers (2.02%). In this case, of the 2 cities and 9 districts in Jambi Province, Jambi City has the highest prevalence of diabetes mellitus. Based on data on the 10 most common diseases at the Rawasari Community Health Center, Rawasari Village, Jambi City, in 2023, there were 2,596 Diabetes Mellitus sufferers.

According to Notoatmodjo (2012) most human knowledge is obtained through the sense of sight and information is remembered more often if they can read the information independently. Attitude is a person's reaction or response that is still closed to a stimulus or object (Notoatmodjo, 2012). In an effort to promote health, several methods or ways of providing information can be done, one of which is by giving interactive lectures. This is effective if accompanied by demonstrations.

For school children, playing in the classroom aims to avoid boredom and feeling sleepy during the learning process, so that the information provided will be easier for the child to accept. The game media used in the learning process is by combining games in it, which is expected to lead to active teaching and learning activities so that it can make learning more fun, train cooperation, increase students understanding of the material being taught, and create interest in learning (Muyaroah, 2017). One of the learning media is the Smart Diabetes Spinner Game. Smart Diabetes Spinner is an innovative game media from a spinning wheel or often known as a spinning wheel. It is hoped that with this research students can be motivated and increase students knowledge and attitudes towards preventing diabetes mellitus and can apply it in everyday life.

METHODS

This type of research is quantitative research with the pre-experiment method. The design used in this research was a one group pre-post test design, because the researchers wanted to see the effect after being given health education using media smart diabetes spinner. This research design was used to test the effect of health education using media smart diabetes spinner on knowledge and attitudes among students at SDN 149/IV Jambi City. Measurement of knowledge and attitudes was carried out before being given health education (pre-test) and after being given health education (post-test).

This research was carried out at SDN 149/IV Jambi City in May 2024. The population was all students at SDN 149/IV Jambi City grades IV to V, totaling 34 students. The sample in this research is non-probability sampling with a total sampling technique which uses the entire population as the sample.

Data processing is collected using a questionnaire, data processing will be carried

out using Editing, Coding, Transferring, Tabulating. Data analysis was carried out univariate and bivariate. The statistical test for bivariate analysis is using the Shapiro Wilk and Wilcoxon tests using computer equipment at a confidence level of 95% ($\alpha = 0.05$). Hypothesis testing is carried out by comparing the P-value at the 95% confidence level with the following criteria; If the p value $> \alpha$ value then H_0 fails to be rejected. If the p value $< \alpha$ value then H_0 fails to be rejected. Data is presented in tabular and textual form.

Table 2. The influence of health education using smart diabetes spinner media in increasing knowledge and attitudes in efforts to prevent diabetes mellitus in elementary school children

Variabel	Mean $\pm$ (SD)	Median $\pm$ selisih	Min-Max	95% CI (Lower – Upper)	P
Knowledge					
Pre-test	4.03 $\pm$ 0.717	4.35 $\pm$ 0.205	3 - 6	3.78 – 4.28	0.001
Post Test	8.38 $\pm$ 0.922		7 - 10	8.06 – 8.70	
Attitudes					
Pre-test	4.09 $\pm$ 0.712	4.12 $\pm$ 0.266	3 – 6	3.84 – 4.34	0.003
Post Test	8.21 $\pm$ 0.978		6 - 10	7.86 – 8.55	

Source: Primary Data (2024)

Based on table 1, it shows that men and women have the same number of 17 respondents (50%). while the age group of most respondents was 11 years old, 12 years old (35.3%), then the level of most respondents was grade 4, 18 respondents (53%). The influence of health education using media smart diabetes spinner on knowledge and attitudes in efforts to prevent diabetes mellitus in children at SDN 149/IV Jambi City is presented in table 2.

These results have shown that there is an increase in knowledge and attitudes about diabetes mellitus among students. Data analysis shows that there is a difference in average knowledge (difference of 4.29) and average attitude (difference of 4.12) between before being given health education and after being given it using media smart diabetes spinner.

This study used the Shapiro Wilk data normality test because the number of respondents was less than 50 respondents. p value (significant) in the normality test using the Shapiro-Wilk test. The sig value of the pre-test and post test knowledge is 0.001, the

RESULTS AND DISCUSSION

Table 1. Characteristics of the research sample

Student Characteristics	n	%
Gender		
Male	17	50.0
Female	17	50.0
Age		
9 years	4	11.7
10 years	11	32.4
11 years	12	35.3
12 years	7	20.6
Class		
4	18	53.0
5	16	47.0

pre- test attitude value is 0.000, and the post test attitude value is 0.003, which shows that the data for each research variable is not normally distributed because p or sig < 0.05 . Analysis used the Wilcoxon test with a significance level of 95% because the research variables were not normally distributed.

Then the researcher used the Wilcoxon test because the data was not normally distributed. With the Sign Rank test, the value $p = 0.001 \leq 0.05$ with a confidence level of 95%. The results of the Wilcoxon knowledge test data obtained from 34 respondents stated that there was no decrease in knowledge and attitudes and values were the same. between the pre-test and post-test with a p value of knowledge and attitude of 0.001, then H_0 is rejected, which means there is an influence of health education using media Smart diabetes spinner on increasing knowledge about preventing diabetes mellitus in students in grades VI and V at SDN 149/IV Jambi City. 2024.

Based on the research results, it is

known that the value of diabetes mellitus knowledge in students at SDN 149/IV Jambi City pre-test 4.03 and post test 8.32 with an increase difference of 4.29 with a significance value of 0.001. From these results there are differences between the results pre-test and posttest when given, it can be concluded that there is an influence of health education with media smart diabetes spinner on increasing knowledge about diabetes mellitus in school children. In line with research (Oktorina et al., 2019), health education is the process of providing information that can improve cognitive, affective and psychomotor aspects in a better direction. Someone who has adequate knowledge about diabetes mellitus will develop positive knowledge in an effort to support healthy health.

In line with research (Fauziah et al., 2020), it shows that there was an increase in knowledge after being given health education in preventing diabetes mellitus for sufferers at the Padurenan Bekasi health center where before education it was 14.83 with standard deviation. The mean value after health education was 22.00 with standard deviation. deviation of 2,763 so that a deviation value of 2,763 is obtained so that a mean difference value is obtained before and after health education is $0.000 < 0.05$.

Efforts to increase knowledge made from an early age will create habits that last until the child becomes an adult. In line with research (Oktapia et al., 2023), children find it easier to gain knowledge from what they see, experience and hear. It is also supported by the theory contained in research (Purnama J., 2013) that the methods used in health education/counseling also influence the ability to change the level of knowledge. The level of knowledge can be changed by a combination of various methods, namely lectures, presentations, brainstorming, seminars and panel discussions. Apart from that, a person's ability to absorb material is influenced by his five senses.

Based on the research results, it is

known that the attitude value of diabetes mellitus in students at SDN 149/IV Jambi City pre-test 4.09 and post test 8.21 with an increased difference of 4.12 with a significance value of 0.001. From these results there are differences between the results pre-test and post test when given, it can be concluded that there is an influence of health education with media smart diabetes spinner on improving attitudes about diabetes mellitus in school children.

Attitude is a reaction to objects and stimuli that involve the emotions in question. Attitude is a form of feeling, namely feeling supportive or partial (favourable) or feeling unfavorable (unfavourable) towards an object. Attitude is a pattern of behavior, tendency or anticipatory readiness, predisposition to adapt to social situations, or simply a response to a coordinated social simulation.

From the definition above, it can be concluded that attitude is a person's reaction to a certain object that is positive or negative, which is usually manifested in the form of liking or disliking, agreeing or disagreeing with a particular object.

The influence of smart diabetes spinner media on students knowledge and attitudes about preventing diabetes mellitus at SDN 149/IV Jambi City

The results of statistical tests showed that differences in knowledge and attitudes showed that there was an increase in attitudes before and after. This proves that health education using media smart diabetes spinner can increase knowledge or change attitudes. In line with research (Sry Meylanda et al., 2023), providing counseling using a spinning wheel about immunization received a good response resulting in an increase in the average attitude score of respondents after being given the spinning wheel media. Providing health education assisted by spinning wheel media is a good method, because it can introduce a health message in a

pictorial medium as well as playing. In line with research (Hidayah et al., 2021), it is stated that interventions using spinning wheel media have a higher effect on increasing students' knowledge and attitudes than leaflets. This can be explained by the fact that the increase in knowledge in the subjects of the wheel intervention group was higher than in the leaflet group, so that attitudes which were the effect of knowledge followed suit. The level of reasoning regarding an object in question.

Based on Edgar Dale's theory in the Cone of Experience (Dale's Cone Experience) explains that a person's learning outcomes are obtained through direct (concrete) experience, the reality found in a person's life environment, then through replicas, and even verbal symbols (abstract). The higher the top of the cone, the more abstract the equalization device becomes. Based on the following statement, it can be concluded that school children have 90% memory skills if they are given learning in the form of role playing.

Based on Skinner's theory in (Notoatmodjo, 2012), states that a more influential stimulus is needed to increase respondents' knowledge and attitudes. In this study, the bigger stimulus was the media smart diabetes spinner. The media used in health education must pay attention to characteristics and targets. Elementary school children are an age group that tends to prefer active games, so the media created must also contain elements of play so as not to cause boredom.

CONCLUSION

Based on the research results, it can be concluded that providing health education through smart diabetes spinner media has a significant effect on increasing knowledge and attitudes about diabetes mellitus in students. Thus, smart diabetes spinner media can be used as an educational tool to improve

knowledge and attitudes among students at SDN 149/IV Jambi City.

Suggestion, media smart diabetes spinner has been able to increase students' knowledge and attitudes. Thus, it is necessary to disseminate information related to DM through attractive and creative media smart diabetes spinner in schools to support the success of efforts to prevent diabetes mellitus and improve the health status of school children.

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CONFLICT OF INTEREST

The author has stated that in this article there is no or potential conflict of interest from either the author or the institution in relation to the research that has been carried out, both based on authorship and publication.

REFERENCES

- Fauziah, N., Peraten Pelaw, Arabta M., & M. Ernauli. (2020). The influence of health education on the level of knowledge in the prevention of diabetic cuultures in patients with type 2 diabetes mellitus at the padurenan health center 2019. *Binawan Student Journal (BSJ)*, 2(p-ISSN 2656-5285).
- Hidayah, E. R., Hidayat, N., & Siswati, T. (2021). Effectiveness of Nutrition Education through Spinning Wheels and Leaflets on Knowledge and Attitudes of Balanced Nutrition in Elementary School Students. *Jurnal Nutrisia*, 23(1). <https://doi.org/10.29238/jnutri.v23i1.206>
- IDI. (n.d.). *IKATAN DOKTER ANAK*

- INDONESIA 2017 Diagnosis and Management of Type-1 Diabetes Mellitus in Children and Adolescents.
- Kebijakan Pembangunan, B., Kementerian, K., & Ri, K. (n.d.). *the figures of the 2023 SKI preparation team in the figures of the Ministry of Health of the Republic of Indonesia*.
- Laporan Riskesdas Jambi 2018. (n.d.). Muryaroah, S. (2017). Effectiveness of Mobile Learning as an Alternative Learning Model. *Karang Sari.Oku.Sum-Sel*, 46(1), 326-122. <http://journal.unnes.ac.id/nju/index.php/LIK>
- Notoatmodjo, S. (2012). Promosi Kesehatan dan Perilaku Kesehatan. *Rineka Cipta*.
- Oktapia, S., Herawati, S. J., Prodi, P., Pendidikan, I., Institut, K., Kristen, A., & Tarutung, N. (2023). Improving the health of early childhood by implementing clean and healthy living behavior in early childhood. *Jurnal Pendidikan Sosial Dan Humaniora*, 2(3). <https://publisherqu.com/index.php/pedidau>
- Oktorina, R., Sitorus, R., & Sukmarini, L. (2019). The Effect of Health Education with a Self-Instructional Module on Knowledge About Diabetes Mellitus. *Jurnal Endurance*, 4(1), 171. <https://doi.org/10.22216/jen.v4i1.2995>
- Qifti, F., Malini, H., & Yetti, H. (2020). Characteristics of High School Adolescents with Risk Factors for Diabetes Mellitus in Padang City. *Jurnal Ilmiah Universitas Batanghari Jambi*, 20(2), 560. <https://doi.org/10.33087/jiubj.v20i2.950>.
- Putra, E. S., Junita, J., & Siregar, S. (2021). Konsumsi minuman manis prediktor risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 10(2), 89-97.
- Putra, E. S., & Junita, J. (2022). Rasio lingkar pinggang tinggi badan dan aktivitas fisik sebagai risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 11(1), 45-53.
- Sunanda, E., Sofiyetti, S., & Muhaimin, A. (2023). Jenis dan Asupan Advanced Glycation EProducts (AGEs) dengan Obesitas Abdominal pada Remaja di Kota Jambi. *Pontianak Nutrition Journal (PNJ)*, 6(2).
- Sry Meylanda, A., Audia Nadira, N., Maria Lestari, E. S., Amos, J., Promosi Kesehatan, N., Kesehatan Kementerian Kesehatan Padang, P., Jend Ahmad Yani Km, J., Harapan Kota Parepare, L., Selatan, S., & Ilmiah, J. (2023). *The Effectiveness of the Immunization Spinning Wheel on Knowledge and Attitudes of Couples of Childbearing Age*.

EVALUATING ORAL HYGIENE IN 9-12 YEARS OLD CHILDREN WITH DENTAL CROWDING: A SCHOOL-BASED STUDY

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ABSTRACT

Background: Crowded teeth refer to the condition where teeth are misaligned outside of the normal dental arrangement, resulting from a discrepancy between tooth size and dental arch dimensions. Crowded teeth occur due to a difference between the space required within the dental arch and the space available within it. This research aimed to determine the relationship between crowded teeth and oral hygiene among 9-12 years old students at SDN 92/V Gemuruh, Tanjung Jabung Barat Regency.

Method: This research employed an analytical survey design with a cross-sectional approach. The population in this study consisted of all fourth and fifth-grade students at SDN 92/V Gemuruh with the age range of 9-12 years old, totaling 49 students. A sample of 39 students was selected using purposive sampling. Oral hygiene was assessed using the PHP-M (Personal Hygiene Performance-Modified) index. The chi-square test was used to compare oral hygiene between groups.

Result: The results showed that out of 39 respondents, 84.6% students had crowded teeth, while 15.4% of students did not. Regarding oral hygiene status, 12.8% of students had good oral hygiene, 48.7% had moderate oral hygiene, and 38.5% had poor oral hygiene. The statistical test results showed a p-value of 0.201 ($p > 0.05$), indicating that there is no significant relationship between crowded teeth and oral hygiene in 9-12 years old students.

Conclusion: No significant relationship between crowding and oral hygiene status among 9-12 years old students at SDN 92/V Gemuruh, Tanjung Jabung Barat Regency

Keywords: Dental crowding; Oral hygiene; PHPM

INTRODUCTION

Crowding is a common kind of malocclusion in which teeth are positioned too closely together, resulting in tooth rotation, displacement in different directions, and overlap (*Mosby's Medical Dictionary*, 2013). This condition developed as a result of insufficient space in the dental arch to accommodate all the teeth. It is a frequent orthodontic problem that makes it difficult for school-age children to practice good oral hygiene (Gul et al., 2023). Having crowded teeth makes it more difficult for kids to properly eliminate plaque because of the small, tough-to-clean crevices they produce. These regions are therefore more prone to

plaque buildup, raising the possibility of gum disease and tooth cavities (Gopalasamy et al., 2020).

The prevalence of crowding varies between countries and continents. From 28.4% in America, 41.5% in Africa, 6.5% in Asia and 16% in worldwide (Lombardo et al., 2020). A high prevalence of crowding was also found in 12-17 years old subjects in Iraq with about 57% (Hasan, 2018).

Another study in Shanghai showed that there was an anterior crowding of more than 2 mm in 28.4% of the individuals. Remarkably, among subjects, anterior crowding was more common in the mandible (22.5%) than in the maxilla (13.3%). Girls were more likely than boys to have anterior crowding; these

dimorphisms may be explained by variations in skeletal maturity and/or the emergence of permanent teeth(Yu et al., 2019).

Children between the ages of 9 and 12 have mixed dentition and transitional growth, which often presents unique challenges for maintaining effective oral hygiene due to dental crowding, which can significantly complicate oral hygiene practices. As permanent teeth erupt, they may cause crowding and misalignment. This can result in overlapping teeth and tight spaces that are hard to reach with a toothbrush or floss. Crowded and misaligned teeth create difficult-to-clean areas, leading to increased plaque buildup and a higher risk of cavities and gum disease. Proper cleaning in these tight spaces requires more effort and specialized techniques(Kolawole & Folayan, 2019).

Dental crowding occurs when there is insufficient space in the dental arch to accommodate all the teeth, leading to overlapping and misalignment. This condition is known to exacerbate difficulties in cleaning hard-to-reach areas, increasing the risk of plaque accumulation and subsequent dental issues such as caries, gingivitis, and periodontal disease. Despite the known risks, there is limited research specifically focusing on how dental crowding impacts oral hygiene practices and outcomes in this age group(Daoud et al., 2021).

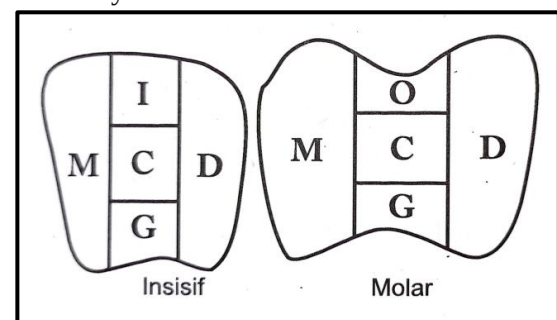
A previous study on Junior high school students in Tasikmalaya showed a relationship between crowded teeth and the Hygiene Index (HI) score. It involved 43 participants, where those with crowded teeth had 43.5% with good HI scores and 56.5% with poor HI scores. In contrast, those without crowded teeth had 75.0% with good HI scores and 25.0% with poor HI scores. The study found a significant relationship between crowded teeth and the HI, with a p-value of 0.037, which is less than the 0.05 significance level(Sari, 2023).

This school-based study focuses on evaluating how dental crowding impacts the oral hygiene of children in this age group. By understanding these dynamics, educators and dental health professionals can implement targeted interventions and education programs within schools. These efforts aim to empower children with effective oral hygiene practices, promoting better dental health outcomes and overall well-being during their school years and beyond.

METHODS

This study employs an analytical survey design with a cross-sectional approach. A total of 39 fourth and fifth-grade students at SDN 92/V Gemuruh data collected through dental examinations to assess crowding status and dental hygiene score using the PHPM (Personal Hygiene Performance-Modified) index from Marten and Meskin (Martens & Meskin, 1972).

The index evaluates dental plaque by assessing selected teeth' buccal (cheek side) and lingual (tongue side) surfaces after employing a disclosing agent to reveal plaque. Each surface is divided into 5 sub-division areas consisting of M(mesial), D(distal), G (gingival), C(central), and I(Incisal) for anterior teeth and O(occlusal) for posterior teeth. Every area that is covered with dental plaque will give a score of 1. PHP-M scores were obtained by dividing the total sum of the scores by the number of surfaces examined.



Picture 1. Sub-division area for plaque scoring in PHP-M index (Martens & Meskin, 1972)

PHP-M scores are then categorized into Excellent (0), Good (0,7-1,7), Fair (1,8-3,4),

and Poor (3,5-5,0). Statistical analysis involves chi-square testing to compare between groups.

RESULTS AND DISCUSSION

The research findings reveal that the frequency distribution of respondents with crowded teeth is 84.60%, while those without crowded teeth were 15.40% (table 1). This study is consistent with the research conducted by Sari et al., that a majority of respondents (53.5%) also had crowded teeth (Sari, 2023).

Table 1. Relationship between dental crowding status and oral hygiene status

Dental Crowding Status	Oral Hygiene Status						Total	<i>p-value</i>	
	Good		Fair		Poor				
	n	%	n	%	n	%			
Non Crowded	2	33,30	3	50,00	1	16,70	6	15,40	0,201*
Crowded	3	9,10	16	48,50	14	42,40	33	84,60	
Total	5	12,80	19	48,70	15	38,50	39	100	

* Chi-Square test

This may be attributed to the respondents being at the mixed dentition stage, where the eruption of permanent teeth aligns with the arch curvature. Additionally, early extraction of primary teeth might contribute to this condition. Early removal of primary teeth can also result in permanent teeth lacking directional growth guidance, thus impeding their proper alignment (Bhujel et al., 2016).

The oral hygiene examination showed that most of the respondent has fair oral hygiene (48,7%), 12,8% of the students had good oral hygiene, and 38.50% had poor oral hygiene. This finding is consistent with the research on crowded teeth among students in grades IV and V at Binjai Timur which showed that most of the respondent also had 47% of students were in fair group, and 53% had poor oral hygiene (Aritonang et al., 2022).

This condition may be attributed to the fact that some respondents have not yet developed good habits in maintaining oral hygiene. Proper oral hygiene can be achieved through brushing teeth to remove plaque from the tooth surfaces. Brushing should be performed at least twice daily, in the morning

after breakfast and in the evening before bedtime.

Previous studies also showed that plaque accumulates more readily in these areas because the toothbrush bristles and dental floss cannot easily reach the interproximal spaces between crowded teeth (Mustilwar et al., 2022). Some findings also indicate that one of the periodontal problems found in people with crowded teeth is the accumulation of plaque (Ma'rifatullah et al., 2021).

The statistical test results indicated no significant relationship between crowded teeth and oral hygiene (*p*-value 0.201). The lack of a significant difference may be due to the fact that most respondents in this study exhibited similar behaviors in maintaining oral hygiene. As a result, the oral hygiene status of respondents with crowded teeth and those without crowded teeth did not show a substantial difference.

A previous study conducted in Pakistan on respondents aged 14-25 years also showed similar results, where no significant correlation was found between anterior crowding and the plaque index (*p*-value = 0.690). However, a significant correlation was observed with the gingival index score (*p*-value = 0.036) (Hamza et al., 2019).

Different results were found in another previous study in Lahore, Pakistan on respondents above 18 years old. The results showed that crowding strongly correlates to the buildup of debris and calculus (OHI-S score), especially in young adults, and may develop further into periodontal disease (Gul et al., 2023).

Our findings only divide the crowding groups based on is there any teeth that were positioned as misaligned present, without grading the severity of crowding. Previous study showed that, there were significant difference between severity of crowding and OHI-S with *p* value 0,03 (Obi et al., 2023).

Another study showed a different result, which showed that a weak correlation was found between the ALD (arch length discrepancy), a degree of severity in crowding with O'Leary plaque index value with a statistical significance of $p = 0.033$ ($p < 0.05$), and a correlation coefficient value of $r = -0.352$. This study also found that there were cases that has lower degrees of ALD but showed poor plaque index, A contributing factor to the problem is the general lack of understanding and awareness of the significance of keeping good oral hygiene. However, some data—such as crowding values greater than 3 milli meters or diastema values greater than 0 milli meters have a bad ALD index; still, the O'Leary plaque index criteria reveal good or moderate values. Despite having crowded teeth, patients may make more efforts to maintain oral hygiene since they are more conscious of it (Fauzia et al., 2023).

The age seems also contributed to our finding. Our research was conducted on 9-12 years old students. A previous study in India showed that plaque distribution based on age group showed that the group of 18-21 years had lesser plaque accumulation than the group of 22-25 years old (Gopalasamy et al., 2020).

Our findings also have a similar result in a previous study conducted on 6 to 12 years respondents that showed that no significant difference (p -value 0,397) was found between crowding status and oral hygiene using OHI-S described by Greene and Vermillion (Kolawole & Folayan, 2019).

Children age 6-12 years old are in the phase of mixed dentition. Crowding can be caused by retained teeth, premature loss, supernumerary or anomaly in tooth-shaped teeth present. It can be one of the combination of those factors(Chantic et al., 2020).

CONCLUSION

From this study, it can be concluded that there is no significant correlation between crowded teeth in children aged 9-12 years and oral hygiene.

REFERENCES

- Aritonang, N. J., Siahaan, Y. L., Restuning, S., Sirait, T., & Supriyanto, I. (2022). Gambaran Gigi Yang Berjejal dan Gigi Tidak Berjejal terhadap Karang Gigi Pada Siswa Kelas IV Dan V Sekolah Dasar. *Dental Therapist Journal*, 4(1), 10–15.
<https://doi.org/https://doi.org/10.31965/DTJ>
- Bhujel, N., Duggal, M. S., Saini, P., & Day, P. F. (2016). The effect of premature extraction of primary teeth on the subsequent need for orthodontic treatment. In *European Archives of Paediatric Dentistry* (Vol. 17, Issue 6).
<https://doi.org/10.1007/s40368-016-0247-7>
- Chantic, S. F., Indonesia, U., & Indonesia, U. (2020). Identification of Dental Factors Associated With Crowding Malocclusion in Primary School Children in Jakarta. *Journal of International Dental and Medical Research*, 13(3), 1147–1151.
- Daoud, R., Bencze, M.-A., Albu, C.-C., Teodorescu, E., Dragomirescu, A.-O., Vasilache, A., Suci, I., & Ionescu, E. (2021). Implications of Permanent Teeth Dimensions and Arch Lengths on Dental Crowding during the Mixed Dentition Period. *Applied Sciences*, 11(17), 8004.
<https://doi.org/10.3390/app11178004>
- Fauzia, M., Gayatri, drg., Sp.Ort., Subsp.DDTK(K), G., Carolina, D. N., Harsanti, A., & Zakaria, M. N. (2023). Impact of the Crowding Degree Measured by the ALD Analysis Against the Plaque Accumulation Measured by the O'Leary Plaque Index: a Cross-sectional Study.

- Padjadjaran Journal of Dental Researchers and Students*, 7(3), 217. <https://doi.org/10.24198/pjdrs.v7i3.50596>
- Gopalasamy, K., Dinesh, S. S., & Pradeep, D. (2020). Lower Anterior Crowding As a Risk Factor for Plaque Accumulation in Patients Between 18 To 25 Years of Age. *Annals of Tropical Medicine & Public Health*, 23(22). <https://doi.org/10.36295/asro.2020.232338>
- Gul, H., Shirazi, U.-E.-R., Fiaz, M. Bin, Chaudhry, A. R., Dar, N. A., & Ahmed, A. (2023). Effects of Dental Crowding on Oral Hygiene Index-Simplified(OHI-S) score in Adult Population of Lahore: An Analytical Study. *Pakistan Journal of Medical and Health Sciences*, 17(2), 132–134. <https://doi.org/10.53350/pjmhs2023172132>
- Hamza, S. A., Wahid, A., Imran, M. F., Khalaf, K., Akhtar, S., & Bokhari, H. (2019). *Exploring The Relationship of Anterior Crowding and Oral Hygiene: A Pilot Study*. 28(02).
- Hasan, S. M. (2018). Prevalence of Malocclusion in Adolescence (12-17 Years) in Najaf area. *Journal of University of Babylon, Vol 26, Iss, 4(4)*, 213–221. <https://doaj.org/article/a7a8b8ebaabc4a25a353db89e2ca7d97%0Ahttps://www.base-search.net/Search/Results?lookfor=baseid:ftdoajarticles:oai:doaj.org/article:a7a8b8ebaabc4a25a353db89e2ca7d97>
- Kolawole, K. A., & Folayan, M. O. (2019). Association between malocclusion, caries and oral hygiene in children 6 to 12 years old resident in suburban Nigeria. *BMC Oral Health*, 19(1), 1–9. <https://doi.org/10.1186/s12903-019-0959-2>
- Lombardo, G., Vena, F., Negri, P., Sagano, P., Barilotti, C., Paglia, L., Colombo, S., Orso, M., & Cianetti, S. (2020). Worldwide prevalence of malocclusion in the different stages of dentition: A systematic review of literature reporting and meta-analysis. *European Journal of Paediatric Dentistry*, 21(2), 155–122. <https://doi.org/DOI10.23804/ejpd.2020.21.02.05>
- Ma'rifatullah, A. A., Wibowo, D., & Azizah, A. (2021). The relationship between the severity of malocclusion and gingival status in students of SMPN 5 Marabahan. *Dentino : Jurnal Kedokteran Gigi*, 6(1). <https://doi.org/10.20527/dentino.v6i1.10633>
- Martens, L. V., & Meskin, L. H. (1972). An innovative technique for assessing oral hygiene. *ASDC Journal of Dentistry for Children*, 39(1), 12–14. <https://europemc.org/article/med/4551106>
- Mosby's Medical Dictionary*. (2013). Elsevier mos. <https://doi.org/10.1093/milmed/145.1.23>
- Mustilwar, R. G., Shetti, A. N., Mani, A., & Kale, P. P. (2022). Ortho-Perio interrelationship - A review. *IP International Journal of Periodontology and Implantology*, 7(4). <https://doi.org/10.18231/j.ijpi.2022.033>
- Obi, A. L., Variani, R., & Ayatullah, M. I. (2023). The Effect of Anterior Crowding Toward Oral Hygiene Index-Simplified and Gingival Index Score. *Jurnal Ilmu Dan Teknologi Kesehatan*, 10(2). <https://doi.org/10.32668/jitek.v10i2.1035>
- Sari, S. M. (2023). Hubungan Gigi Berjejal dengan Hygiene Index. *Journal of Oral Health Care*, 10(2), 62–68. <https://doi.org/10.29238/ohc.v10i2.1487>
- Yu, X., Zhang, H., Sun, L., Pan, J., Liu, Y., & Chen, L. (2019). Prevalence of malocclusion and occlusal traits in the early mixed dentition in Shanghai, China. *PeerJ*, 2019(4), 1–15. <https://doi.org/10.7717/peerj.6630>

STUDY OF ALBUMIN-GLOBULIN RATIO IN THE SALIVA AND SERUM OF DIABETES MELLITUS PATIENTS IN JAMBI CITY

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ABSTRACT

Background: DM is a metabolic disorder that is genetically and clinically heterogeneous with manifestations of loss of carbohydrate tolerance. Resistance in type 2 DM affects carbohydrate, lipid and protein metabolism. Protein is a macronutrient that functions as the main source of energy reserves, cell and tissue building substances, regulating metabolic processes that play a role in the body's defense system. Total protein consists of Albumin, globulin and the ratio of Albumin-Globulin (RAG). RAG examination has the same function as the total protein assay in addition to that this examination is also to determine the typical factors to classify the level of systemic inflammation, in addition to this parameter is also simpler and less expensive.

Method: this study use analytical research with a case control and sampling used convenience sampling technique, the instruments is spectrophotometer, and the data analysis used mann-whitney test and kruskal wallis test.

Result: the result showed the average of AGR between saliva and serum control group was significant (0,049), but for the DM and DM-TB group there's no significant for DM (0,589) and DM-TB (0,176). The comparison among all groups for AGR saliva was no significant (0,183), also same for the AGR serum showed there no significant (0,283).

Conclusion: Based the result of the study that shows the differences between saliva and serum among the 3 groups but no significance. In saliva the average of DM group was the higher, but in the serum the average of DM-TB group was the higher.

Keywords: Serum; Saliva; Diabetes Mellitus; Albumin-globulin ratio

INTRODUCTION

The International Diabetes Federation reports that in 2021, 10.5% of the world's population will suffer from Diabetes mellitus (DM). Meanwhile, Indonesia itself occupies the 5th position in the world for DM sufferers who have been diagnosed with a total of 19.5 million people (Sun et al., 2022). Recorded by the Jambi Province health profile in 2022 as many as 45,781 people with diabetes mellitus in Jambi Province and in Jambi City alone reached 21,127 (Dinkes Provinsi Jambi, 2022).

DM is a metabolic disorder that is genetically and clinically heterogeneous with manifestations of loss of carbohydrate tolerance. Type 2 DM itself is a disease of hyperglycaemia due to cell insensitivity to insulin and a metabolic disorder characterised

by elevated blood sugar due to decreased insulin secretion by pancreatic beta cells and impaired insulin function (insulin resistance). Diabetes mellitus is characterised by several symptoms such as polydipsia (drinking a lot), polyuria (urinating a lot or often urinating at night), increased appetite but rapid weight loss, and fatigue (Fatimah, 2015).

The high incidence of DM will result in an increased incidence of TB. This is because the cellular immune system will decrease in patients with DM. In DM patients, the number of T lymphocytes and netrophils are decreases, accompanied by a decrease in the number of T helper 1 (Th1) and the production of inflammatory mediators such as TNF α , IL-1 β and IL-6. If the number of Th1 lymphocytes is reduced, there will be a vulnerability of DM patients to TB because Th1 lymphocytes have an important role in

inhibiting the growth of mycobacterium tuberculosis bacilli. In addition, macrophages are also impaired which causes the inability to produce reactive oxygen species, as well as decreased chemotaxis and phagocytic functions (Niazi & Kalra, 2012).

Hyperglycaemia results from deficient insulin production, insulin resistance or both. Resistance in type 2 DM affects carbohydrate, lipid and protein metabolism. Protein is a macronutrient that functions as the main source of energy reserves, cell and tissue building substances, regulating metabolic processes that play a role in the body's defence system. Total protein consists of Albumin, globulin and the ratio of Albumin - Globulin (RAG). Hyperglycaemia will increase protein and fat catabolism due to decreased insulin action. This causes changes in plasma protein levels and composition, in addition, in DM there is an inflammatory state, so there is an increase in the synthesis of acute proteins and other proteins that cause inflammation-related protein levels to increase. Several studies have reported that insulin deficiency can cause a decrease in the rate of albumin and fibrinogen synthesis (Rachma et al., 2023).

RAG examination has the same function as the total protein assay in addition to that this examination is also to determine the typical factors to classify the level of systemic inflammation, in addition to this parameter is also simpler and less expensive (Malik et al., 2010). Examination of blood specimens causes discomfort and trauma to the patient. It is optimized to use other biological fluids (American Diabetes Association, 2012). one such example is saliva. The use of saliva specimens is a much easier and non-invasive tool to diagnose and monitor diabetes, which is much needed in the current situation (Nirmala & Sultana, 2021). Saliva shows its own superiority when compared to other biological fluids. In addition, saliva is a "real time" fluid because it is secreted from an exocrine gland which also shows a picture of protein levels which is

a picture of how a person's health status and ability to collect samples. Because of this, it is possible to monitor some biomarkers in infants, children, the elderly, and patients who are uncooperative when collecting blood or urine samples due to several situations (Hassaneen & Maron, 2017).

METHODS

The research to be conducted uses analytical research with a case control design, using the observational method and sampling using convenience sampling technique. With the sample were healthy controls, DM patients, and DM-TB patients. the number of samples in this study were 15 healthy controls, 15 DM patients, and 20 DM-TB patients the total is 50 respondents. By inferring specimens, which are saliva and serum. the instrument used is a spectrophotometer. Data analysis used in this research is mann-whitney test and kruskal wallis test.

RESULTS AND DISCUSSION

In a study conducted in March-June 2024 in Jambi City, the following results were obtained, with the characteristics of respondents consisting of age, gender, and length of illness.

3.1 Respondent Characteristics

Table 1. Respondent characteristics

	Control		DM		DM-TB	
	N	%	N	%	N	%
Gender						
- Male	5	33,3%	9	60%	10	50%
- Female	10	66,7%	6	40%	10	50%
Age						
- 18-60 years	15	100%	9	60%	16	80%
- >60 years	0	0%	6	40%	4	20%
Length of illness						
- 1-5 years	0	0%	5	33,3%	14	70%
- >5 year	0	0%	10	66,7%	6	30%

The respondents of this study consisted of 3 groups, they were health control, DM patients, and DM-TB patient. From the table we can the characteristic got divide to 3 categories.

In control group there more female respondent than male respondent, but in DM group there more male respondent than male respondents, for the DM-TB group have same number of male and female responden.

Based of the age, calculate from all group there more 18-60 years respondent than the >60 years respondent. For the length of illness in DM group there more respondent with length if illness more than 5 year but in DM-TB group had more respondent with length of illness less than 5 years.

Table 2. AGR of Saliva- Serum control

	N	mean	P- value
Saliva	15	0,7320	0,049
Serum	15	0,9427	

The table show the comparison of AGR of saliva and serum on health control. The p-value of the comparison is 0,049 or <0,05 that's mean it was significant between saliva and serum. It show AGR on serum was higher than on saliva in control group.

3.2 Albumin-Globulin Ratio

Table 3. AGR of saliva-serum DM

	N	mean	P- value
Saliva	15	1,1193	0,589
Serum	15	0,8093	

The table show the comparison of AGR of saliva and serum on DM group. The p-value of the comparison is 0,589 or >0,05 that's mean it was no significant different between saliva and serum.

The table show saliva was higher than serum on DM group. The increase of AGR saliva compare to serum, the greater micro-organism activity or protein of periodontol origin can be the cause for increased salivary protein. High levels of salivary total protein than serum in DM patients due to extra proteins addes to saliva derived from the gingival fluid by active periondontal disease activity. Increased basement membrane permeability, which often associated with DM, is one of the possibilities for the increased passage of protein from the exocrine glands into their secretions(Lodgotra et al., 2016).

Table 4. AGR of Saliva-serum DM-TB

	N	mean	P- value
Saliva	20	1,0355	0,176
Serum	20	2,1050	

The table show the comparison of AGR of saliva and serum on DM-TB group respndent, the p-value of the comparison is 0,176 or >0.05 which is mean there no significance different.

The table show that serum have higher average than the saliva in DM-TB group it the opposite DM group. Salivary levels in DM were variable in different paper and at sometimes contradictory. The decrease was due to protein utilization by other biochemical metabolic pathways as an overall systemic response to glucose intolerance, (Virginia et al., 2016) explained such difference in their study by the fact that assay was performed immediately after collection where centrifugation of the saliva sample was carried out to prevent endogenous proteolytic activity.

Therefore, this contradiction can be explained by the different used methods was carried out, techniques and type of salivary collection like the stimulated or unstimulated collection of saliva, different salivary sample analysis, different glucose metabolic contol methods, as well as, the type diabetes and duratin of the disease (Razooki Hasan et al., 2019).

Table 5. AGR Saliva

	N	Mean	p-value
Control	15	0,7320	0,183
DM	15	1,1193	
DM-TB	20	1,0355	

The table show the comparison of AGR saliva among the groups. It show the p-value is 0,183 or >0,050 which is mean theres no significance differents among the saliva per group. The table also show the average of saliva were higher in DM group (1,1193) and the lowest in control group.

The increase was may be expalined on the basis that saliva can serve as partial filtrate of blood which contain serum components transported from capillaries into

saliva diffusion, active transport, or ultra-filtration via gingival sulcus (Naing & Mak, 2017).

Glucose metabolic products lead microvascular changes in blood vessel and basal membranes of cells in salivary glands and oral tissue which lead to a change in salivary composition which include organic and inorganic components associated with increased basement membrane permeability and increased passing of molecules from exocrine gland into their secretions. All this cause easier movements proteins from blood to saliva and gingival fluid (Gupta et al., 2015).

Table 6. AGR Serum

	N	Mean	p-value
Control	15	0,9427	0,283
DM	15	0,8093	
DM-TB	20	2,1050	

The table show the comparison of AGR serum among the groups. It show the p-value is 0,283 or >0,050 which is mean there's no significance different per group. The table also the average of serum were higher in DM-TB group (2,1050) and the lowest in DM group.

Albumin and globulin are two primary components of serum proteins and are involved in systemic inflammation. Low albumin levels are associated with malnutrition and inflammation, whereas low globulin levels are associated with chronic inflammation and indicate cumulative exposure to various pro-inflammatory cytokines. AGR is considered a more stable and reliable marker than serum albumin or globulin alone as prognostic factor and has been associated with poor results in relation to different pathologies, such as digestive and urological cancers in general. In infectious diseases, AGR was associated with worse prognosis in pediatric patients with tuberculosis and meningitis as predictor of febrile urinary tract (Ulloque-badaracco et al., 2022).

In air infection like mycobacterium tuberculosis, it is expected that changes in plasma protein levels will occur in patients. However, the change in level of each protein at any particular time usually reflects the net effect of the rate of synthesis and rate of catabolism as a result of host microbe interaction. In chronic infectious TB disease, the albumin shows a decrease while globulin content shows an increase leading to low albumin to globulin (A/G) ratio and albumin to alpha-2 globulin ratio (Shingdang et al., 2016)

CONCLUSION

Based on the result of the study that shows the differences between saliva and serum among the 3 groups but no significance. In saliva the average of DM group was the higher, but in the serum the average of DM-TB group was the higher.

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CONFLICT OF INTEREST

All authors declared that there was no conflict of interest.

REFERENCES

- American Diabetes Association. (2012). Executive summary: Standards of medical care in diabetes--2012. *Diabetes Care*, 35 Suppl 1. <https://doi.org/10.2337/dc12-s004>
- Dinkes Provinsi Jambi. (2022). Profil Kesehatan Provinsi Jambi. *Journal of Chemical Information and Modeling*, 192.
- Fatimah, R. (2015). DIABETES MELITUS TIPE 2. *J MAJORITY*, 4(5), 93–101.

- Gupta, S., Sandhu, S. V., Bansal, H., & Sharma, D. (2015). *Comparison of Salivary and Serum Glucose Levels in Diabetic Patients*. 166. <https://doi.org/10.1177/1932296814552673>
- Hassaneen, M., & Maron, J. L. (2017). Salivary diagnostics in pediatrics: Applicability, translatability, and limitations. *Frontiers in Public Health*, 5(APR), 1–8. <https://doi.org/10.3389/FPUH.2017.00083>
- Lodgotra, A., Verma, P., & Raj, S. S. (2016). Estimation of salivary and serum biomarkers in diabetic and non diabetic patients - A comparative study. *Journal of Clinical and Diagnostic Research*, 10(6), ZC56–ZC61. <https://doi.org/10.7860/JCDR/2016/19135.7995>
- Malik, A. M., Malik, E. M., Al-Shammaa, N. M. J., & Al-Rubaei, Z. M. (2010). A. M. Malik, E. M. Malik, N. M. J. Al-Shammaa, and Z. M. Al-Rubaei, “A Comparative Biochemical Study of Proteins Profile in Iraqi Children and Adolescent with β -Thalassemia,” *Iraqi J Pharm Sci*, vol. 19, no. 2, pp. 19–23, 2010. *Iraqi J Pharm Sci*, 19(2), 19–23.
- Naing, C., & Mak, J. W. (2017). Salivary glucose in monitoring glycaemia in patients with type 1 diabetes mellitus : a systematic review. *Journal of Diabetes & Metabolic Disorders*, 1–9. <https://doi.org/10.1186/s40200-017-0287-5>
- Niazi, A. K., & Kalra, S. (2012). Diabetes and tuberculosis: A review of the role of optimal glycemic control. *Journal of Diabetes and Metabolic Disorders*, 11(1), 1. <https://doi.org/10.1186/2251-6581-11-28>
- Nirmala, A., & Sultana, M. (2021). ORIGINAL ARTICLE Estimation of Salivary Protein as A Potential Biomarker For Diagnosis of Type -II Diabetes Mellitus. 10(March), 256–260.
- Rachma, B., Adiputra, F. B., Triliana, R., Rachma, B., Adiputra, F. B., & Triliana, R. (2023). PERAN KENDALI GLUKOSA PADA STATUS TOTAL PROTEIN DARAH PASIEN DM TYPE 2 DI KOTA MALANG THE ROLE OF GLUCOSE CONTROL IN TOTAL BLOOD PROTEIN STATUS IN TYPE 2 DM PATIENTS IN MALANG CITY. *Jurnal Kedokteran Komunitas*, 11(02), 11.
- Razooki Hasan, H., Aburahma, N. N. A., & Al-Kazaz, A. K. A. (2019). Oxidative stress status in sera and saliva of type 2 diabetic Iraqi patients with and without proliferative diabetic retinopathy. *Asian Journal of Chemistry*, 31(3), 719–722. <https://doi.org/10.14233/ajchem.2019.21789>
- Shingdang, J., Bot, Y., Ojo, O., Edeh, O., Essien, C., Bwende, E., Okolie, C., & Ai, E. (2016). *Mycobacterial Diseases Serum Albumin / Globulin ratio in Tuberculosis and HIV Patients any Relationship ?* 6(1), 1–6. <https://doi.org/10.4172/2161-1068.1000199>
- Sun, H., Saeedi, P., Karuranga, S., Pinkepank, M., Ogurtsova, K., Duncan, B. B., Stein, C., Basit, A., Chan, J. C. N., Mbanya, J. C., Pavkov, M. E., Ramachandran, A., Wild, S. H., James, S., Herman, W. H., Zhang, P., Bommer, C., Kuo, S., Boyko, E. J., & Magliano, D. J. (2022). IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Research and Clinical Practice*, 183, 109119. <https://doi.org/https://doi.org/10.1016/j.diabres.2021.109119>
- Ulloque-badaracco, J. R., Mosquera-rojas, M. D., Herrera-a, P., Hernandez-bustamante, E. A., & Alarc, E. A. (2022). *Heliyon Prognostic value of albumin-to-globulin ratio in COVID-19 patients : A systematic review and*

meta-analysis. 8(January).
<https://doi.org/10.1016/j.heliyon.2022.e09457>

Virginia, M., Lima, V., Jesus, J. De, Junior, D. O., Cristina, M., & Maciel, G. (2016). Salivary profile in diabetic patients : biochemical and immunological evaluation. *BMC Research Notes*, 1–7. <https://doi.org/10.1186/s13104-016-1881-1>

ASSOCIATION BETWEEN DIETARY DIVERSITY AND DIETARY PATTERNS IN CHILDREN (6-59 MONTHS) IN LOMBOK TENGAH

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ABSTRACT

Background: Inadequate intake among children under five years has both long term and immediate negative health impact, and lifelong consequences including increased risk of disease, poor cognitive development, lower school performance and increased risk of death in childhood, reduce productivity. This study evaluated household dietary diversity (HDD) as a determinant of nutritional status of children.

Method: An analytical cross-sectional study involving 359 mothers-child pairs aged 6-59 month was conducted in Lombok Tengah. Socio demographic, dietary and anthropometric data were collected in face-to-face interviews. HDD scores were calculated using data from 24-h dietary recall among children. Anthropometric indices (stunting, wasting and underweight) were defined as anthropometric z-scores < - 2 standard deviations using WHO growth standards.

Result: We evaluated dietary diversity using 10-food-group-based child/individual dietary diversity (IDDS) and found a mean (SD) IDDS of 4.3 (1.7). The prevalence rates of stunting, wasting and underweight in the children were 30.9%, 9.0 %, 20.2% respectively, while 32.1% of the household had less dietary diversity. The most diverse pattern 58.3% had high consumption of grains, eggs, vegetables and fish. Diverse pattern less than 20% consumption of meat, poultry and dairy milk. Dietary patterns that were associated with energy intake and gender and we found that males were more likely to have a less diverse dietary pattern than females.

Conclusion: High prevalence of stunting in children and many households consumed less diverse diet in Lombok Tengah. Despite variation for some children, dietary diversity was relatively low for children. Intervention and supporting the need to improve child growth and overall diet of children in Lombok Tengah

Keywords: Dietary diversity; Dietary pattern; Children

INTRODUCTION

Healthy dietary practices necessitate that people eat from all food categories because no single food category has all the essential elements (Labadarios et al., 2011). Dietary diversity is a useful substitute indicator of family food security and nutritional adequacy, according to the research that is currently available (Kennedy et al., 2010; Leonard K et al., 2020; Hussein FM et al., 2017; Sarkar S, 2014).

Food security is achieved when all individuals have constant physical and financial access to sufficient amounts of wholesome food that meet their dietary requirements and preferences and allow them

to lead active, healthy lives (Burchi et al., 2016). Food security is primarily composed of three factors: utilization, accessibility, and availability.

Availability: An appropriate supply of food is readily available (Shaw DJ, 1996). Food can be grown domestically, bought commercially, or received via food assistance (Gursoy S., 2020).

Accessibility: having enough money or other resources to buy, gather, produce, or otherwise obtain enough appropriate food for one's needs. Food may be accessible, but it is not for people who do not have enough land to grow it or the money to buy it (Busch L., 2021).

Utilization: Sufficient knowledge and application of nutrition and

child care principles, appropriate food processing and storage practices, and an adequate supply of health and sanitation services guarantee that food is used appropriately (WFP, 2019). Utilization also refers to how food is distributed among household members according to each person's nutritional needs. Usage also includes biological use, which is connected to an individual's health (Busch L, 2021).

According to Mbwana et al. (2016), the technique of calculating a household's HDDS involves counting the food types that members of the household have ingested over a given time frame, often 24 hours. According to studies by Vaitla B et al. (2017) and Amugsi D A et al. (2016), households in poor nations are most likely to have low dietary diversity. According to the Food and Agriculture Organization (FAO, 2001), food insecurity is the condition in which people do not have the material or financial access to enough safe, nourishing food to lead active, healthy lives. Applying this notion at the family level leads to household food insecurity (FAO, 2009).

Nutrient adequacy and a high dietary diversity score are associated. Sufficient intake of nutrients is necessary for human body maintenance, growth, strength, physical exertion, immunity, and cognitive function (Habte TY, & Krawinkel M, 2016). In addition to depression and anxiety, poor dietary diversity has been linked to an increased risk of chronic diseases like obesity, diabetes, and cardiovascular disease (Lawal KM & Katsina KP, 2020). According to Murray CJL et al. (2020), one of the main causes of disease and death worldwide is a poor diet.

The purpose of this study is to ascertain the degree of food insecurity, dietary patterns and diversity, and factors linked to food security and dietary diversity in children aged 6–59 months residing in Lombok Tengah.

METHODS

A cross-sectional study with an analytical population focus was carried out in homes located in Lombok Tengah, West Nusa Tenggara, Indonesia. 359 households took part in the study, which involved the random selection of households. The Health Polytechnic of Mataram's Institutional Ethics Committee gave its clearance for this study (LB.01.03/6/115/2023).

In order to measure the effects of development food aid programs on the access component of household food insecurity, the household Food Insecurity Access Scale (HFIAS) was used to assess food security. To gauge the prevalence of food security, the comprehensive 9-question HFIAS scale is employed. By counting the amount of food groups that a particular target group consumed the day before or the night before, the Individual Dietary Diversity Score (IDDS) evaluated diet diversity among the population. The 24-hour recall was obtained from every respondent in order to administer the IDDS. To evaluate the relationship between exposure and outcome variables, Chi-square analysis was employed, and frequencies and percentages were computed for categorical variables.

RESULTS AND DISCUSSION

According to Coates et al. (2007) and Castell et al. (2018), the HFIAS score for every home was determined by adding the codes of responses to the topic of occurrence. Merely food insecure, moderately food insecure, severely food insecure, and food secure are the categories into which the scores have been divided. Four weeks (30 days) before data collection, this score assesses the level of food insecurity (access) in the home. The level of food insecurity (access) in the household four weeks (30 days) before data collection is measured by this score. The score is between 0 and 27, where 0 denotes a home

that answered "no" to each and every occurrence question and 27 denotes a household that answered "often" to each of the nine frequency of occurrence questions. The household suffered greater food insecurity (access) the higher the score. A household's level of food insecurity (access) decreased with a lower score (Coates et al., 2007).

As can be observed in Fig. 1, a majority of the agricultural households surveyed (96.7%) are facing varying degrees of food insecurity. 87.5% of food insecure households are slightly insecure, followed by highly insecure households (8.4%) and severely insecure households (0.8%). In Lorestan province, Iran's Dowreh Chegeni county had nearly as many food-secure agricultural households (40.8%) as Lesotho (40%), with 13.4% of households facing mild food insecurity, 14.4% moderate food insecurity, and 31.4% severe food insecurity (Chegini RK et al., 2021).

Table 1 data show that the highest percentage of households experiencing mild food insecurity is found in Batukliang Utara (97.6%), followed by Jonggat (92.9%), Praya Tengah (92.8%), and Kopang (91.0%). A household's consumption of food types during a specific time period is indicated by the HDDS. Seven days before the poll, food consumption data was used to calculate the score. It is based on twelve food groups: cereals, veggies high in vitamin A, legumes, fish and shellfish, eggs, green leafy vegetables, other vegetables, roots and tubers, vitamin A-rich fruits, other fruits, organ meat, flesh meats, sugar and sweets, oils, and fats.

Table 1. Mean household food insecurity access score for different district of health centre in Lombok Tengah

Area	n	Frequency			
		Food secure	Mildly food insecure	Moderately food insecure	Severely food insecure
Praya Timur	52	1.9	82.7	13.5	1.9
Praya Tengah	56	1.8	92.8	5.4	0
Pujut	51	3.9	82.3	11.8	2.0
Kopang	56	3.6	91.0	5.4	0
Batukliang Utara	41	2.4	97.6	0	0
Jonggat	56	7.1	92.9	0	0
Praya Barat Daya	47	2.1	72.3	23.5	2.1
Total	359				

It's a measure of the variety of food groups that people have eaten. Improved economic access to food is indicated by a higher score, which also reflects a wider range of food categories consumed. Das Shufo et al., 2022; Walsh et al., 2020; Sambo et al., 2022).

Table 2. Mean household dietary diversity score for different district of health centre in Lombok Tengah

Area	n	Mean	Std. Deviation	F Statistic
Praya Timur	52	4.32	1.20	6.24***
Praya Tengah	56	4.49	1.36	
Pujut	51	4.41	1.82	
Kopang	56	4.80	1.90	
Batukliang Utara	41	4.83	1.46	
Jonggat	56	4.57	1.97	
Praya Barat Daya	47	3.92	1.15	
Total	359			

Table II reveals that Praya Barat Daya got the lowest score (3.92) and Kopang (4.80) had the greatest score (4.83). This suggests that, compared to the other areas, residents in the foothills (Batukliang Utara) have greater access to varied food, while Praya Barat Daya has the least. There is statistically significant variation in HDDS between districts ($p = 0.004$).

Food access is therefore improved for households that grow commercially and live in the foothills. Their purchasing power is increased by the income from commercial farming, increasing their chances of having access to a wider range of foods (Saifuddin SNM et al., 2022; Otekunrin, 2021). Food availability is improved if households save some produce for domestic use (Sibhatu KT et al., 2015).

CONCLUSION

According to the data, 87.5% of agricultural households have some degree of food insecurity. According to the HFIAS results, households engaged in subsistence farming and living in the highlands (Batukliang Utara) are more susceptible to food insecurity. With the lowest results for dietary diversity, households in the highlands that did not cultivate their own food for the market had less diverse diets. However, the

average daily dietary diversity among farming households was insufficient, as they had generally consumed a variety of cuisines during the previous seven days (mean = 4.72).

REFERENCES

- Amugsi DA, Lartey A, Kimani E, Mberu BU. Women participation in household decision making and higher dietary diversity: findings from nationally representative data from Ghana. *J Health Popul Nutr*. 2016. <https://doi.org/10.1186/s41043-016-0053-1>.
- Burchi F, De Muro P. From food availability to nutritional capabilities: Advancing food security analysis. *Food Policy*. 2016 Apr;60:10–9.
- Busch L, Lacy WB. Introduction: What Does Food Security Mean? In: *Food Security in the United States* [Internet]. CRC Press; 2021 [cited 2024 July 24]. p. 1–10. Available from: <https://www.taylorfrancis.com/chapters/edit/10.1201/9780429048975-1/introduction-food-security-mean-lawrence-busch-william-lacy>.
- Castell GS, Rodrigo CP, de la Cruz JN, Bartrina JA. Escalas de evaluación de la inseguridad alimentaria en el hogar. *Nutr Hosp*. 2018; 2015 (31) : 272–8.
- Chegini RK, Pakravan-Charvadeh MR, Rahimian M, Saeed G. Is there a linkage between household welfare and income inequality, and food security to achieve sustainable development goals? *J Clean Prod*. 2021;326:129390. <https://doi.org/10.1016/j.jclepro.2021.129390>.
- Coates J, Swindale A, Bilinsky P. *HFIAS for Measurement of Food Access Indicator Guide*. Vol. 53. 2007.
- Das Shuvo SI, Sakhawot Hossain M, Riazuddin M, Mazumdar S, Roy D. Factors influencing low-income households' food insecurity in Bangladesh during the COVID-19 lockdown. *PLoS ONE*. 2022. <https://doi.org/10.1371/journal.pone.0267488>.
- FAO (Food and Agriculture Organization). *The State of food insecurity in the world, economic crises—impacts and lessons learned*. Rome: Food and Agriculture Organisation of the United Nations; 2009.
- FAO (Food and Agriculture Organisation). *The state of food insecurity in the world 2001*. Rome: Food and Agriculture Organisation; 2001.
- Gürsoy S. Addressing the Challenge of Food Security in Turkey. In Springer, Cham; 2020 [cited 2022 Sep 10]. p. 127–40. Available from: https://link.springer.com/chapter/10.1007/978-3-030-36483-0_8
- Habte TY, Krawinkel M. Dietary diversity score: a measure of nutritional adequacy or an indicator of healthy diet? *J Nutr Heal Sci*. 2016;3(3):303.
- Hussein FM, Ahmed AY, Muhammed OS. Household food insecurity access scale and dietary diversity score as a proxy indicator of nutritional status among people living with HIV/AIDS, Bahir Dar, Ethiopia, 2017. *PLoS ONE*. 2018. <https://doi.org/10.1371/journal.pone.0199511>
- Kennedy G, Ballard T, Dop M. *Guidelines for measuring household and individual dietary diversity*. Rome: Food and Agriculture Organization; 2010.
- Labadarios D, Steyn NP, Nel J. How diverse is the diet of adult South Africans? *Nutr J*. 2011;10(1):1–11.
- Lawal KM, Katsina KP. Covid-19 lockdown: measures on food choices and dietary diversity in Nigeria. *Al-Hikmah J Educ*. 2020;7(1):288–92. 22.
- Leonard K, Dela Luna G, Ostonal JM, Teresa A, Orillo O. Dietary diversity as a component of food security among households with preschool children in a Coastal Municipality in Batangas, Philippines. *Asia Pac J Multidiscip Res*. 2020;8(3):63–75.

- Mbwana HA, Kinabo J, Lambert C, Biesalski HK. Determinants of household dietary practices in rural Tanzania: implications for nutrition interventions. *Cogent Food Agric*. 2016;2(1):1–13.
- Murray CJL, Aravkin AY, Zheng P, Abbafati C, Abbas KM, Abbasi-Kangevari M, et al. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396:1223–49.
- Otekunrin OA. Dietary diversity choices of women: evidence from cassava farming households in Nigeria. *Arch Curr Res Int*. 2021;21(4):11–22.
- Sambo TA, Oguttu JW, Mbombo-Dweba TP. Analysis of the dietary diversity status of agricultural households in the Nkomazi Local Municipality, South Africa. *Agric Food Secur*. 2022;11(1):1–12.
<https://doi.org/10.1186/s40066-022-00387-0>.
- Sarkar S. Households' dietary diversity: a study of rural households in West Bengal. *India Eur Acad Res*. 2014;2(6):8307–25.
- Shaifuddin SNM, Azmi A, Ghazali SNFM, Shahid NSM. Food Accessibility and movement control order: analyzing impact of first lockdown on access to food. *Malaysian J Med Heal Sci*. 2022;18(8):176–82.
- Shaw DJ, World Food Summit. 1996. In: *World Food Security*. Palgrave Macmillan UK; 2007. p. 347–60.
- Sibhatu KT, Krishna VV, Qaim M. Production diversity and dietary diversity in smallholder farm households. *Proc Natl Acad Sci U S A*. 2015;112(34):10657–62.
- Vaitla B, Coates J, Glaeser L, Hillbruner C, Biswal P, Maxwell D. The measurement of household food security: correlation and latent variable analysis of alternative indicators in a large multi-country dataset. *Food Policy*. 2017;68:193–205.
- Walsh CM, Fouché MS, Nel M, Booyesen F. The impact of a household food garden intervention on food security in Lesotho. *Int J Environ Res Public Health*. 2020;17(22):1–12.
- World Food Programme. Emergency Food Security Assessment (EFSA): North West and South West regions, Cameroon January 2019. Rome; 2019.

PREDISPOSING FACTORS PREVENTING ANEMIA BEHAVIOR IN ADOLESCENT GIRLS: CROSS SECTIONAL STUDY IN JAMBI PROVINCE

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ABSTRACT

Background: Anemia is a health problem throughout the world, especially in developing countries where it is estimated that 30% of the world's population suffers from anemia. Based on 2018 Basic Health Research (Riskesdas) data, the prevalence of anemia in teenage women in Indonesia is 32%. That means 3-4 out of 10 teenage daughters are suffering from anemia. Factors that worsen anemia in teenage daughters are lacking in substance intake.

Method: The aim of the research is to determine the analysis of preventive behavior factors and the incidence of anemia in adolescent girls. The research was carried out at 3 high schools in Jambi Province, namely at SMA Negeri 6 Jambi City, at a private vocational school Jambi Mother's Family and at the Saadatul Abadiyah Kuala Tungkal Islamic Boarding School, Jambi Province in June 2022. The sample for this study was 279 people. Data analysis used chi-square.

Result: The research results showed that 24.4% of young women suffered from anemia with an average Hb level of 10.5 mg/dl. The results of statistical analysis show a relationship between knowledge, peer *group support* and the role of health workers on the behavior of young women in preventing anemia. The test results show that there is a relationship between compliance in consuming Blood Supplement Tablets obtained from school and the incidence of anemia, while Body Mass Index (BMI) has no relationship.

Conclusion: It is hoped that schools, in collaboration with health workers, can provide education or health education, especially the prevention of anemia in young women, and hold joint discussions to discuss the problem of preventing anemia using information system technology such as electronic-based Anemia Prevention Education Model.

Keywords: Anemia; Adolescent Girls; Anemia Prevention Behavior

INTRODUCTION

Anemia is a condition of the body where the hemoglobin (Hb) level is lower than normal. Anemia in adolescent girls is still quite high, according to the World Health Organization (WHO) (2013), the prevalence of anemia in the world ranges from 40-88%. In Indonesia, the prevalence of anemia in adolescent girls is 75.9% (SDKI, 2012), while the 2012 Household Health Survey (SKRT) data, the prevalence of anemia in adolescent girls aged 10-18 years is 50.5%. Riskesdas data, in 2018 the proportion of 32 % of adolescent women (15-24 years) experienced

anemia. In Indonesia, it is stated that 1 in 3 women suffer from anemia. Satriani's research (2018), in Jeneponto Regency, of 200 female students, 74 (37%) had anemia.

Women of reproductive age (adolescent girls) have a higher risk of iron deficiency anemia during the menstrual cycle (WHO, 2011; McDanie, 2019). Another factor that worsens anemia in adolescent girls is a lack of iron intake, where iron in adolescent girls is really needed by the body to accelerate growth and development. Besides that, young women menstruate every month so they need more iron, while the amount of food they consume is lower than

men, due to the desire to be slim (Ministry of Health of the Republic of Indonesia, 2013). The volume of blood lost during the menstrual period of more than 80 ml occurs in adolescents who experience long menstrual periods (Wijiastuti, 2006) . Menstrual problems interfere with activities at school and daily activities (Chan. SSSC, at all, 2009).

Anemia causes fatigue quickly; decreased study concentration resulting in low learning achievement and can reduce work productivity. Anemia also reduces the body's immune system, putting you at risk of infection. The high prevalence of anemia among teenagers, if not handled properly, will continue into adulthood and contribute greatly to the increase in maternal mortality (MMR), risk of giving birth to babies with low birth weight (LBW) and stunting (Robertus, 2014: Ministry of Health, 2016).

Management of anemia can be carried out well if the risk factors associated with anemia can be identified early. WHO (2014), targets reducing the prevalence of anemia in women of childbearing age (WUS) by 50% by 2025. Following up on these recommendations, the Indonesian government is intensifying the prevention and control of anemia in adolescent girls (aged 12 – 18 years) and WUS by prioritizing giving 52 blood supplement tablets through school institutions every month throughout the year (Ministry of Health, 2016). Several studies have shown that supplementation with tablets containing 200 mg ferrous sulfate and 0.25 mg folic acid resulted in an increase in the average Hb in adolescent girls after being given treatment (Sari. A, et al, 2017; Sayogo, et al, 2000)

The government has made regulations regarding the priority of giving TTD to WUS to prevent the incidence of anemia, but the incidence of anemia is still high. This is proven by the percentage of TTD coverage for adolescent girls aged 10-19 nationally, namely 76.2 (SDKI, 2018). In Jambi Province, the coverage of providing TTD to

adolescent girls aged 10-19 years is still below the national coverage, namely 71.62%, while in Jambi City it is lower than the coverage in Jambi Province, namely 67.88 % (Riskesdas Jambi Province 2018).

The problem of anemia in adolescent girls is caused by a lack of knowledge, attitudes and skills of adolescents due to lack of information, lack of concern from parents, society and the government regarding adolescent health . The causes of anemia in adolescent girls are mainly insufficient food intake, consuming enough food but the food has low iron bioavailability so that the amount of iron absorbed by the body is less. The Indonesian population's habit of consuming tea is also a factor that inhibits the proper absorption of iron (Noorkasiani, 2019). Adolescent girls tend to limit their food intake because they want to look slim. Teenage busyness can be a factor causing anemia in teenagers due to excessive activity and fatigue (Meiliana, 2018) . Malnutrition factors: Adolescents who have a lower BMI have a high risk of anemia. Yulia's research. EK (2019) in Rokan Hulu Regency, Riau, stated that respondents with a low body mass index (BMI) suffered from anemia at 91.3%. The research results concluded that there was a relationship between nutritional status and the incidence of anemia in adolescent girls.

METHODS

This research aims to analyze the causal factors and prevention behavior of anemia in adolescent girls. The research was carried out at 3 high schools in Jambi Province, namely at Public High School 6 in Jambi City, at the Bunda Family Private Vocational School in Jambi and at the Saadatul Abadiyah Kuala Tungkal Islamic Boarding School, Jambi Province. *Cross-sectional* analytical research method. The sample for this study consisted of 279 people (62 from SMA Negeri 8 Jambi City, 152 from the Private Vocational High School Bunda Jambi and 65 people from the

Saadatul Abadiyah Islamic Boarding School Kuala Tungkal).

Data collection was carried out in May and June 2022 using a questionnaire, BMI data was obtained through measuring body height using *a microtomies* and weighing using a digital weight scale. Hemoglobin levels were obtained using *a hematology analyzer* examination by taking venous blood at the Technology Laboratory, Medical Laboratory, Health Polytechnic, Ministry of Health, Jambi and at KH District Hospital. Daud Arif Kuala Tungkal. The anemia threshold limit for hemoglobin levels in the blood is less than 12 g/dL (WHO, 2019; Gandosoebata, R. 2011). BMI is an index of a person's body weight in relation to height, which is determined by weighing weight in kilograms (Kg) with TB in meters (m²). Normal BMI is 18.5 – 25.0 (RI Ministry of Health, 2019). Consume Fe supplement regularly if young women consume Fe supplement 1 tablet every week or ≥ 52 tablets in one year. The research hypothesis is that there is a relationship between knowledge, peer influence, the role of health workers, BMI and compliance with consuming blood supplement tablets on the incidence of anemia in young women. Data analysis uses *Chi-square* with a confidence level of 95%.

RESULTS AND DISCUSSION

Research conducted on Young Women in 3 High Schools in Jambi Province in May and June 2022 with 279 respondents, is as follows.

Table 1. Characteristic respondents

Variable	n	Percentage
Age		
< 17 years	270	96,7
≥ 17 years	9	3.3
Tribes		
Malay	664	22.9
Java	558	20.7
Batak	556	20
Padang	559	21.1
Buginese	228	10.3
Banjar	114	5
Parents' job		
ASN/ TNI/ POLRI/ BUMN	106	37.9
Private	97	34.7
Farmer	27	9.8
Fisherman	11	3.9
Laborer	38	13.7
	279	100

Table 1. shows that the majority (60%) of respondents are 15 years old, with an age range of 14 years to 17 years.

Table 2. Distribution of Anemia Incidence in Adolescent Girls

Variable	n	Percent	Average Hb Level (mg/dl)
Anemia	71	25.4 %	10.5
Normal	208	74.6 %	13.1
	279	100.0%	

The table above shows that the incidence of anemia in adolescent girls is still high, namely 25.4%.

Table 3. Relationship between adolescent girls knowledge about anemia and anemia prevention behavior

Variable	Indicator	Prevention of Anemia				P-value
		Not enough		Good		
		n	%	n	%	
Knowledge about anemia	Not enough	150	68.6	219	31.4	0.004
	Good	13	21.4	60	78.6	

Based on table 3, it is known that the majority of respondents (78.5%) have insufficient knowledge about anemia in adolescent girls. Respondents with less knowledge had less anemia prevention behavior. From the results of the *chi-square* statistical test, it can be concluded that there is a significant relationship between adolescent girls' knowledge about anemia and anemia prevention behavior.

The results of the analysis of the relationship between female peer influence and anemia prevention behavior can be seen in the following table.

Based on table 3, it is known that the majority of respondents (63%) received less support for preventing anemia from their peers (peer *group*). Respondents who received less support from their peers showed a lack of anemia prevention behavior in young women. From the results of the *chi-square* statistical test, it can be concluded that there is a significant relationship between peer influence and anemia prevention behavior.

The results of the analysis of the relationship between the role of health workers and anemia prevention behavior can be seen in the following table:

Based on table 3, it is known that health workers play a role in preventing anemia in adolescent girls. The results of the *chi-square* statistical test concluded that there was a significant relationship between the role of health workers and anemia prevention behavior.

Apart from describing anemia prevention behavior in adolescent girls, the following can be seen the relationship between BMI and the incidence of anemia.

Table 4. Relationship between the incidence of anemia in adolescent girls based on BMI

Variable	BMI						P-value
	Thin	%	Normal	%	Fat	%	
Anemia	22	30.7	33	46.1	16	23.1	0.420
Normal	64	30.8	117	56.4	27	12.8	
Amount	86	30.8	150	53.8	43	15.4	

Table 4 shows that the majority of respondents (75.6%) had a normal BMI and did not suffer from anemia. The results of the *Anova* statistical test showed that there was no relationship between BMI and the incidence of anemia in adolescent girls.

Table 5. Relationship between adherence to taking blood supplement tablets (TTD) and the incidence of anemia

Variable	BMI						Q-value
	Thin	%	Normal	%	Fat	%	
Anemia	22	30.7	33	46.1	16	23.1	0.420
Normal	64	30.8	117	56.4	27	12.8	
Amount	86	30.8	150	53.8	43	15.4	

Table 5. concludes that the majority of respondents (84.8%) did not regularly consume TTD, and the incidence of anemia was more in the group who did not regularly consume TTD. The results of the *chi-square* statistical test concluded that there was a significant relationship between adherence to consuming TTD and the incidence of anemia in young women.

Research results show that the incidence of anemia in adolescent girls is 25.4% with an average Hb level of 10.5 mg/dl, below the national figure of 32% (Risikesdas, 2018), but this is still a health problem that must be addressed immediately. If prevention and control are not carried out, it can result in a decrease in the learning achievements of young

women due to a decrease in their ability to concentrate on learning. Apart from that, it can reduce work productivity, reduce the body's resistance and put you at risk of infection. The high prevalence of anemia among adolescents, if not handled properly, will continue into adulthood and contribute greatly to the increase in maternal mortality (MMR), risk of giving birth to babies with low birth weight (LBW) and *stunting* (Robertus, 2014: *Ministry of Health*, 2016). The results of this study are in accordance with research by Noviyanti (2020) showing that the incidence of anemia in adolescent girls is 74.1% with an average of 9mg/dL.

Currently, the main prevention of anemia is by administering TTD regularly, 1 tablet every week throughout the year. Changing the behavior of young women is the most important thing in preventing anemia, for example the culture of consuming junk food is popular among young people, foods that are high in calories but relatively empty of important nutrients such as amino acids, vitamins, minerals and anti-oxidants (Jenkins, 2019).

Knowledge is the result of knowing from knowing, and this occurs after people sense a particular object. Sensing occurs through the five human senses, namely the senses of sight, hearing, smell, taste and touch. Most human knowledge is acquired through the eyes and ears . Good knowledge of disease is very important to achieve a better quality of life. Knowledge is a very important provision for the formation of one's actions. A person's actions reflect the knowledge they have, good knowledge will make someone have the provisions to treat themselves appropriately throughout their life. Good

understanding has the potential to make someone adhere to treatment (Notoatmodjo, 2010). Several studies state that there is a relationship between knowledge and the prevention of anemia in adolescent girls (Nesrin, N., 2021; Caturi, 2015; Lestari, 2018).

Based on the research results, there is a significant relationship between the influence of peers and the prevention of anemia in young women. The role of peers to support and remind other young women to regularly consume blood supplement tablets is very important. Increasing knowledge and information related to anemia and anemia prevention in adolescent girls by *peer groups*, teachers and parents is very important to implement so that adolescent girls can share this knowledge with their peers, so that more adolescent girls will regularly prevent anemia because they are motivated by habit. peers (Satrina, 2018).

Relationships with peers are individual relationships that involve relatively large amounts of closeness within the group (Laning, 2009). This shows that peers also function as a place to communicate so that changes in behavior often occur. This behavior can also be included in food consumption behavior. Apart from that, teenagers have a strong desire to be accepted and liked by their peers or their circle of friends, resulting in imitation of habits (Aisah, 2009). If their peers are regular in preventing anemia, it is hoped that young women will be motivated to follow their peers' behavior.

These results are in line with previous research which stated that there was a relationship between the environment and the prevention of anemia in adolescent

girls. The environment in question is everyone around the young woman, such as parents, peers, neighbors who can encourage her to prevent anemia (Nurbaya, 2018).

According to previous research, teenagers spend more time outside the home with their peers as a group, so it is understandable that the influence of peers on attitudes, conversations, interests, appearance and behavior is very large. Therefore, the role of peers is very important, especially in changing behavior, as well as anemia prevention behavior (Nurbaiti, 2018).

Based on the research results, it was concluded that there was a significant relationship between the role of health workers and the prevention of anemia in Japutri juveniles. It can be seen that most of the roles of health workers have not played an optimal role in preventing anemia because health workers rarely provide education about preventing anemia but the information provided is general and not specific so that many respondents still do not understand about preventing anemia. Sarinah's research results. S et al (2022), that educational interventions can prevent iron deficiency anemia in adolescent girls.

The research results are based on BMI with the incidence of anemia in adolescent girls with the highest percentage in the normal BMI category of 53.8 %. Nutritional status is the condition of the body as a result of consumption, absorption and use of nutrients or physiological conditions resulting from the availability of nutrients in the body. Nutritional status can be measured by BMI, thin, normal and obese. Several factors trigger nutritional problems in

adolescence, such as food intake, wrong eating habits, wrong understanding of nutrition, where a slim body becomes the dream of teenagers so that nutritional needs are not met and excessive preference for certain types of food, for example fast food (Nurhayati, 2020; Setyaningrum, 2014).

The incidence of anemia based on irregular consumption of blood supplement tablets (TTD) has an anemia percentage of 92.3%. Compliance with consuming iron supplementation or administering Fe tablets greatly influences changes in Hb levels, where hemoglobin levels are normal, anemia status will also be normal, so that it can prevent and treat anemia (Sarinah. S and Asnaily, 2021; Yuniarti, 2015; Citra, 2012). In accordance with research by Febrianti, et al, (2020), the results of the research show that teenagers who have strong behavioral control will be more likely to comply with TTD consumption compared to young women with weak behavioral control regarding TTD consumption. The research results prove that increasing knowledge is carried out through continuous health education regarding the importance of consuming TTD regularly.

CONCLUSION

The incidence of anemia in adolescent girls in 3 high schools in Jambi Province is 25%. There is a relationship between knowledge, peer influence and the role of health workers in preventing anemia in adolescent girls. The highest incidence of anemia (92.3%) was in the group of young women who did not regularly consume blood supplement tablets. The results of the analysis showed that there was a relationship between adherence to taking TTD and the incidence of

anemia. Based on BMI, the highest incidence of anemia occurred in the normal BMI group at 53.8 %, followed by underweight BMI. The results of the analysis found no relationship between adolescent girls' BMI and the incidence of anemia. as much as 30.7% in young women.

It is important to provide education to prevent anemia in adolescent girls using methods that are more accessible, easy to use and can be implemented. The need for monitoring and monitoring adolescent girls' compliance in consuming TTD. The weakness of the research is that not all variables that influence anemia in adolescent girls were studied so that other factors could influence the results of this study. For example, diet, lifestyle, socio-economic status and others. The weakness of the research methodology is that this research uses a descriptive method so that it is not known for certain the cause of anemia in young women. Another weakness is the *cross-sectional research* method, preferably a prospective method so that the actual causal factors are clearly known.

REFERENCES

- Aisah S. (2009). *The Influence of Peer Group Education on Behavioral Changes in Preventing Iron and Nutritional Anemia in Women of Childbearing Age in Semarang City*. Thesis. University of Indonesia.
- Caturi, Yantining Tiya, 2015. *The Relationship Between Knowledge, Attitudes and Behavior and the Incidence of Anemia in Adolescent Girls in Classes X and XI of SMA Negeri 1 Polokarto*.
- Chan , Symphorosa SC Pm Yuen , Ka Wah Yiu , Daljit Singh Sahota . (2009). *Menstrual Problems and health-seeking*

- behavior in Hong Kong Chinese girls .
Hong Kong Med J 2009;15:18-23 .
- Citra Kesumasari. (2012). *Nutritional Anemia, Problems and Prevention*. Cet. 1 - Yogyakarta.
- Febriyanti Diana, Farida Wahyu, and Ninna Rohmawati, (2020). *Compliance Behavior Consumption of Added Blood Tablets for Adolescent Girls in Jember, Indonesia*. Department of Public Health Nutrition, Faculty of Public Health, University of Jember.
- Gandosoebrata, R. 2011. *Clinical Laboratory Guide*. Dian Rakyat: Jakarta.
- Ian Jenkins and Aryeh Shande r. (2019). *Anemia Prevention and Management Program Implementation Guide*, Editors: Howard L. Corwin, Lawrence T. Goodnough, Benjamin Hohmuth, MD, MPH and Lisa Shieh
- Republic of Indonesia Ministry of Health, (2012). *Basic health research*. <http://www.depkes.go.id> ..
- Republic of Indonesia Ministry of Health, 2013. *2013 Indonesian Health Profile*
- Indonesian Ministry of Health, (2016). *Guidelines for Anemia Management in Adolescent Girls and Women of Childbearing Age (WUS) Directorate of Community Nutrition, Directorate General of Public Health, Jakarta*.
- Indonesian Ministry of Health, (2019). *Body mass index classification*. www.p2ptm.kemendes.go.id
- Laning, Vina Dwi, 2009. *Dream Teenagers* . Cempaka Putih Publishers. Klaten.
- Lestari, Desy Indah Nur, 2018. *Analysis of Factors Associated with Efforts to Prevent Anemia During Menstruation in Adolescent Girls at Islamic Boarding Schools in the Jenu Region, Tuban Regency* .
- McDaniel Jenny K. and Caryn E. Sorge 2019, *Anemia in the Young and Older Diagnosis and management*, Editor Robert T. Means. Jr, Springer Nature Switzerland AG
<https://doi.org/10.1007/978-3-319-96487-4>
- Meiliana, 2018. *Description of Anemia Risk Factors in Class X Adolescent Girls at SMAN 3 Tangerang Regency in 2018*.
- Nesrin N. Abu-Baker A, Anwar M. Eyadat and Abdullah M. Khamaiseh, 2021, The impact of nutrition education on knowledge, attitude, and practice regarding iron deficiency anemia among female adolescent students in Jordan, *Heliyon journal homepage: www.cell .com/heliyon*
- Noorkasiani, et al, 2019. *Sociology of Nursing* . EGC Medical Book Publishers. Jakarta.
- Notoatmodjo, Soekidjo , 2010 . *Health Research Methodology*. Publisher PT. Rineka Cipta. Jakarta.
- Noviyanti, RD, & Kusudaryati. DPD 2018. Relationship between Breakfast Habits and Nutritional Status of Muhammadiyah Elementary School Students, Special Program in Surakarta. *Journal of the University Research Colloquium*
- Nurbaiti, 2018. *Factors Associated with Preventing Anemia in Adolescent Girls at SMA Negeri 4 Jambi City*. Volume 19, Number 1, February 2019, (Pages 84-88)
- Nurhayati, Qariati, NI, & Jalpi, A. 2020. The relationship between knowledge, breakfast habits and physical activity with the incidence of anemia in young women at MAN 1 Banjarmasin in 2020. Faculty of Public Health, Kalimantan Islamic University
- Ruqoiyah Siti. (2019). The Relationship between Compliance with Blood Added Tambelt Consumption and the Incidence of Anemia in Class
- Sarwono, Sarlito, 2010. *Adolescent Psychology* . Salemba Medika Publisher. Jakarta.
- Sarinah Siregar, Asni Johari, M. Rusdi and Sahrial. 2022. The Impact of Health Education on Knowledge, Attitude, Practice, And Prevention of Iron Deficiency Anemia Among Adolescent Females: A Systematic Review. *NSC NURSING* , Volume 4, Nr.1, pp. 1-22
<https://www.nscnursing.it/napolisana-campania/nsc-nursing/anno-di-pubblicazione-2022/>
- Sarinah Siregar and Asnaily. (2021). Empowerment of Cadres in Preventing

- Anemia in Adolescent Girls. *Martabe: Journal of Community Service*. Volume 5 Number 3 of 2022. <http://jurnal.um-tapsel.ac.id/index.php/martabe/article/view/6193>
- Satrina. (2018). *Analysis of Determinants of Anemia in Adolescent Girls (15-18 Years) in Tamalate District, Jeneponto Regency*. Thesis. Hasanuddin University Makassar.
- Setiyaningrum E, Zulfa. 2014. *Family planning and reproductive health services*. Jakarta: CV. trans media info.
- Setyowati, Nanik Dewi, 2017. *Factors Associated with Eating Behavior of Adolescent Girls in Preventing Anemia in the Working Area of the Ngemplak Simongan Community Health Center*. PUBLIC HEALTH JOURNAL (e-Journal) Volume 5, Number 5, October 2017 (ISSN: 2356-3346)
- SDKI. (2018). *2018 Indonesian Demographic and Health Survey Adolescent Reproductive Health*. Indonesian Ministry of Health .
- WHO. (2014). *Global Nutrition Targets 2025: Anemia Policy Brief* Geneva: WHO; 2014.
https://apps.who.int/iris/bitstream/handle/10665/148556/WHO_NMH_NHD_14.4_eng.pdf?ua=1 . .
- WHO. (2019). *Hemoglobin concentrations for the diagnosis of anemia and assessment of severity. Vitamin and Mineral Nutrition Information System [Internet]*. Geneva (Switzerland): WHO; 2011. (WHO/NMH/NHD/MNM/11.1.) [cited 2019 November 15]. Available from: <http://www.who.int/vmnis/indicators/hemoglobin.pdf> .
- WHO. *The global prevalence of anemia in 2011*. Geneva: World Health Organization. <http://www.who.int>
- Yuli Eka Handayani and Ziska Rumiati, (2019). *The Relationship between Adolescent Nutritional Status and the Incidence of Anemia in Adolescent Girls at SMP N 02 Rambah Hirilir, Rokan Hulu Regency*.

EXPRESSED EMOTION: FAMILY PSYCHO-EDUCATIONAL EFFECT WITH AUDITORY HALLUCINATION TREATMENT ON FAMILY CAREGIVERS OF PEOPLE WITH SCHIZOPHRENIA

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ABSTRACT

Background: Hallucinations in people with schizophrenia can trigger high expressed emotion on family caregivers. Family psycho-education using auditory hallucination treatment modules and videos has never been done and is not specific to auditory hallucinations. The study aimed to determine the effect of the use of Auditory Hallucination Nursing Module and Videos on expressed emotion the family caregivers of people with Schizophrenia.

Method: The research design was *Randomize Controll Trial (RCT)*. The population study consists of 1729 family caregivers of schizophrenia patients with auditory hallucinations at the psychiatric out patients clinic of the Jambi Regional Psychiatric Hospital. Subjects were selected randomly with 42 subjects for each treatment and control group. The treatment group received auditory hallucination treatment materials in the forms of module and videos, while the control received the modules only. Expressed emotions measured by the *Family Attitude Scale* before and 1 month after treatment. The data were analyzed univariate and bivariate by dependent and independent t-tests.

Results: There was a significant difference in expressed emotion ($p=0.000$) within treatment groups before and after the treatment. There was a significant difference in expressed emotion ($p=0.000$) within control groups before and after the treatment. There was no significant difference in expressed emotion ($p=0.132$) between both of groups 1 month after treatment.

Conclusions: Family psycho-education by the module and videos treatments can lower the expressed emotion of family caregivers of schizophrenia patients with auditory hallucination. Psychiatric Nurses should educate the family caregivers by auditory hallucination nursing module and videos as means to reduce expressed emotion of family caregivers.

Keywords: Hallucinations; Family; Expressed Emotion; Schizophrenia

INTRODUCTION

Hallucinations are perceptual experiences without any relevant stimuli from outside the senses (Parnas, et al, 2024). One of the positive symptoms of schizophrenia is hallucinations, where about 59% of schizophrenia patients experience auditory hallucinations (Harvey, 2018; Gupta et al., 2015); 60-80% schizophrenia (Shao et.al, 2021); 95% of patients with mental disorders (Waters & Fernyhough, 2016). Auditory hallucinations are experienced by 59-95%

schizophrenia patients. They hear the voices discussing the patient or commenting on his or her behavior as a third person (Parnas, et al, 2024). The content may be negative in 50% of cases, more often positive (83%) in schizophrenia (Waters & Fernyhough, 2016). Negative hallucinations make their behavior uncalm such as restless, making noise, and even though self-harm and their environment. The patient's behavior generates tension that is expressed as a heightened emotional state of the family caregivers.

Expressed Emotion is manifested in the form of the attitude of family members or

people who are directly related to the patient (Dewi, et al., 2019; Putra et al., 2018). Components of Expressed emotion (EE) consists of critical comment, hostility, positive remarks, warmth, and emotional over-involvement (Chien, et al, 2016; Sadath et al, 2018). Around 77% of families of schizophrenia patients display high expressed emotion, in the form of critical comments and excessive emotional involvement (Zanetti, et al., 2019); 43.6% of high expressed emotion in family caregivers in southwestern Ethiopia (Yimam, et al., 2022); 50.5% of high emotional expression in caregivers in South Ethiopia (Sime, et al., 2022); 71.9% of the emotional expression was high in the patient's family in China (Wang., et al, 2017). It is nearly 43.6-77% of family caregivers have high expressed emotion towards people with schizophrenia.

Family involvement in the care of people with mental disorders is a very important role (Ong, et al., 2021). In fact, around 56.4% of family knowledge about the symptoms of the disease in patients is low (Wan and Wong, 2019). In addition, the patient's family's knowledge of hallucination treatment was low, where before the treatment the average value was 4.87 ± 1.25 (Daryanto.,et al, 2023). The family's ability to care for schizophrenia patients is predicted by family resources (Iswanti et al, 2023). While Family psychoeducation aims to improve knowledge and ability to care for patients at home (Rusmimpong, et al, 2016).

Several studies on effect of family psycho-education on expressed emotion of patients' families. Family psycho-education can reduce high expressed emotion (Batra, et al., 2018; Zanetti, 2019; Begam and Baruah, 2020; Suparada, et al., 2022; Ahmed and Ghaith, 2022) and have a positive effect on expressed emotion (Budiono, et al., 2021). Family psycho-education with 6 sessions had an effect on expressed emotion of caregivers of schizophrenia patients (Shetty, et al., 2023). This study did not explain the material

provided, but the media used by online through social media, seminars, and inpatient visits.

The researcher interviewed 5 caregivers family of schizophrenia patients with auditory hallucinatory. They often comment critically to the patient's behavior, such as; does not obey the advice, do not want to stay at home and make quarrels in the family environment, and even though they come to mental hospitals themselves to asked for treatment, and some of them have relapses. This illustrates that family caregiver have high expressed emotion and it have difficulty in managed tha patient's behavior. The research question is: "Does family psychoeducation using auditory hallucination nursing modules and videos affect to the expressed emotion the caregivers of people with Schizophrenia.?". This study aims to analyze the effect of family psycho-education using auditory hallucination nursing modules and videos on the expressed emotion between groups.

METHODS

This study a quantitative design used *pretest and post test design with control group design*. The hypothesis measured effect of family psycho-education by Module and Nursing Video on expressed emotion of family caregivers of Schizophrenia Patients with Auditory Hallucinations compared to the Control. The family caregivers participated at outpatient clinic of the Jambi regional psychiatric hospital in 2022, as sums of 1729 people. The number of research subjects was 42 people for each group, both of treatment and control group with a total sample of 84 people who met the following criteria; Familie's caregivers of schizophrenia patients who experience prominent symptoms of auditory hallucinations, who takes care of patients (16 hours/week), ranging from 18 to 65 years, can read and write Indonesian. Then, the treatment and control groups were selected randomly.

The research instruments include demographic data, such as; age, gender, education level, marital status, occupation, kinship, number of hours of care and parenting methods. Expressed emotion measured by the *Family Attitude Scale*, that contains 30 statements with the modification of the answer score into four scales (scale 1-4), consists of scale 1 = never, 2 = rarely, 3 = often and 4 = every day. The questionnaire consisted of 20 negative statements (2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 17, 18, 19, 22, 23, 25, 26, 27, 29). The positive statement consists of 10 items (1, 9, 12, 15, 16, 20, 21, 24, 28, 30). The grade for a negative statement is that if you choose an answer every day=4, often=3, rarely=2, never=1. The grade for a positive statement in the opposite way, that if you choose an answer every day =1, often=2, rarely=3, never=4. The number of FAS scores is in the range of 30-120 values. The results of the validity and reliability test of the Indonesian version of the FAS obtained a *chronbach value* of $\alpha=0.935$.

Data were analysed by the *t-dependent test* was used to analyze the differences in expressed emotion before and after treatment in the treatment and control groups. An independent t test was conducted to analyze the differences in expressed emotion between the two groups before and after treatment.

RESULTS AND DISCUSSION

Demographic Characteristic

Description of demographic characteristics of the family caregivers of the treatment vs control groups. Female caregivers 57.1 vs 61.9%, high school education 42.9 vs 38.1%, working 57.1-59.5%, married 71.4% vs 64.3%, Javanese ethnicity 40.5%, parents (father/mother) 31 vs 38.1%, and 71.4% taking turns of care each others. The mean scores age of the treatment vs control groups is closely between 38.69 vs 39.64 years, and the mean scores duration of caregiving is closely to 7.26 vs 7.88 hours

daily.

This finding was different from other studies, where the mean age scores of caregiver is 45.31 years old (Gupta, et al., 2015); 46.44 years (Dewi, et al., 2019); 32.5% are between the ages of 56-65 years (Wan and Wong, 2019); and 56 years old (Zanetti, et al, 2019). Caregiver's age was identified as a predictive variable of high expressed emotion (Araujo and Pedroso, 2019). The patient's age was related to excessive emotional involvement and the level of critical comments in the families of schizophrenia patients in Brazil (Zanetti, et al., 2019).

The more caregiver was female, such as, 57.1 vs 61.9%, which is almost the same with six other studies, such as, 72.2% vs 55.6% (Gupta, et al., 2015); 59.6% (Dewi, et al, 2019); 71.8% (Wan and Wong, 2019); 71% (Zanetti, et al, 2019); 59.4% (Shime, et al. 2022), and 68.8% (Wang, et al, 2022). Gender is related to excessive emotional involvement and the level of critical comments in Brazil (Zanetti, et al., 2019). These findings and the previous research confirm that 51.37-72.2% of women act as family caregivers. It's mean that women are the main source of care for schizophrenia patients.

The education of family caregivers is mostly high school around 41.9% vs 38.1%, which is different from family caregivers in other places where 30.6 vs 36.1% do not complete elementary school (Dewi, et al, 2019) and also 65% (Zanetti, 2019); High school below is around 65.97% (Dewi, et al, 2019); SMA 47% (Wan and Wong, 2019). Education is also considered a predictive variable of high expressed emotion (Araujo and Pedroso, 2019) and correlated with expressed less warmth (Avraam, et al, 2022). Our findings confirm that the number of caregivers in high school is almost the same in others four places and that is different in contrast to others two studies where elementary level or equivalent.

The family caregivers who worked

ranged from 59.5% vs 57.1%, which is almost the same as other findings, that was 57.64% (Dewi, et al., 2019), and vice versa in contrast to other studies, where 49.3% do not work/retire (Wan and Wong, 2019). Meanwhile, other studies mention low income of around 69.4% (Gupta, et al., 2015), and 55.4% (Wan and Wong, 2019). This confirms that more than half of the caregiver were worked and low-income. The marital status is 71.4% vs 64.3%, where the results are almost the same as other findings, that was 62.83% (Dewi, et al., 2019), and 89.1% (Wang, et al, 2022).

Furthermore, we found that the Javanese ethnicity is 40.5%, confirming that the Javanese ethnicity dominates for mental disorders, this is possible considering that the distribution of the Javanese population has spread throughout Indonesia including Jambi. This study found that parents (Father/Mother) are the main caregivers of patients compares to others relatives. Parents (father/mother) as caregivers of patients ranged from 31 vs 38.1%, where others studies showed that it was higher, that were 41.7-58.3% (Gupta, et al., 2015), and 78.3% (Wang, et al, 2022) or almost the same nearly 41.8%, where fathers 9.9%, and mothers 31.9% (Wan and Wong, 2019) and 30% were siblings of patients (Zanetti et al., 2019). Then, parents (fathers), siblings and descendants, there was an increase in average critical comments of 68.19%, 82.85% and 52.65%, respectively, when compared to mothers (Zanetti, et al., 2019). The degree of relationship bonding is related to excessive emotional involvement and the level of critical comments in families of schizophrenia patients in Brazil (Zanetti, et al., 2019). Parents with a mental illness are show high expressed emotion often, especially high critics (Fahrer et al, 2022). Then, the parents (father and mother), especially mothers, are important people and have the closest relationship with their children and vice versa affect excessive emotional involvement and critical

comments.

It's nearly 71.4% who takes turn in provide care to the patients. The mean scores duration of care is 7-8 hours daily and other studies show that 62.8% provide 1-3 hours of care time daily (Wan and Wong, 2019), more than 92.5% have contact with patients every day (Shetty et al., 2022). Other research, although it does not mention how to provide caregiving, it was estimated that all siblings and relatives are involved in took care the patients.

Expressed emotions within groups before and after treatment

Table 1. Comparison of expressed emotion within groups of treatment and control group before and after treatment (n=42)

Group	Expression of Emotions	
	Treatment	Control
Before	70.52±14.69	66.83±14.16
After	58.93±12.25	63.33±14.20
Mean difference	11,59	3,5
p	0,000	0,000

The results show that expressed emotion of caregivers of treatment group at before and 1 month after the treatment by module and videos of auditory hallucination nursing. The mean score of expressed emotion were 70.52 and 1 month after treatment were decreased to 58.93, where the difference scores were 11.59. It means that the expressed emotion of family caregivers in the treatment group has decreased by 11.59 after the treatment. There was a significant difference in expressed emotion before and after the treatment (p value $0.000 < \alpha = 0.05$).

In the control group, there were changed in the mean scores of expressed emotions before treatment was 66.83 and 1 month after the treatment decreased to 63.33, where the difference scores were 3.5. It means that the expressed emotion of family caregivers in the control group has decreased by 3.5 after the module treatment. There was a significant difference in the mean scores of expressed emotions before and after the treatment (p value $0.000 < \alpha = 0.05$).

This research shows both of the treatment has same effect in decreased expressed emotion. The mean scores of expressed emotions at the treatment have more decreased than the control group. This confirms that family psycho-education with combination auditory hallucination nursing module and videos has more decreased than the module group.

Expressed emotions between groups after treatment

The results of the levenes test for expressed emotion were obtained with p value = $0.314 > \alpha=0.05$, which means that the expressed emotion of the treatment and control groups 1 month after treatment had the same variant or no difference in variant.

Table 2. Comparison of expressed emotion between treatment and control group before and after treatment (n=42)

after treatment (n=42)					
Expressed Emotion	Mean	SD	d	SE 95%	p
Before					
Treatment	70.52	14.68	3.69	2.26-2.18	0.244
Control	66.83	14.15			
After					
Treatment	58.93	12.24	4.40	1.89-2.19	0.132
Control	63.33	14.20			

Based on table 2, there was the difference mean scores of expressed emotions between the treatment and control groups before treatment were 3.69. The results shows that expressed emotion for the same variant (p value $0.244 > \alpha=0.05$). It means that there was no significant difference in expressed emotion between the treatment and the control group before treatment (Pretest). Next, there was the difference mean scores of expressed emotions between groups was 4.4. The results show that expressed emotion for the same variant (p value $0.132 > \alpha=0.05$). It means that there was no significant difference in expressed emotion between the treatment group (Module and Video) and the control group (Module) 1 month after the treatment (Posttest).

Module and videos as a medium for family psycho-education and expressed emotion effect on family caregivers of schizophrenia patients

The use of auditory hallucination nursing module and videos as a psychoeducational medium for caregivers of schizophrenia patients has been proven to reduce the mean scores of expressed emotions in both the treatment group (Module and video) and control (Module). The mean scores of expressed emotions in the treatment group were decreased more than 3 times compared to the control group. This indicates that video as a psychoeducational medium can help family caregivers in improving their ability to provide care to the people who experienced auditory hallucinations. In addition, videos psycho-educational media are considered more interested, needed and easier than the module. Caregivers can apply the subject matter by imitating actions as demonstrated in the video, besides, the video can be played over and over repeatedly so that it is more practical for family caregivers to apply.

The results findings are consistent with previous study that family psycho-education has decreased significantly in expressed emotion in the treatment group (Batra, et al., 2018; Begam and Baruah, 2020); Budiono, et al., 2021). Although not exactly the same, the application of family psycho-education takes more longer than this study, where using brainstorming, case sketches, and role playing, and video clipping, can significantly reduce the expression of family emotions (Shetty, et al., 2023). Other study focus on schizophrenia as a mental disorders, while this study focus specifically on the module and videos for treatment of auditory hallucinations (Daryanto, et al, 2022; Daryanto, et al, 2023).

Although the psychoeducational effect has been proven to be effective in reducing expressed emotion, in fact, family caregivers have increased in parenting ability. This ability reduces family stress, so that it has an impact on reducing emotional reactions from

the family. Actually, they cannot able how to manage the emotions caused by hallucinatory symptoms in patients. The researcher's experienced when mentoring several caregivers of patients' families, they reported that they were very stressed in dealing with the symptoms of hallucinations of patients. They also have difficulty managing their own emotions in the face of patient behavior. This would rise to expressed emotions of family caregivers. The expressions forms were comments that are critical, hostile, limiting and supervising their activities, etc. It should be considered, that's family caregivers also need to be given knowledge on how to manage their emotions conveyed online using social media or through face-to-face meetings either individually or in groups.

Family psychoeducational materials need to be added as needed. It's providing families knowledge about psychiatric illness and their management (Sarkhel et al, 2020). They need to learned how to provide hallucinatory nursing care. They also need to be given a manual or video on how to manage emotions to learn on their own or practice their own skills at home according to the content of the material in the manual or video that has been given. Other psychoeducational materials that need to be provided include how to communicate assertively, and how to manage emotions and anxiety and prevent recurrence. Through family psychoeducation, caregivers are expected to have a number of abilities to manage their own emotions so that the family becomes an important support system by creating a family environment that is conducive to recovery and preventing patient recurrence.

Research excellence

The advantage of this research lies in the media and materials of family psycho-education using the module and videos as well as materials/content that learned specifically auditory hallucination nursing. Meanwhile, the media used in previous study for the

patient's family were films, leaflets, manuals or modules, the language material is still general related to schizophrenia. Although videos media has been applied to other research before, but this psychoeducation material related to auditory hallucination treatment and it is the first thing. Psycho-educational materials includes how to expand self-awareness, stop unpleasant past thoughts/ memories, manage anxiety, install plugs/ earmuffs, listen to music through a headphone set, watch entertainment programs on radio or television and do activities according to the schedule (Daryanto, et al, 2023).

Study Limitations

Psychoeducation took in short time treatment, which is one week and followed by group mentoring for a month. The results of this study have also not been able to detect the differences expressed emotion between the treatment and control groups 1 month after treatment. While others study was mostly conducted over a longer period of time such as 6 months, 1 year and 2 years. It is necessary to practice emotional management skills repeatedly and until it confirmed the skill has been mastered properly. Therefore, future research needs to be conducted by considering longer treatment and mentoring times for families as well as training emotional management skills. Besides, psychoeducation is expected to be carried out face-to-face so that participants' skills can be trained and supervised and guided directly. Thus, the goal of family psychoeducation can be achieved according to expectations.

CONCLUSION

The was several conclusions in this study:

- a. Family caregivers are mostly over 45 years old, most of them are parents, especially the patient's mother, 62.8% are married, have a high school education, more than 57% worked with low income and 40.5% as the Javanese.

- b. The mean scores of emotional expressions in the treatment group of 70.52 decreased to 58.93 after treatment, while the mean scores of expressed emotions in the control group was 66.83 decreased to 63.33 after treatment.
- c. There was a significant difference in expressed emotion (Pv 0.000) within treatment group before and after the treatment.
- d. There was a significant difference in expressed emotion (Pv 0.000) within control group before and after the treatment.

There was no significant difference in expressed emotion (Pv 0.132) between groups, 1 month after treatment hallucination module and nursing videos.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this research publication. The researcher team guarantees that this manuscript and publication are the rights of each author according to their proportionally.

REFERENCES

- Ahmed H.A.AE and Ghaith R.F.A.H. Effect of psycho-educational program on families' perception of burden and attitudes toward mental illness among caregivers of patients with schizophrenia. *Egyptian Nursing Journal*, Vol. 15 No. 3, September-December 2018
- Araujo A.S. and Pedroso, T.G. (2019). The relationship between expressed emotion and sociodemographic variables, early stress and stress symptoms in informal caregivers of people with mental disorders. *Cad. Bras. Tar. Ocup., São Carlos*, v. 27, n. 4, p. 743-753, 2019
- Avraam G. et al,. (2022). High Expressed Emotion and Warmth among Families of Patients with Schizophrenia in Greece. *Healthcare* **2022**, 10, 1957. <https://doi.org/10.3390/healthcare10101957>.<https://www.mdpi.com/journal/healthcare>.
- Batra B.S., at al.(2018). Effect of family psycho education on Knowledge, Quality of Life, Expressed Emotions, Burden of Disease and coping among caregivers of patients with schizophrenia. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*. Volume 17, Issue 8 Ver. 5 (August. 2018), PP 59-73. www.iosrjournals.org.
- Begam B., and Baruah A. (2020). Effectiveness of Psychoeducation on Expressed Emotion of Family Members and as Perceived by the Patient with Schizophrenia. *Eastern Journal of Psychiatry*, Volume 23 Issue 1 (January–June 2020)
- Budiono, W. et al. (2021). Psychoeducation Improved Illness Perception and Expressed Emotion of Family Caregivers of Patients with Schizophrenia. *Int. J. Environ. Res. Public Health* **2021**, 18, 7522.
- Chien W.T, et al. (2016). Psychometric properties of a Chinese version of the Level of Expressed Emotion scale and expressed emotion of family members

- perceived by patients with severe mental illness. Hong Kong Med J | Volume 22 Number 6 (Supplement 6) | December 2016 | www.hkmj.org
- Daryanto, et al. (2022). The effect of nursing intervention strategy by video to ability Control Auditory Hallucination for Patients with schizophrenia. The 5th International Conference Health Polytechnic of Surabaya. 28-29 September 2022. Proceeding ICoHPS 2022, Vol 2 (1), p24-35. ISBN: 978-000-00000-0-0.
- Daryanto, at al.(2023). Effect psychoeducation enrichment on family's ability to control hallucinations in people with schizophrenia: Pre experimental study. Health education and health promotion. Vol 11, Issues 1, 2023.
- Dewi AR, et al. (2019). Managing family burden through combined family psycho-education and care decision without pasung therapies. *Enferm Clin.* 2019;29(S2):76---80
- Fahrer J. et al. (2022). Expressed Emotion in the Family: A Meta-Analytic Review of Expressed Emotion as a Mechanism of the Transgenerational Transmission of Mental Disorders. *Frontiers in Psychiatry* | www.frontiersin.org. February 2022 | Volume 12 | Article 721796
- Gupta S., et al.(2015). Assessing health status in informal schizophrenia caregivers compared with health status in non-caregivers and caregivers of other conditions. *BioMedCentral Psychiatry*.
- Harvey C. (2018). Family psychoeducation for people living with schizophrenia and their families. *BJPsych Advances* (2018), vol. 24, 9–19 doi: 10.1192/bja.2017.4
- Iswanti D.I., et al. (2023) Factors related to family's ability to care for schizophrenic patients. *International journal of public health science*. Vol 12 Issue no.2 of 2023.
- Ong H.S. et al. (2021). Family engagement as part of managing patients with mental illness in primary care. *Singapore Med J* 2021; 62(5): 213-219. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8801858/pdf/SMJ-62-213.pdf>
- Parnas J., et al (2024). Phenomenology of auditory verbal hallucination in schizophrenia: An erroneous perception or something else?. *Schizophrenia Research* 265 (2024) 83–88. <https://www.sciencedirect.com/science/article/pii/S0920996423001391?via%3Dihub>. Diakses 13 Juli 2024.
- Putra, E. S., Wasita, B., & Anantanyu, S. (2018). A randomised trial on walking exercise and banana consumption on self-reported depression symptoms among female adolescents in Surakarta, Indonesia.
- Rusmimpong., at. Al.(2016). The Burden of Families of Schizophrenic Patients Examined at the Psychiatric Polyclinic of the Jambi Provincial Mental Hospital. *Journal of Nurses and Midwifery*. Vol 3 Number 1, 2016 p. 42-45.
- Sadath A., at al.(2018). Expressed Emotion Research in India: A Narrative Review. *Indian Psychiatric Society - South Zonal Branch* | Published by Wolters Kluwer – Medknow.
- Sarkhel S., et al. (2020). Clinical Practice Guidelines for Psychoeducation in Psychiatric Disorders General Principles of Psychoeducation. *Indian J Psychiatry*. 2020 Jan; 62(Suppl 2): S319–S323.
- Shao X. et al. (2021). The Etiology of Auditory Hallucinations in Schizophrenia: From Multidimensional Levels. *Frontiers in Neuroscience* | www.frontiersin.org 1 November 2021 | Volume 15 | Article 755870
- Shetty K.V., et al.(2023). Family intervention for expressed emotion in schizophrenia: Indian context. *Indian Journal of Psychiatry* Volume 65, Issue 4, April 2023
- Shime Y. et al. (2022). Expressed emotion and associated factors among care givers of schizophrenia patient attending mental health service in Dilla University

- Refferal Hospital, Dilla, Southern Ethiopia, 2022. Research Square.
- Suparada, et al (2022). The Effect of a Psychiatric Family Caregiving Program on the Expressed Emotions of Caregivers of Persons with Schizophrenia in a Community. Nursing Journal CMU Volume 49 No.4 October - December 2022
- Wan K.F and Wong M.M.C. (2019). Stress and burden faced by family caregivers of people with schizophrenia and early psychosis in Hong Kong. Internal Medicine Journal (2019) 49 (Suppl. 1): 9–15.<https://onlinelibrary.wiley.com/doi/epdf/10.1111/imj.14166>
- Water F. and Fernyhough C. (2016). Hallucinations: A Systematic Review of Points of Similarity and Difference Across Diagnostic Classes. Schizophrenia Bulletin vol. 43 no. 1 pp. 32–43, 2017. <https://pubmed.ncbi.nlm.nih.gov/27872259/>. Diakses 13 juli 2024.
- Wang X., et al. (2017). Effect of caregivers' expressed emotion on the care burden and rehospitalization rate of schizophrenia. Patient Preference and Adherence 2017:11 1505–1511
- Yimam B., et. Al. (2022). Expressed emotion of caregivers among schizophrenic patients visiting Jimma University Medical Center Psychiatry Outpatient Unit, Southwest Ethiopia. Annals of General Psychiatry 2022, 21(1):27
- Zanetti.A.C.G, et. Al. (2019). Expressed emotion and sociodemographic and clinical factors in families of Brazilian patients with schizophrenia. International Journal of social psychiatry. 2019, Vol. 65(1):56-63.

THE EFFECT OF INTEGRATED EDUCATION WITH BOOKLETS AND FOOT EXERCISE VIDEOS ON KNOWLEGDE, DIET COMPLIANCE AND BLOOD SUGAR OF PATIENTS WITH TYPE 2 DM AT RSUD DR. DORIS SYLVANUS PALANGKA RAYA

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ABSTRACT

Background: Apart from providing diet, the management of Type 2 DM that is also important to help control BGD is providing education and doing physical activities such as diabetic foot exercise. This study aims to determine the effect of integrated education through booklets and videos of leg exercises on knowledge, diet compliance.

Method: The quasi-experimental research method is a one group pretest-posttest design through purposive sampling with 18 respondents. Education with booklet and video media was carried out at the respondents' homes. Knowledge and compliance before and after were obtained through interviews using validated questionnaires. Meanwhile the diabetic foot exercise intervention was carried out 6 times for 2 weeks with a duration of 15 minutes and a 1-day break. BGD data were measured using a glucometer. Data analysis used paired t-test and Wilcoxon test.

Results: The test results obtained knowledge $p = 0.001$ with an average increase of 10.28 points, compliance $p = 0.007$ with an average increase of 7.67 points, and blood sugar $p = 0.000$ with a decrease in KGD of 15.4 mg / dL.

Conclusion: The conclusion is that there is a significant effect of providing integrated education using booklets and foot exercise videos on knowledge, diet compliance and blood sugar levels in outpatients with Type 2 DM at the dr. Doris Sylvanus Palangka Raya Hospital. It is recommended that respondents routinely do foot exercises and regulate their diet with a 3J pattern.

Keywords: Blood Sugar Levels; Booklet; Diabetic Foot Exercises; Type 2 Diabetes Mellitus; Video

INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disorder that affects the body's ability to metabolize glucose in the blood, characterized by hyperglycemia resulting from abnormalities in insulin secretion, insulin activity, or both (PERKENI, 2022). According to the World Health Organization, type 2 DM ranks as the fourth most common disease worldwide, following heart disease, cancer, and respiratory disease. Diabetes is responsible for 6.7 million deaths worldwide (Sugiyanto and Sumarni, 2022).

In 2020, data on diabetes cases in Palangka Raya City showed a significant

increase compared to the previous year. In 2019, there were 2,732 cases of diabetes mellitus, while in 2020, this number rose significantly to 7,615 cases. Observations at the internal medicine clinic of RSUD dr. Doris Sylvanus Palangka Raya indicated that approximately 60 patients were seen daily, totaling 1,800 patients per month and 21,600 patients annually. A preliminary study of medical records at RSUD dr. Doris Sylvanus Palangka Raya for 2021 revealed 1,630 outpatient cases of type 2 diabetes, which increased to 5,066 cases in 2022. According to the Palangka Raya City Health profile, diabetes predominantly affects individuals of working age (Dinas Kesehatan Kota Palangka Raya, 2022).

Diabetes management is known revolves around four key pillars: counseling or education, medical nutrition therapy, physical exercise or activity, and pharmacological intervention. Education plays a crucial role as one of the strategies in managing diabetes. It involves imparting health information to individuals or groups to enhance their knowledge (Habibi, 2015 in Sepang et al., 2020; Putra & Junita, 2022). Knowledge about diabetes serves as a tool to help patients in managing their condition effectively throughout their lives. The effectiveness of health education often depends on the medium through which it is delivered.

One of the educational media that can be utilized includes booklets and videos. Research conducted by Puspitasari et al. (2013) as cited in Sepang et al. (2020) found that health education using well-designed manuals effectively enhanced patient compliance. Education plays a crucial role in enabling individuals to understand how to improve their quality of life and health status, particularly for people with diabetes, and can motivate patients to adopt healthier lifestyle changes (Christyanni et al., 2019).

Physical exercise is a crucial aspect often overlooked in managing diabetes. However, in reality, engaging in physical exercise can help maintain body fitness, prevent obesity, and enhance insulin sensitivity, so it can reach blood sugar levels to normal values (PERKENI, 2022). According to Sipayung (2018) as cited in Lubis and Kanzanabilla (2021), activities such as cooking, watching TV, or using gadgets has a significantly higher risk up to 6.2 times of developing diabetes compared to activities like swimming, jogging, and gymnastics. Regular physical exercise plays a vital role in strengthening, repairing, and improving the body's metabolic system (Kurniawaty and Yanita, 2016).

One type of physical exercise is diabetic foot exercises, which involve movements of the muscles and joints in the feet. These exercises are beneficial for enhancing blood

circulation and strengthening the muscles around the joints (Istianah et al., 2022; Putra et al., 2021). This statement aligns with Yulianti and January (2021), who emphasize that diabetic foot exercises contribute to improved blood circulation and muscle strength around the joints. According to PERKENI (2022), a regular physical exercise program is carried out 3-5 days per week, lasting approximately 30-45 minutes each, with at least 2 consecutive days of rest between sessions.

Based on this issue, researchers were motivated to study the effect of integrated education using booklets and diabetic foot exercise videos on the knowledge, diet compliance, and blood sugar levels of patients with type 2 diabetes mellitus (DM) at RSUD dr. Doris Sylvanus Palangka Raya.

METHODS

This research was conducted in February-March 2024 at the Internal Medicine Polyclinic of RSUD dr. Doris Sylvanus Palangka Raya to identify and visit patients at their homes. The research employed a quantitative approach with a quasi-experimental design in the form of a one-group pretest-posttest design. The sample, obtained through purposive sampling, consisted of 18 individuals who met the inclusion criteria, namely patients who diagnosed with type 2 diabetes mellitus (DM), with or without complications such as kidney disease, heart disease, or stroke, receiving outpatient treatment at RSUD dr. Doris Sylvanus, residing in Palangka Raya City, capable of reading, writing, and communicating clearly, aged between 30 and 65 years, and willing to participate in the study. Data on knowledge and dietary compliance were collected through interviews using validated questionnaires containing 14 and 19 items respectively, administered before and after education sessions. Blood

sugar levels were measured using a glucometer.

Providing education using booklets and practicing foot exercises using video media was conducted once for approximately 60 minutes at the participants' homes. The process began with a pre-test to assess knowledge, diet compliance, and blood sugar levels. Following the education and foot exercise practice, a post-test was administered to assess knowledge, while diet compliance was measured three days later. Blood sugar levels were measured three times: on day 3, 5, and 14 after the participants performed the leg exercises guided by the video. The exercise was performed six times, with each session lasting 15-20 minutes. Later, the average blood sugar levels measured after the diabetic foot exercises were calculated and compared with the levels before the exercises. Statistical analyses included the paired t-test for knowledge data, the chi-square test for dietary compliance data, and the Wilcoxon test for blood sugar level data, which had previously undergone normality testing.

RESULTS AND DISCUSSION

1. Sample Characteristics

The sample in this study consisted of outpatients diagnosed with type 2 diabetes mellitus (DM) at RSUD dr. Doris Sylvanus Palangka Raya. There were a total of 18 participants.

Based on Table 1, it shows that the majority age group is within the range of 46-50 years, with 5 individuals (27.8%), followed by the age range of 61-65 years, also with 5 individuals (27.8%), 13 individuals who are females (72.2%), 10 individuals of whom have completed high school education (55.6%), and 8 individuals are employed as civil servants (44.4%).

The characteristics of the sample, including age, gender, education, and occupation, are presented in the following table:

Table 1. Distribution of Sample Characteristics

Characteristics	Respondent	
	n	%
Ages (year)		
46-50	5	27,8
51-55	4	22,2
56-60	4	22,2
61-65	5	27,8
Total	18	100
Gender		
Male	5	27,8
Female	13	72,2
Total	18	10
Education		
Elementary School	3	16,7
High School	10	55,6
University	5	27,8
Total	18	100
Occupation		
Housewife	4	22,2
Entrepreneur	3	16,7
Private Sector Employee	3	16,7
Government Employee	8	44,4
Total	18	100
Medication		
Consumed	16	88,9
Not consumed	2	11,1
Total	18	100

Table 2. Frequency Distribution of Knowledge and Compliance with Diet Sample

Kategori	Pre-test		Post-test		Explanation
	n	%	n	%	
Knowledge					
Good	6	33,3	14	77,2	↑ 43,9
Sufficient	12	66,7	4	22,2	↓ 44,5
Total	18	100	18	100	
Compliance					
Compliant	3	16,7	6	33,3	↑ 16,6
Non-Compliant	15	83,3	12	66,7	↓ 16,6
Total	18	100	18	100	

Table 3. Average Distribution of Knowledge and Diet Compliance Before and After 3J Diet Education in type 2 diabetes mellitus (DM) patients at RSUD dr. Doris Sylvanus Palangka Raya (n=18)

Knowledge	Mean	SD	Min	Max
Before	46,11	9,785	25	65
After	56,39	7,237	40	70
Compliance	Mean	SD	Min	Max
Before	68,22	5,320	60	78
After	75,89	4,057	70	84

Based on Table 3, knowledge after receiving diet education using booklets shows an average increase (mean) of 10.28 points. Compliance after receiving diet education using booklets shows an average increase (mean) of 7.67 points.

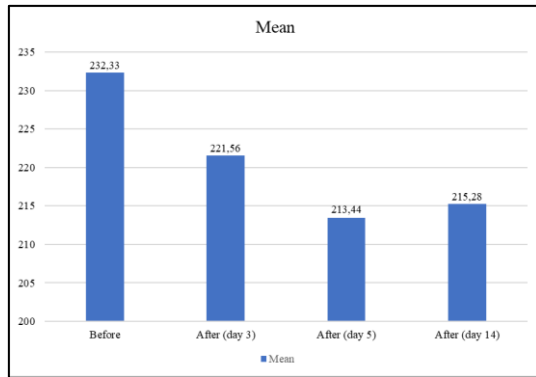


Figure 1. Sample of average blood sugar levels before and after diabetic foot exercises

Based on Figure 1, shows that the average GDS after diabetic foot exercise (day 3) decreased by 10.77 mg/dL compared to before exercise. This average decrease also occurred on day 5, which was 8.12 mg/dL compared to the measurement on day 3. However, the average measurement on day k-14 increased by 1.84 mg/dL compared to the measurement on day 5. This is because in the measurements up to day 5, the frequency of exercise performed by the sample was the same. However, on the following day, there were samples that did not exercise so that the total frequency up to measurement on day 14 was different (some were less than 6 times). Diabetic foot exercise, if done routinely, will help stabilize the decrease in blood sugar. The higher the frequency of foot exercise, the greater the decrease in blood sugar levels in the sample. Lack of physical activity causes an increase in blood sugar levels. This statement agrees with Mitasari et al. (2020), which states that lack of movement or inactivity increases the likelihood of being diagnosed with diabetes mellitus.

2. Bivariate Analysis

The results of the statistical analysis on each variable are presented in Table 4.

Table 4. Statistical Test Results

Variabel	Statistical test	Sig.
Knowledge Pretest-Posttest	Paired t test	0.001
Compliance	Chi-square	0.007
Diabetic foot exercise Pretest-Posttest	Wilcoxon	0.000

Based on Table 4, it shows that there are differences in the variables of knowledge,

dietary compliance and GDS of the samples before and after being given integrated educational intervention and diabetic foot exercises.

3. The effect of education using booklets on knowledge among outpatient type 2 diabetes mellitus (DM) patients

The paired t-test analysis showed a significance value of $p=0.001$ (<0.05), indicating that there is an effect of nutrition education using booklets on the knowledge of type 2 DM patients. This influence occurs because counseling can enhance the understanding of type 2 DM patients regarding their dietary patterns. This study is consistent with research conducted by Handayani et al. (2016) and Trisda and Bakri (2020), which explored the impact of nutrition counseling on the knowledge and dietary compliance of type 2 diabetes patients at the Kapuan Health Center, Cepu District, Bulola Regency. They found differences in knowledge and attitudes among diabetes patients after counseling sessions every 3 x 2 weeks (Trisda and Bakri, 2020).

The change in knowledge among the samples presented in Tables 2 and 3 shows an increase of 10.28 points, indicating an improvement in knowledge categorized as 'good'. In this study, samples are considered to have 'good' knowledge if their questionnaire scores range from 51 to 70 points, and 'sufficient' if they score ≤ 50 points. Before the education, the majority of samples had sufficient knowledge (66.7%). After the education, the number of samples with good knowledge increased to 77.8% (14 individuals). The cause of this improvement is because of information through booklets containing clear and easily understandable information accompanied by text and images. The information provided focuses on diabetes knowledge, which has motivated the samples to achieve their goals. This increased commitment to learning has ultimately enhanced the patients' understanding of diabetes mellitus.

According to Agustina (2018) cited in Kune et al. (2023), providing health education to diabetes patients can enhance their diet knowledge and prevent further complications. After receiving education, respondents gained better understanding about dietary patterns, starting with understanding what is necessary to prevent type 2 diabetes. Basic education levels can influence low knowledge due to lack of information, affecting their abilities and knowledge. However, higher education levels also may not always guarantee higher knowledge levels, as samples often lack experience in diabetes management, not often consult with healthcare professionals, and rarely participate in health education seminars (Husen and Basri, 2021). Knowledgeable individuals can influence how food knowledge is allowed and improved. Minarsih (2019) in Kune et al. (2023) states that booklet media can enhance respondent knowledge. Additionally, booklet media can also facilitate the information delivery process from the booklet's content.

4. The effect of education using booklets on dietary compliance among outpatient type 2 diabetes mellitus (DM) patients

The chi-square test analysis showed a significance value of $p=0.007$ (<0.05), indicating that the use of booklets for education significantly affects dietary compliance among outpatient type 2 diabetes mellitus (DM) patients. This finding aligns with the theory proposed by Delaune and Ladner (2016) in Sari et al. (2021), which suggests that strategies to improve compliance include providing information and support to healthcare providers. Clear information provided to patients about their condition and its treatment can enhance knowledge, modify behavior, provide motivation, and improve patient compliance.

The dietary compliance of the samples presented in Tables 2 and 3 showed an average increase in dietary compliance of 7.67 points. Additionally, the compliance before

education showed that only 3 individuals (16.7%) were compliant, which increased to 6 individuals (33.3%). Meanwhile, the number of non-compliant individuals decreased from 15 (83.3%) to 12 (66.7%). In this study, samples are considered compliant if their questionnaire scores range from 76 to 95 points, and non-compliant if they score ≤ 75 points. This improvement is attributed to the samples' better understanding of the information. Through clear and relevant information delivery, the samples understand the importance of complying to the rules, procedures, or instructions given. However, it is noted that a significant number of samples remained non-compliant with the recommended diet, likely due to the short observation period of three days. Changes in diet and lifestyle habits formed over many years are difficult to change in a short time span. Three days may not be sufficient for some samples to significantly affect their eating habits. Consistency in the diet they follow may require a longer period of time.

In the research results based on the questionnaire scores obtained, there are several samples categorized as non-compliant but with good knowledge. This is because individuals may have a basic understanding of diabetic diets, yet they may not perceive the importance of making lifestyle changes and lack self-management skills to implement those changes. Without a strong awareness of the risks associated with diabetes and the benefits of following recommended dietary patterns, they may lack motivation to comply to such diets. With a broader and deeper knowledge base, it is expected that their understanding of nutrition and health, particularly in terms of beneficial food choices, will increase. On average, individuals with lacking nutrition knowledge tend to prioritize sensory appeal over the nutritional value of foods. When individuals with diabetes have sufficient knowledge, their attitudes toward diabetic diets should ideally support compliance with those diets.

Therefore, nutritional education is crucial to changing the attitudes of diabetes patients, as it enhances knowledge that guides them in determining their attitudes, thoughts, and efforts to prevent illness or alleviate their condition (Syauqy, 2015; Puspita and Rakhma, 2018 in Trisda and Bakri, 2020).

5. The effect of diabetic foot exercise video education on blood sugar levels among outpatient type 2 diabetes mellitus (DM) patients

The Wilcoxon test analysis showed a result of $p=0.000$ (<0.05), indicating a significant effect of diabetic foot exercise video education on blood sugar levels among outpatient type 2 diabetes mellitus (DM) patients. Blood sugar levels in DM patients can be controlled by regularly, measured, and appropriate diabetic foot exercises. These exercises aid in increasing insulin production, thereby reducing blood sugar levels. Sufficient insulin production helps convert blood sugar into energy, potentially reducing the risk of developing DM (Kobosu et al., 2019).

Based on Figure 1, the average blood sugar level before diabetic foot exercises was 232.33 mg/dL, while the average blood sugar level after diabetic foot exercises was 216.93 mg/dL. This indicates a decrease in blood sugar levels by 15.4 mg/dL among the samples. This reduction is attributed to the insulin metabolism process in the body, which increases the sensitivity of cells to insulin after the samples engage in diabetic foot exercises (Santoso and Rusmono, 2016). During diabetic foot exercises, there is an increased energy demand causing the leg muscles to work more actively, leading to higher glucose utilization and ultimately a decrease in blood sugar levels (Khaerunnisa and Rahmawati, 2019). The regularity of the samples in performing diabetic foot exercises also supports the reduction in blood sugar levels (Rahmah and Sari, 2021).

Based on Figure 1, some samples experienced a decrease in blood sugar levels,

while others did not achieve normal levels. This discrepancy relates to blood sugar measurements not being timed, with attention only given to the interval between measurement days. Blood sugar remains within the low range throughout the day, typically between 70-150 mg/dL, particularly in the morning or before breakfast (Naraeni and Arjita, 2019). According to research by Yulianti and January (2021), there was a decrease in blood sugar levels by 15.28 mg/dL, indicating a significant effect of diabetic foot exercises. However, despite this impact, some samples did not show a significant decrease. This is often due to lifestyle factors and dietary habits that do not adhere to recommendations. Regular medication intake among diabetes patients, without proper diet and physical activity, can affect changes in blood sugar levels (Yulianti and January, 2021). Interviews revealed that several samples had never been exposed to information regarding diabetic foot exercises. Diabetic foot exercises are practiced six times over a two-week period, with each session lasting approximately 15-20 minutes. The samples performed these exercises at home under the guidance of researchers. Blood sugar levels were measured once before exercise and three times afterward. Based on the information obtained after performing these exercises, the samples reported feeling fitter, with reduced pain, tingling, and numbness in their legs. According to the Ministry of Health of the Republic of Indonesia (2018), diabetic foot exercises involve regular foot movements that can improve blood circulation, prevent injuries, and alleviate joint movement limitations in the feet. The leg movements performed during these exercises give pressure on the legs, which affects insulin sensitivity, leading to lower blood sugar levels and decreased discomfort (Prihantoro and Aini, 2022). Widiarti (2010) cited in Rahanmitu (2019) indicates that one of the benefits of leg exercises is the reduction of blood sugar

levels. At rest, muscles require minimal sugar for energy, but during exercise, they demand significantly more glucose and fat up to 15 times more than when at rest.

CONCLUSION AND SUGGESTIONS

There was a significant effect on knowledge, dietary compliance and blood sugar levels after providing integrated education using foot exercise videos and booklets for outpatients with type 2 DM at RSUD dr. Doris Sylvanus Palangka Raya and it is expected that respondents will do diabetic foot exercises regularly in order to control blood sugar levels more optimally and continue to follow the recommendations of nutritionists regarding eating arrangements with the 3J pattern (schedule, quantity and type of food).

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REFERENCES

- Christyanni Y, Aheng NMK, Nyamin Y. (2019). Edukasi Senam Kaki terhadap Kemampuan Melakukan Senam Kaki pada Penderita Diabetes Melitus Tipe 2 di Puskesmas Kereng Bangkirai Palangka Raya: Foot Gymnastics Education on the Ability to Do Foot Gymnastics in Type 2 Diabetes Mellitus Patients at the Kereng Bangkirai Health Center in Palangka Raya. *Jurnal Surya Medika (JSM)*. 5(1): 100-114.
- Dinas Kesehatan Kota Palangka Raya. (2022). Profil Kesehatan Kota Palangka Raya tahun 2022. Palangka Raya: Dinkes Kota Palangka Raya.
- Hidayah M, dan Sopiandi S. (2019). Efektifitas Penggunaan Media Edukasi Buku Saku dan Leaflet Terhadap Pengetahuan dan Kepatuhan Diet Pasien Rawat Jalan Diabetes Melitus Tipe 2 di Puskesmas. Pontianak Nutrition Journal (PNJ), 1(2):66 – 69.
- Husen SH, dan Basri A. (2021). Faktor-Faktor Yang Mempengaruhi Terjadi Ulkus Diabetik Pada Penderita Diabetes Melitus Di Diabetes Center Kota Ternate. *PROMOTIF: Jurnal Kesehatan Masyarakat*, 11(1), 75-86.
- Istianah, Haerunnisa, Hapipah. (2022). Senam Kaki Diabetik Dengan Latihan Fisik Harvad Test Berpengaruh Terhadap Penurunan Kadar Glukosa Darah Penderita Diabetes Mellitus Tipe 2. *Jurnal Ilmiah Permas: Jurnal Ilmiah Stikes Kendal*. 12(2).
- Kabosu RAS, Adu AA, Hinga IAT. (2019). Faktor Risiko Kejadian Diabetes Melitus Tipe Dua di RS Bhayangkara Kota Kupang. *Timorese Journal of Public Health*. 1(1):11-20.
- Kemenkes RI. 2018. Profil Kesehatan Indonesia Tahun 2018. Jakarta: Kementerian Kesehatan RI.
- Khaerinnisa N, Rahmawati. (2019). Penerapan Senam Kaki Pada Penderita Diabetes Melitus Tipe 2 Dalam Pemenuhan Kebutuhan Keamanan Dan Proteksi (Integritas Kulit/Jaringan) Di Wilayah Kerja Puskesmas Mamajang. *Media Keperawatan: Politeknik Kesehatan Makassar*. 9(2): 160-166.
- Kune AE, Rahayu S, dan Qorahman W. (2023). Pengaruh Pendidikan Kesehatan Dengan Media *Booklet* Terhadap Pengetahuan Tentang Diet Penderita Diabetes Melitus Tipe 2 Di Wilayah Kerja Puskesmas Arut Selatan. *Jurnal Kesehatan Borneo Cendekia*, 7(1,), 67-76.
- Kurniawaty E, Yunita B. (2016). Faktor-faktor yang Berhubungan Dengan

- Kejadian Diabetes Melitus Tipe II. *Jurnal Majority*, Vol. 5 No. 2.
- Lubis RF, Kanzasabilla R. (2021). Latihan Senam Dapat Menurunkan Kadar Glukosa Darah Pada Penderita Diabetes Melitus Tipe II. *Jurnal Biostatistik, Kependudukan, dan Informatika Kesehatan*. 1(3): 177-188.
- Mitasari G. Saleh I, Marlenyawati. (2014). Faktor-Faktor Yang Berhubungan Dengan Kejadian Ulkus Diabetika Pada Penderita Diabetes Mellitus Di Rsud. Dr. Soedarso Dan Klinik Kitamura Pontianak. *Jumantik*. 1(2).
- Nuraeni N, Arjita IPD. (2019). Pengaruh Senam Kaki Diabet Terhadap Penurunan Kadar Gula Darah Pada Penderita Diabetes Mellitus Type II. *Jurnal Kedokteran*, 3(2), 618-627.
- PERKENI. (2022), Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 di Indonesia, PERKENI, Jakarta.
- Prihantoro W, Aini DN. (2022). Penerapan Senam Kaki Diabetes Terhadap Nilai Kadar Gula Darah Pada Penderita Diabetes Mellitusdi Kel. Krapyak Kec. Semarang Barat Kota Semarang. *Jurnal Ilmu dan Teknologi Kesehatan*.
- Profil RSUD dr. Doris Sylvanus Palangka Raya. 2023.
- Putra, E. S., Junita, J., & Siregar, S. (2021). Konsumsi minuman manis prediktor risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 10(2), 89-97.
- Putra, E. S., & Junita, J. (2022). Rasio lingkar pinggang tinggi badan dan aktivitas fisik sebagai risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 11(1), 45-53.
- Rahmah ST, Sari NF. (2021). Penurunan Gula Darah Setelah Mengikuti Latihan Senam Kaki Diabetes Melitus Pada Kelompok Dewasa. [Naskah Publikasi]. Jakarta: *Akabdemi Keperawatan Pelni Jakarta*.
- Rahanmitu IES. (2019). Perbandingan Efektivitas Antara Jalan Kaki Dan Senam Kaki Terhadap Penurunan Kadar Gula Darah Penderita Diabetes Melitus Di Puskesmas Kebonsari Surabaya. [Tesis] Surabaya: Stikes Hang Tuah.
- Santosa A, Rusmono W. (2016). Senam Kaki Untuk Mengendalikan Kadar Gula Darah Dan Menurunkan Tekanan Brachial Pada Pasien Diabetes Melitus. *Jurnal Ilmiah Ilmu-Ilmu Kesehatan Universitas Muhammadiyah Purwokerto*, 14(2), 24-34.
- Sari NKP, Sutresna IN, Kio AL, et al. (2021). Pengaruh Pemberian Informasi Melalui Media *Booklet* Terhadap Tingkat Kepatuhan Pasien DM Tipe 2. *Jurnal Media Keperawatan: Politeknik Kesehatan Makassar*, 12(1).
- Sepang MYL, Patandung VP, dan Rembet IY. (2020). Pengaruh Edukasi Terstruktur Dengan Media *Booklet* Terhadap Tingkat Pengetahuan Pasien Diabetes Melitus Tipe 2 Mellitus. *Jurnal Ilmiah Perawat Manado*, 8(1):70 – 78.
- Sugiyanto S, Sumarni S. (2022). Pengaruh Senam Kaki Diabetik Terhadap Perubahan Kadar Gula Darah Pada Pasien DM Tipe 2 Non Ulkus. *Jurnal Fenomena Kesehatan*. 5(1): 1-8.
- Trisda R, dan Bakri S. (2020). Pengaruh Konseling Menggunakan Media *Booklet* Terhadap Pengetahuan Dan Sikap Pada Pasien Diabetes Melitus.

JOINT MODEL INNOVATION ON THE PARTICIPATION OF JUNIOR HIGH SCHOOL STUDENTS IN DHF PREVENTION IN JAMBI CITY

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ABSTRACT

Background: There is no vaccine or cure for dengue fever, the incident always occurs every year, investigation and observation activities for infectious diseases are carried out continuously and continuously, to explain disease patterns, study the history of the disease and provide basic data for controlling and overcoming the disease. *Aedes sp* is a mosquito that can cause dengue haemorrhagic fever. Several factors influence the spread and transmission of dengue fever, poor hygiene conditions, drinking water supply and proper waste disposal. Schools are areas that have characteristics such as households having clean water reservoirs and eating and drinking activities, so that waste produced by waste that is not managed properly during the rainy season will become a medium for storing clean water, and can become a breeding ground for mosquitoes.

Method: This research is a quasi-experimental design (quasi-experiment), with a non-equivalent control group design.

Results: Modelling (videos, leaflets and counselling) in understanding dengue fever in junior high school (SMP) students is very important for junior high school students in disseminating information to the household (parents/family), the environment around the household and even their peers.

Conclusion: Modelling that has duration 30 minutes has effect of increasing student actions in dengue fever control at Jambi City.

Keywords: Modelling; Video; Leaflet; DBD

INTRODUCTION

Indonesia Dengue fever is still a health problem because there are still many areas where it is endemic. A serious viral disease transmitted by mosquitoes is endemic in many countries in Southeast and South Asia, the Pacific and Latin America; characterized by increased vascular permeability, hypovolemia and impaired blood clotting mechanisms. Mainly attacks child attacks adults (Wang et al., 2020) (Gede Nara Swara et al., 2021). In dengue endemic areas, dengue fever outbreaks generally begin with an increase in the number of cases. Data from the Jambi Provincial Health Service. In 2023 to July 2023, 218 cases of dengue fever were observed in Jambi city residents, from January to February there were 49 cases of dengue

fever, two of which died. (Dinas Kesehatan Provinsi Jambi, 2023)

Epidemiology activities are observations of disease in populations that are carried out continuously and continuously, to explain disease patterns, study the history of disease and provide basic data for controlling and overcoming the disease, by knowing the distribution of the species, the type of *Aedes* is known. The dominant SP in an area and area of the *Aedes* Mosquito. SP is a mosquito that can cause dengue fever. Several factors influence the spread and transmission of dengue fever, supported by : 1) the increasing number of residents in the city. 2) community attitudes and knowledge regarding disease prevention are still lacking, poor hygiene conditions, drinking water supply and correct

waste disposal (Da et al., 2020) (Sanyaolu, 2017) (Zulfikar et al., 2023) (Periatama et al., 2022).

Schools are areas that have characteristics such as households having clean water reservoirs and eating and drinking activities, so that waste produced by waste that is not managed properly during the rainy season will become a medium for storing clean water, and can become a breeding ground for mosquitoes. (Kularatne & Dalugama, 2022) (lina shofiyannah & mahalul azam, 2016). Dengue hemorrhagic fever (DHF) is a public health problem in Indonesia which is caused by the environment, the number of sufferers tends to increase and its spread becomes wider. With climate change, the prevalence of dengue fever is increasing (Kaeng et al., 2020). Indonesia is one of the Southeast Asian countries that reports the most cases of dengue fever. Based on the data obtained, dengue fever infections in Indonesia are mostly suffered by young adults (sumampouw, 2020).

Maria Lambertina Barek Aran (2020) **states** that areas at high risk of dengue fever transmission are urban areas with the highest income (Lambertina et al., 2020). How does modeling improve student actions in controlling dengue fever. This research aims to find out previous actions, modeling innovations in preventing dengue fever in school children in Jambi City.

Socialization and promotion are an invitation from facilitators to work together with the educational community in efforts to eradicate dengue fever through environmental cleanliness efforts and the outcome is ABJ and the incidence of dengue fever in junior high schools (SMP) education has decreased.

METHODS

This type of research is a quasi-experimental design (quasi-experiment), with a non-equivalent control group design. This research used a group that was given

counselling treatment using the lecture method using videos, leaflets and lectures as well as questions and answers. The research was conducted from July – November 2023 to July-November 2024 and the research location was a state junior high school in the city of Jambi. The population in this study were all junior high school students in grades 7 to 9. The sample in the study were students in grades 7-9. Independent variables: using videos, leaflets and lectures as well as questions and answers and continued with field observations around the students' homes. Dependent variable: actions in controlling dengue fever in Jambi City, student actions were measured using a questionnaire. The data analysis used in this research was the Wilcoxon Chi-Square sample because the data was not normally distributed. Data analysis was carried out using a process SPSS version 20.

In carrying out the evaluation, formative evaluation is carried out, the results of observations and immediate response during/after 3M action is carried out, controlling dengue fever, while the summative evaluation is a recapitulation and conclusion from observations and analysis of health status according to the time of the objective. The population in this study is junior high schools in the city of Jambi, owned by the Jambi City government, which always carries out the 3M movement to break the chain of mosquito breeding. *Aedes. Sp.* The sample was 8 junior high schools in the Jambi city research location.

RESULTS AND DISCUSSION

Dengue haemorrhagic fever is a disease that is currently a public health problem in Indonesia, often occurring during the rainy season and summer. This disease can cause death. Dengue fever is a problem such as extraordinary events that can cause death. This disease is a complex problem because there is no cure.

Table 1. Respondent Characteristics

Characteristics	Total	%
Gender		
Male	170	37,44
Female	284	62,56
Total	454	100

Based on the results of Chi-square analysis, all values of knowledge, 3M behavior, socialization, use of larvae cards, presence of larvae and prevention before and after obtained a p-value of 0.00. Based on this value, because the p value is > 0.05, it can be concluded that there is a significant influence before and after modelling with increasing prevention behaviour and understanding of efforts to avoid larval brooding and preventing dengue fever.

Table 2. Respondents' knowledge of combined model innovation in junior high school students for dengue fever prevention

Variable	Implementation						P-Value
	Before	Total	%	After	Total	%	
Knowledge	High	93	20,5	High	450	99,1	0,002
	Low	361	79,5	Low	4	0,9	
	Total	454	100	Total	454	100	
Behaviour 3M	Good	79	17,4	Good	451	99,3	0,005
	Bad	375	82,6	Bad	3	0,7	
	Total	454	100	Total	454	100	
Socialization	Good	50	11	Good	430	94,7	0,005
	Bad	404	89	Bad	24	5,3	
	Total	454	100	Total	454	100	
Use of Larvae cards	Good	30	6,6	Good	450	99,1	0,000
	Bad	424	93,4	Bad	4	0,9	
	Total	454	100	Total	454	100	
The presence of larvae	Good	354	78	Good	374	82,4	0,000
	Bad	100	22	Bad	80	22	
	Total	454	100	Total	454	100	
Prevention	Good	374	82,4	Good	370	18,5	0,000
	Bad	80	17,6	Bad	84	81,5	
	Total	454	100	Total	454	100	

Table 3. Bivariate Selection of Variables that Influence the Effect of Modelling on DHF Prevention

Variable	P-Value
Knowledge	0,002
Behaviour 3M	0,005
Socialization	0,005
Use of larvae cards	0,000
The presence of larvae	0,000
Prevention	0,000

Based on known statistical test outputs Asymp Sig (2 Tailed) has a value 0,000 because the value of 0,000 is smaller than <0,005 it can be concluded that the hypothesis is accepted, meaning there is a difference between before and after modelling so it can be concluded that there is an influence before and after modelling by increasing student actions in controlling dengue fever in the city of Jambi.

Table 4. Effect of Bivariate Selection of Variables that Influence the Effect of modeling on dengue prevention

Variable	Mean	95% confidence interval of the difference		t	Df	P-value	
		lower	upper				
Knowledge Before	-	-,786	-,826	-,747	-38,845	453	,000
Knowledge after Behavior 3m	-	-,819	-,856	-,782	-43,435	453	,000
After Socialization Before	-	-,837	-,882	-,792	-36,202	453	,000
After Socialization After	-	-,925	-,952	-,898	-66,792	453	,000
Use of larvae cards Before	-	-,925	-,952	-,898	-66,792	453	,000
After use of larvae cards After	-	-,044	-,063	-,025	-4,569	453	,000
The presence of larvae Before	-	-,044	-,063	-,025	-4,569	453	,000
The presence of larvae After Prevention	-	-,586	-,658	-,514	-15,932	453	,000
Before prevention After	-	-,586	-,658	-,514	-15,932	453	,000

One of the factors that influence the level of knowledge is counselling using videos, social media, socialization of counselling and questions and answers. This can be seen by the increase in respondents' knowledge from before modelling and after modelling using videos, social media, outreach and questions and answers. Modelling is a combination of several media and is an effort to provide information. The more information you get, the more extensive your knowledge will be (Hasan et al., 2017).

Modelling is a teaching aid that functions as a tool to explain or present material. The advantages of video leaflets and socialization can increase understanding, including: the material becomes more interesting because there are detailed explanations, letters and animations, both text animations and animated images or photos. Visual information messages are easy for students to understand, and further stimulate children to find out more information about the importance of controlling dengue fever with the 3M movement. (Vindo Galaresa et al., 2023).

This increase in action was caused by the learning process by the respondent and occurred due to an increase in the subject's

sensitivity or readiness for the test given to the respondent. The DBD action that is carried out occurs after the person senses a certain object. Sensing occurs through the senses of sight, hearing, smell and touch. Increased student actions in controlling dengue fever are obtained through the eyes and ears. Video media is a type of audio-visual media. Audio visual media is media that relies on the senses of hearing and sight. Audio visual media is one of the media that can be used in listening learning (Aryani & Rodiyana, 2021). This media can increase students' interest in learning because students can listen and see pictures.

The use of modeling in learning and socialization can make students more active and enthusiastic, the benefits of media in the teaching process include that teaching will attract students' attention so that it can increase students' learning motivation, the meaning of teaching materials will be clearer so that it can be more easily understood by students, and students better understand or master the goals of learning. Learning methods using media will be more varied because it is not just verbal communication through the teacher's telling of words so that students do not get bored easily. (Wahid, 2018).

This is in line with the fact that health education is very influential in increasing knowledge, which can be seen from the comparison before health education (pre-test) and after health education (post-test). Where before being given health education, students' knowledge was lacking, while after being given health education, there was an increase in students' knowledge (Yuliana et al., 2022).

The absorption capacity of humans who only rely on the sense of sight is only around 82%. In the leaflet media, only obtaining material by relying on the sense of sight alone, there are factors that influence the failure of an extension process seen from the fact that the leaflet does not attract attention, the

pictures that accompany the theme, the colour of the writing is less striking, the language used is less understandable to the public. targets, and monotonous delivery of material (M Anwas et al., 2009).

Lawrence and Green's theory which describes the predisposing, reinforcing framework and enabling cause in education diagnosis and evaluation where health education is related to changes that can change behaviour and help achievement that goal desired. According to modelling researchers in controlling dengue fever, dengue fever is one of the methods used to increase a person's knowledge about dengue fever with the aim of changing or influencing human behaviour in preventing dengue fever.

Socialization activities will be carried out after the regional head's decision. The school can be visited and learning can be reopened and students can provide information about the 3M Socialization plan to students.

Larval-free rate Surveys on the presence of mosquito larvae are needed to support controlling the transmission of dengue fever. This survey can be used as an indicator to predict the risk of dengue transmission in an area. One indicator that is often used is the Larval Free Rate (ABJ). An area that has a larvae-free rate equal to or greater than 95% is categorized as a larvae-free area. Larvae-free areas have the possibility of reducing the level of dengue fever transmission and vice versa. ABJ's achievements mean that Jambi City cannot be said to be safe from the risk of dengue fever transmission, based on the density of mosquito larvae. Calculating the density of mosquito larvae. The type of water reservoir where many larvae are found is a bathtub. The bathtub is the water reservoir where many larvae are found, the bathtub is the water reservoir where the most larvae are found, which means that the type of container that is found to be the most larvae positive. *Aedes* sp. are the bathtub, baking pan and barrel (anggraini shinta, 2018).

Surveys on the presence of mosquito larvae can also be used to identify the type of water reservoir (TPA). Identification that can be obtained includes the size of domestic landfills infected with larvae, the level of public knowledge about dengue fever, health promotion, water cleanliness conditions and community participation in activities to eradicate mosquito nests in endemic areas. The identification results obtained are useful for breaking the mosquito life cycle *Aedes aegypti*, the presence of larvae in water reservoirs is caused by the attitude of respondents regarding draining water reservoirs. They will drain the landfill if they feel that the water is dirty, smelly or not clear. The main reason respondents drained the bathtub was not to remove mosquito larvae or prevent the water reservoir from becoming a breeding ground for mosquitoes.

Based on research that has been carried out, it shows that there is a relationship between the existence of water storage areas and the presence of larvae. From the results of the observations, it was found that many of the respondents' water reservoirs contained mosquito larvae in them. The water reservoir is also not equipped with abate which is useful as a killer for mosquito larvae. Draining and abatement of water reservoirs is one of the preventive measures against dengue fever because it can reduce the growth rate of the *Aedes aegypti* mosquito, which is the main vector for transmitting dengue fever. The *Aedes aegypti* mosquito has the habit of breeding in water reservoirs (TPA) which contain clean, permanent water and are protected from direct sunlight. In previous research, it was also stated that the highest container index was in cement and clay vessels. Cement and clay materials easily become mossy, the surface is rough and porous on the walls. Rough surfaces have the impression of being difficult to clean, easily grow moss and have low light reflection. Low light reflection and porous walls result in low water temperatures, so that this type of landfill

material will be preferred by the *Aedes aegypti* mosquito as a breeding place.

There is no difference in the use of the Dengue Hemorrhagic Fever (DBD) Larva Monitoring Card for groups of public and private primary school students, public junior high school students have already done it and gained understanding through socialization carried out by health workers when they were in settlements.

Students said that larva monitoring cards were easy to implement at school and at home, larva monitoring (Jumantik) was about efforts to reduce dengue fever numbers and free numbers, larva monitoring at schools were equipped with cards.

A larva card is a form used to record the results of monitoring larvae and 3M plus activities in schools. Research results state that the use of larva cards in every school environment can facilitate examination and data collection of risk factors for dengue fever transmission and help students monitor larvae independently in the school environment. Activities Jumantik filling out larvae cards at schools is one of the community-based dengue vector surveillance activities. The larva monitoring sheet is able to help implement 3 M plus, especially monitoring mosquito larvae independently in the school environment. The results of this surveillance activity can provide an overview of the risk distribution in the form of density and habitat of dengue vector larvae in the school environment. Surveillance activities must be documented periodically and advocated for by those involved. has an interest in early detection, epidemiology and vector monitoring, so that it can determine strategies for implementing case management, vector control measures, and empowering students in schools.

Organizing larvae monitoring, the school should carry out activities related to the presence of supervisors, namely class teachers and larvae monitoring students, with the hope that this organization can make larvae

monitoring activities successful and the school area becomes larvae-free in accordance with the opinion of the Ministry of Health, showing the truth in the process of controlling dengue fever. cannot be separated from community empowerment efforts.

Where organizing among students will create an innovation program, the effectiveness of the organization that is formed should be carried out in schools by: Training a cadre of student larva monitors in each class, having supervisors who can carry out supervision in each class. It is necessary to have a larva monitoring coordinator issued to each class. so that someone is responsible. Considering that junior high schools with more than 500 students have more than 4 students, there will be increased participation and support. stake holder in the region in planning, implementing and evaluating PSN 3M Plus activities and the 1st class 1st jumatic movement in each class. The implementation of commitment raising at the school level, involving several stakeholders such as the Community Health Center, was marked by the production of several MOU for implementing the DHF program with several OPD.

Efforts made to avoid the cycle of dengue fever transmission in November, December, January and February, which are marked by the change of seasons and an increase in dengue cases, must be prevented so that dengue cases, which have decreased, suddenly increase sharply again. Therefore, in accordance with the existing program policy, 1 month before the Transmission Period Cycle, PSN month must be declared, so that the implementation of the dengue prevention and control program can be more effective, and provide encouragement to all students in implementing PSN eradication activities and the 1st class movement 1 Jumantik.

Based on Kepmenkes No. 92 / Menkes / SK / II / 1994 regarding the eradication of dengue fever, carried out by students and schools in villages / sub-districts, the DBD Working Group (DHF Working Group) was

formed within the organizational framework of the LKMD (Village Community Resilience Institute) now changed to LPM (Community Empowerment Institution). DBD) at the District and City Level which is a cross-program and sectoral coordination forum within the LPM development team. The DBD Pokjandal aims to provide operational guidance for the implementation of various activities related to efforts to prevent and eradicate dengue fever in the work area in a tiered and sustainable manner starting from the central to regional levels. dengue fever. The DBD Working Group is human resources which are the main element in organizational management, being planners and active actors in each work area so that we have competent, capable and skilled resources that do not guarantee good work productivity. A total of 4 junior high schools have formed dengue control working groups in schools.

3.1 Knowledge

In the multivariate test results, all results show value p value = 0,000, so that p value $< \alpha$ (0,05). So, there will be at least 1 transformed variable that is not equal to zero. The results of Tests Within Subjects Contrasts show all p values < 0.05 , this shows that all levels provide different results.

The results of the analysis show that there is an increase in PKK cadres' knowledge regarding dengue prevention after receiving a dengue trigger compared to before the dengue trigger. This is shown by the difference between pre and post DHF triggering. The average knowledge score of PKK cadres before the DHF trigger was lower than the average knowledge score after receiving the DHF trigger.

Student behavior, such as knowledge, attitudes and actions in efforts to eradicate mosquito nests (PSN), such as covering, burying and draining activities, has a direct relationship with the presence of larvae in schools.

The research was carried out at 4 state junior high schools with a total of 153

respondents, the research results are presented in the following table:

Tabel 5. Use of Larvae cards in controlling dengue fever in schools

Students understanding of use of larvae cards	Before modeling	Total	After modelling	Total
Understand	58	37,9	92	60,1
Not understand	95	62,1	61	39,9

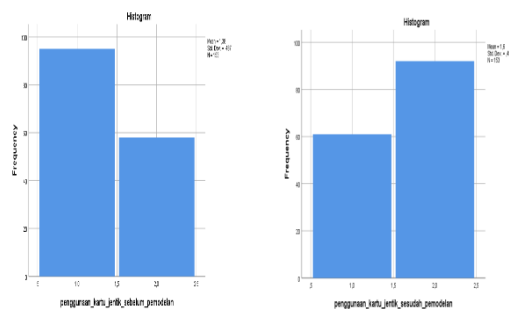


Figure 1. Use of larvae Cards

Based on the results of the T test before and after modeling, junior high school students in the city of Jambi were able to use flick cards before and after modeling with a sig value 0,00 meaning that there was an influence before and after modeling, there was a difference in the test with lower and upper values of 0,335-109 Paired Sample Test results were obtained 0,000.

Tabel 6. Effectiveness of organizing larvae monitors on dengue larvae free rates in Jambi City Middle Schools

Monitoring Effectiveness	Before Modeling	Total	After Modelling	Total
Effective	86	56,2	93	60,8
Ineffective	67	43,8	60	39,2

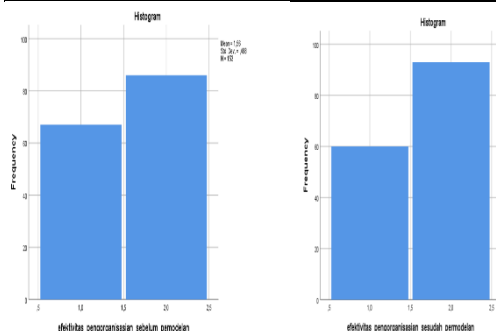


Figure 2. Effectiveness of Organizing

Based on the results of the T test before and after modeling, junior high school students in the city of Jambi were able to use flick cards before and after modeling with a

sig value of 0.00, meaning that there was an influence before and after modeling, there was a difference in the test with lower and upper values of 0.84-0.08, Paired Sample Test obtained a value of 0.000, continue testing using one sample Kolmogorof smirnov 0,19.

Based on the results of the T test before and after modeling for junior high school students in the city of Jambi, the effectiveness of organizing before and after modeling was obtained with a sig value of 0.19, meaning that there was no influence before and after modeling, there was a difference in the test with lower and upper values of 0.84-0.08, Paired Sample Test obtained a value of 0.19.

Table 7. Formation of Working Groups in Junior High Schools for Larva Free Number activities

Working Group	Before Modelling	Total	After Modelling	Total
Terbentuk	1	25	4	100
Tidak Terbentuk	3	75	0	0

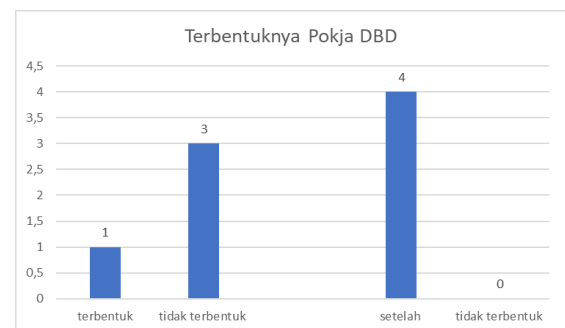


Figure 3. Establishment of the DBD Working Group

Before the new school modeling was carried out, 1 larva eradication working group was formed, but after the modeling was carried out, all schools had formed a 100% working group for controlling and eradicating mosquito nests.

3.2 Known actions before and after modelling in junior high schools in Jambi City in controlling dengue fever

Based on known statistical test outputs Asymp Sig (2 Tailed) have value 0,000 because the value 0.000 is smaller than <0.005 then It can be concluded that the hypothesis is accepted, meaning there is a difference between before and after modeling so it can be concluded that there is an influence before and after modeling by increasing student actions in

controlling dengue fever in the city of Jambi.

3.3 Known student actions before and after modeling in junior high schools in Jambi City in controlling dengue fever

Hypothesis:

Ho: there is no difference in the average of measures before the DHF modelling

Ha: there are differences in the average differences in measures before the DHF modeling.

Negative ranks or difference (negative) between modeling for before and after are mean rank of 15,00 ND sum rank of 135,00 this shows an increase in the pre and post test scores. Meanwhile, positive rank or difference (positive) between modeling actions before and after 135 students experienced an increase in their actions after modeling the pre and post scores, the mean rank or average increase was 121 while the positive rank or sum of ranks was 10119,50.

Ties is the similarity between the pre-test and post-test values, which is 0, so it can be said that there is a difference before and after modelling. Based on the statistical output test, it is known that Asymp Sig (2 Tailed) has a value 0,000 because the value of 0.000 is smaller than <0.005 , it can be concluded that the hypothesis is accepted, meaning there is a difference between before and after modelling, so it can be concluded that there is an influence before and after modelling with increasing student action in controlling dengue fever in the city of Jambi.

One of the factors that influence the level of knowledge is counseling using videos, social media, socialization of counseling and questions and answers. This can be seen by the increase in respondents' knowledge from before modeling and after modeling using videos, social media, socialization and questions and answers. Modeling is a combination of several media which is an effort to provide information. The more information you get, the more extensive your knowledge will be.

Modelling is a teaching aid that functions as a tool to explain or present material. The advantages of video leaflets and socialization can increase understanding, among other things: The material becomes more interesting because there are detailed explanations, letters and animations, both text animations and animated images or photos. Visual information messages are easy for students to understand, and further stimulate children to find out more information about the importance of controlling dengue fever with the 3M movement.

This increase in action was caused by the learning process by the respondent and occurred due to an increase in the subject's sensitivity or readiness for the test given to the respondent. The DBD action that is carried out occurs after the person senses a certain object. Sensing occurs through the senses of sight, hearing, smell and touch. Increased student actions in controlling dengue fever are obtained through the eyes and ears. Video media is a type of audio-visual media. Audio visual media is media that relies on the senses of hearing and sight. Audio visual media is one of the media that can be used in listening learning. This media can increase students' interest in learning because students can listen and see pictures.

The use of modelling in learning and socialization can make students more active and enthusiastic, this is in accordance with the opinion of Sudjana and Ahmad Rivai who revealed that the benefits of media in the teaching process include that teaching will attract students' attention so that it can create student learning motivation, teaching materials The meaning will be clearer so that it can be more easily understood by students, and students will better understand or master the objectives of learning better. Learning methods using media will be more varied because it is not just verbal communication through the teacher's telling of words so that students do not get bored easily.

This is in line with the fact that health education is very influential in increasing knowledge, which can be seen from the comparison before health education (pre-test) and after health education (post-test). Where before being given health education, students' knowledge was lacking, while after being given health education, there was an increase in students' knowledge.

The absorption capacity of humans who only rely on their sense of sight is only around 82%. In left-let media, you only obtain material by relying on your sense of sight. In accordance with the theory of Notoatmodjo (2003), there are factors that influence the failure of an extension process, seen from the factors that the letters do not attract attention, the pictures that accompany the theme, the colour of the writing that is less striking, the language used is less understandable to the target audience, and the delivery of the material. monotonous.

Lawrence and Green's theory which describes the predisposing, reinforcing framework and enabling cause in education diagnosis and evaluation where health education is related to changes that can change behaviour and help achieve desired goals. According to modelling researchers in controlling dengue fever, dengue fever is one of the methods used to increase a person's knowledge about dengue fever with the aim of changing or influencing human behaviour in preventing dengue fever.

Socialization activities will be carried out after the regional head's decision. Schools can be visited and learning can be reopened and students can provide information about the 3M Socialization plan to students.

Larval-free rate Surveys on the presence of mosquito larvae are needed to support controlling the transmission of dengue fever. This survey can be used as an indicator to predict the risk of dengue transmission in an area. One indicator that is often used is the Larval Free Rate (ABJ). An area that has a larvae-free rate equal to or greater than 95% is

categorized as a larvae-free area. Larvae-free areas have the possibility of reducing the level of dengue fever transmission and vice versa. ABJ's achievements mean that Jambi City cannot be said to be safe from the risk of dengue fever transmission, based on the density of mosquito larvae. Calculating the density of mosquito larvae. The type of water reservoir where many larvae are found is a bathtub. The bathtub as a water reservoir where many larvae are found is also conveyed by research from Alim, et al (2017) which states that the bathtub is the water reservoir where larvae are found most often. which says that the type of container that has the most larvae positive cases *Aedes sp.* are the bathtub, baking pan and barrel (Anggraini Shinta, 2018).

Surveys on the presence of mosquito larvae can also be used to identify the type of water reservoir (TPA). Identification that can be obtained includes the size of domestic landfills infected with larvae, the level of public knowledge about dengue fever, health promotion, water cleanliness conditions and community participation in activities to eradicate mosquito nests in endemic areas. The identification results obtained are useful for breaking the mosquito life cycle *Aedes aegypt* Research conducted by Suyasa, et al (2008) stated that the presence of larvae in water reservoirs was caused by the attitude of respondents regarding draining water reservoirs. They will drain the landfill if they feel that the water is dirty, smelly or not clear. The main reason respondents drained the bathtub was not to remove mosquito larvae or prevent the water reservoir from becoming a breeding ground for mosquitoes.

Based on research that has been carried out, it shows that there is a relationship between the existence of water storage areas and the presence of larvae. From the results of the observations, it was found that many of the respondents' water reservoirs contained mosquito larvae in them. The water reservoir is also not equipped with abate which is useful

as a killer for mosquito larvae. Draining and abatement of water reservoirs is one of the preventive measures against dengue fever because it can reduce the growth rate of the *Aedes aegypti* mosquito, which is the main vector for transmitting dengue fever. The *Aedes aegypti* mosquito has the habit of breeding in water reservoirs (TPA) which contain clean, permanent water and are protected from direct sunlight. In previous research, it was also stated that the highest container index was in cement and clay vessels. Cement and clay materials easily become mossy, the surface is rough and porous on the walls. Rough surfaces have the impression of being difficult to clean, easily grow moss and have low light reflection. Low light reflection and porous walls result in low water temperatures, so that this type of landfill material will be preferred by the *Aedes aegypti* mosquito as a breeding place.

3.4 The effectiveness of the use of larvae monitoring cards by junior high school students on the larvae-free rate in school is known

There is no difference in the use of Dengue Hemorrhagic Fever (DBD) Larva Monitoring Cards for groups of public and private primary school students, public junior high school students have already done this and gained understanding through socialization carried out by health workers at the time of settlement.

Students said that larva monitoring cards were easy to implement at school and at home, larva monitoring (Jumantik) was about efforts to reduce dengue fever numbers and free numbers, larva monitoring at schools were equipped with cards. A larva card is a form used to record the results of monitoring larvae and 3M plus activities in schools. Research results state that the use of larva cards in every school environment can facilitate examination and data collection of risk factors for dengue fever transmission and help students monitor larvae independently in the school environment. Activities Jumantik filling out

larvae cards at schools is one of the community-based dengue vector surveillance activities. The larva monitoring sheet is able to help implement 3 M plus, especially monitoring mosquito larvae independently in the school environment. The results of this surveillance activity can provide an overview of the risk distribution in the form of density and habitat of dengue vector larvae in the school environment. Surveillance activities must be documented periodically and advocated for by those involved. has an interest in early detection, epidemiology and vector monitoring, so that it can determine strategies for implementing case management, vector control measures, and empowering students in schools.

3.5 The effectiveness of organizing larvae monitoring on the dengue larvae free rate in Jambi City Middle Schools is known

Organizing larvae monitoring, the school should carry out activities related to the presence of supervisors, namely class teachers and larvae monitoring students, with the hope that this organization can make larvae monitoring activities successful and the school area becomes larvae-free in accordance with the opinion of the Ministry of Health, showing the truth in the process of controlling dengue fever. cannot be separated from community empowerment efforts.

where organizing among students will create an innovation program, the effectiveness of the organization that is formed should be carried out in schools by: Training a cadre of student larva monitors in each class, having supervisors who can carry out supervision in each class. It is necessary to have a larva monitoring coordinator issued to each class, so that someone is responsible. Considering that junior high schools with more than 500 students have more than 4 students, there will be increased participation and support. stake holder in the region in planning, implementing and evaluating PSN 3M Plus activities and the 1st class 1st jumantik

movement in each class. The implementation of commitment raising at the school level, involving several stakeholders such as the Community Health Center, was marked by the production of several MOU for implementing the DHF program with several OPD.

Efforts made to avoid the cycle of dengue fever transmission in November, December, January and February, which are marked by the change of seasons and an increase in dengue cases, must be prevented so that dengue cases, which have decreased, suddenly increase sharply again. Therefore, in accordance with the existing program policy, 1 month before the Transmission Period Cycle, PSN month must be declared, so that the implementation of the dengue prevention and control program can be more effective, and provide encouragement to all students in implementing PSN eradication activities and the 1st class movement. 1 Jumantik.

3.6 Formation of Working Groups in Junior High Schools for Larva Free Number activities

Based on Kepmenkes No. 92 / Menkes / SK / II / 1994 tentang pemberantasan penyakit DBD, carried out by students and schools in the Village / Subdistrict, Pokja DBD (DBD Working Group) was formed within the organizational framework of LKMD (Village Community Resilience Institute) now changed to LPM (Community Empowerment Institution). and City Level which is a cross-program and sectoral coordination forum within the LPM development team. The DBD Pokjanal aims to provide operational guidance for the implementation of various activities related to efforts to prevent and eradicate dengue fever in the work area in a tiered and sustainable manner starting from the central to regional levels. dengue fever. The DBD Working Group is a human resource which is the main element in organizational management, being a planner and active actor in each work area so that we have competent, capable and skilled resources that do not guarantee good work productivity. A total of 4

junior high schools have formed dengue control working groups in schools.

3.7 Discussion

One of the factors that influence the level of knowledge is counseling using videos, social media, socialization of counseling and questions and answers. This can be seen by the increase in respondents' knowledge from before modeling and after modeling using videos, social media, socialization and questions and answers. Modeling is a combination of several media which is an effort to provide information. The more information you get, the more extensive your knowledge will be (Bestari & Ramanda, 2020).

Modeling is a teaching aid that functions as a tool to explain or present material. The advantages of video leaflets and socialization can increase understanding, including: the material becomes more interesting because there are detailed explanations, letters and animations, both text animations and animated images or photos (Suryani et al., 2021). Visual information messages are easy for students to understand, and further stimulate children to find out more information about the importance of controlling dengue fever with the 3M movement.

This increase in action was caused by the learning process by the respondent and occurred due to an increase in the subject's sensitivity or readiness for the test given to the respondent. The DBD action that is carried out occurs after the person senses a certain object. Sensing occurs through the senses of sight, hearing, smell and touch. Increased student actions in controlling dengue fever are obtained through the eyes and ears. Video media is a type of audio-visual media. Audio visual media is media that relies on the senses of hearing and sight. Audio visual media is one of the media that can be used in listening learning. This media can increase students' interest in learning because students can listen and see pictures (Sari Pratiwi et al., 2018).

The use of modeling in learning and socialization can make students more active and enthusiastic, this is in accordance with the opinion of Nurita (2018) who revealed that the benefits of media in the teaching process include that teaching will attract students' attention so that it can create student learning motivation, teaching materials The meaning will be clearer so that it can be more easily understood by students, and students will better understand or master the objectives of learning better (Nurrita, 2018). Learning methods using media will be more varied because it is not just verbal communication through the teacher's telling of words so that students do not get bored easily.

This is in line with research (Hermawan, 2013) that health education is very influential in increasing knowledge can be seen from the comparison before health education (pretest) and after health education (posttest) (Hermawan & Ikhsan Nur Komara, 2013). Where before being given health education, students' knowledge was lacking, while after being given health education, there was an increase in students' knowledge.

In research by Nurul Aini, et al (2013), it was revealed that the absorption capacity of humans who only rely on the sense of sight is only around 82%. In leaflet media, you only obtain material by relying on your sense of sight (Aini et al., 2013). In accordance with the theory of Notoatmodjo (2003), there are factors that influence the failure of an extension process, seen from the factors that the letters do not attract attention, the pictures that accompany the theme, the color of the writing that is less striking, the language used is less understandable to the target audience, and the delivery of the material. monotonous.

Lawrence and Green's theory which describes the framework of predisposing, reinforcing and enabling causes in education diagnosis and evaluation where health education is related to changes that can change behavior and help achieve desired goals. According to modeling researchers in

controlling dengue fever, dengue fever is one of the methods used to increase a person's knowledge about dengue fever with the aim of changing or influencing human behavior in preventing dengue fever.

Another result of this program is the formation of the school children's PSN jumantik organizational structure and the teacher in charge (PJ). In connection with activities during the COVID 19 period, students are still carrying out WFH and learning activities are carried out online, with online learning the implementation of research by conducting socialization cannot yet be carried out. carried out, and in the current situation we are still carrying out the licensing process for other schools so that the research can be carried out in junior high schools.

Socialization activities will be carried out after the regional head's decision. Schools can be visited and learning can be reopened and students can provide information about the 3M Socialization plan to students.

Larval-free rate Surveys on the presence of mosquito larvae are needed to support controlling the transmission of dengue fever. This survey can be used as an indicator to predict the risk of dengue transmission in an area. One indicator that is often used is the Larval Free Rate (ABJ). An area that has a larvae-free rate equal to or greater than 95% is categorized as a larvae-free area. Larvae-free areas have the possibility of reducing the level of dengue fever transmission and vice versa. ABJ's achievements mean that Jambi City cannot be said to be safe from the risk of dengue fever transmission, based on the density of mosquito larvae. Calculating the density of mosquito larvae. The type of water reservoir where many larvae are found is a bathtub. The bathtub as a water reservoir where many larvae were found was also conveyed by research from Anggraini Sinta (Anggraini Shinta, 2018), who said that the bathtub was the water reservoir where larvae were found most often. which says that the type of container that has the most larvae

positive cases *Aedes sp.* are the bathtub, baking pan and barrel.

Surveys on the presence of mosquito larvae can also be used to identify the type of water reservoir (TPA). Identification that can be obtained includes the size of domestic landfills infected with larvae, the level of public knowledge about dengue fever, health promotion, water cleanliness conditions and community participation in activities to eradicate mosquito nests in endemic areas. The identification results obtained are useful for breaking the mosquito life cycle *Aedes aegypti*. Research conducted by Suyasa, et al (2008) stated that the presence of larvae in water reservoirs was caused by the attitude of respondents regarding draining water reservoirs. They will drain the landfill if they feel that the water is dirty, smelly or not clear. The main reason respondents drained the bathtub was not to remove mosquito larvae or prevent the water reservoir from becoming a breeding ground for mosquitoes (Susilowati & Cahyati, 2021).

CONCLUSION

Modeling carried out at 9 junior high schools in the city of Jambi has had an influence on increasing action in knowledge, 3M movements and understanding of dengue fever control in Jambi City. Modeling with a time of 30 minutes has the effect of increasing student actions in controlling dengue fever in the city of Jambi.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest in this research.

REFERENCES

Aini, N., Siti Nurani, A., & Cica Yulia, dan. (2013). *"KOMPETENSI DASAR MENGOLAH STOCK, SOUP DAN*

SAUCE" SISWA SMK 3 CIMAHI (Vol. 2, Issue 1).

anggraini shinta. (2018). *The Existance Of Larvae And Dengue Fever Incidence In Kedurus Sub-District In Surabaya.*

Aryani, S., & Rodiyana, R. (2021). *MEDIA AUDIO VISUAL UNTUK KETERAMPILAN MENYIMAK SISWA.*

Bestari, R. S., & Ramanda, F. F. (2020). *PENYULUHAN KESEHATAN TENTANG PEMBERANTASAN SARANG NYAMUK (PSN) DEMAM BERDARAH DENGUE (DBD) BERPENGARUH TERHADAP TINGKAT PENGETAHUAN DAN SIKAP SISWA SEKOLAH DASAR (SD).*

Da, Z., Moreira, C., Setyobudi, A., Jillvera, H., & Ndun, N. (2020). The Correlation between 3M+ Behavior and The Incidence of Dengue Hemorrhagic Fever in Kupang City. *Journal of Community Health*, 2(1), 34–43. <https://doi.org/10.35508/ljch>

dinas kesehatan provinsi jambi. (2023). *PROFIL KESEHATAN PROVINSI JAMBI 2022.*

Gede Nara Swara, I., Yogi Triana, K., & Bina Usada Bali, S. (2021). The Effect of the One House One Larva Watcher Movement Program on the Larva Free Rate and the Number of DHF Cases in the Regional Technical Implementation Unit of Public Health Centre North Kuta Badung. *Jurnal Ilmu Keperawatan Komunitas*, 5(2), 20–27.

Hasan, O., Sentinuwo, S. R., & Sambul, A. M. (2017). Pemodelan dan Simulasi Penyebaran Penyakit Demam Berdarah Dengue (DBD) dengan Menggunakan Model Cellular Automata. *E-Journal Teknik Informatika*, 10(1).

hermawan, & ikhsan nur komara. (2013). *pengaruh penyuluhan kesehatan lingkungan terhadap pengetahuan dan pelaksanaan kesehatan lingkungan*

- SMP negeri Tambak Sari Kecamatan Tambak sari Kabupaten Ciamis.
- Kaeng, L. W., Warouw, F., Sumampouw, O. J., Kesehatan, F., Univesitas, M., & Ratulangi, S. (2020). Perilaku Pencegahan dan Kepadatan Hunian dengan Kejadian Demam Berdarah Dengue. *Journal of Public Health and Community Medicine*, 1(3).
- Kularatne, S. A., & Dalugama, C. (2022). Dengue infection: Global importance, immunopathology and management. *Clinical Medicine, Journal of the Royal College of Physicians of London*, 22(1), 9–13. <https://doi.org/10.7861/clinmed.2021-0791>
- Lambertina, M., Aran, B., Pitang, Y., & Herminsih, A. (2020). FAKTOR LINGKUNGAN DAN PERILAKU DENGAN KEJADIAN DEMAM BERDARAH DENGUE (DBD) DI DUSUN KAMPUNG BARU DESA MAGEPANDA WILAYAH KERJA PUSKESMAS MAGEPANDA KABUPATEN SIKKA.
- lina shofiyannah, & mahalul azam. (2016). faktor-faktor yang berhubungan dengan pelaksanaan PSN DBD di sekolah dasar. *Journal of Health Education*.
- M Anwas, E. O., Asngari, P. S., & Tjitropranoto. (2009). Faktor-Faktor yang Mempengaruhi Penyuluh dalam Pemanfaatan Media. *Juli*, 07(2).
- Nurrita, T. (2018). PENGEMBANGAN MEDIA PEMBELAJARAN UNTUK MENINGKATKAN HASIL BELAJAR SISWA (Vol. 03).
- Periatama, S., Muji Lestari, R., Wasthu Prasida, D., & Eka, H. (2022). HUBUNGAN PERILAKU 3M PLUS DENGAN KEJADIAN DEMAM BERDARAH DENGUE (DBD) 3M PLUS BEHAVIOR WITH EVENT DENGUE HEMORRHAGICFEVER (DHF). <https://doi.org/10.33084/jsm.vxix.xx>
- Sanyaolu, A. (2017). Global Epidemiology of Dengue Hemorrhagic Fever: An Update. *Journal of Human Virology & Retrovirology*, 5(6). <https://doi.org/10.15406/jhvr.2017.05.00179>
- Sari Pratiwi, A., Mutiara, H., Fakhruddin, H., & Peningkatan Pengetahuan tentang Demam Berdarah, P. (2018). *Dengue antara Metode Ceramah dan Video Animasi Pada Murid Kelas V dan VI SD Negeri 12 Metro Pusat Majority | Volume 7 | Nomor 3 | Desember*.
- sumampouw. (2020). Epidemiologi Demam Berdarah Dengue di Kabupaten Minahasa Sulawesi Utara. In *Sam Ratulangi Journal of Public Health* (Vol. 1, Issue 1).
- Suryani, I., Yasin, H., Kartikasari, P., Statistika, D., Sains, F., & Matematika, D. (2021). PEMODELAN JUMLAH KASUS DEMAM BERDARAH DENGUE (DBD) DI JAWA TENGAH DENGAN GEOGRAPHICALLY WEIGHTED NEGATIVE BINOMIAL REGRESSION (GWNBR). 10(1), 135–148. <https://ejournal3.undip.ac.id/index.php/gaussian/>
- Susilowati, I., & Cahyati, W. H. (2021). Indonesian Journal of Public Health and Nutrition Kejadian Demam Berdarah Dengue (DBD): Studi Kasus di Wilayah Kerja Puskesmas Wonokarto Article Info. *IJPHN*, 1(2), 244–254. <https://doi.org/10.15294/ijphn.v1i2.46475>
- Vindo Galaresa, A., Al Kasanah, A., Fitriami, E., Keperawatan, I., Tinggi, S., Kesehatan, I., Husada, B., Madiun, M., Studi, P. P., Program, P., & Keperawatan, S. I. (2023). Penyuluhan 3m Plus Sebagai Upaya Pencegahan Demam Berdarah Dengue Pada Warga Kelurahan Tangkerang Timur Pekanbaru. In *Jurnal Pengabdian Masyarakat Global* (Vol. 2, Issue 1).

<https://jurnaluniv45sby.ac.id/index.php/Cakrawala>

- Wahid, A. (2018). *Volume V Nomor 2 Maret 2018 ISTIQRA' PENTINGNYA MEDIA PEMBELAJARAN DALAM MENINGKATKAN PRESTASI BELAJAR (The Importance of Learning Media In Improving Student Learning Achievements)*.
- Wang, W. H., Urbina, A. N., Chang, M. R., Assavalapsakul, W., Lu, P. L., Chen, Y. H., & Wang, S. F. (2020). Dengue hemorrhagic fever – A systemic literature review of current perspectives on pathogenesis, prevention and control. *Journal of Microbiology, Immunology and Infection*, 53(6), 963–978. <https://doi.org/10.1016/j.jmii.2020.03.007>
- Yuliana, Machrumnizar, Suriyani, & Devita, A. (2022). Penyuluhan Tentang Demam Berdarah Dan Pencegahannya. *JURNAL ABDIMAS KESEHATAN TERPADU*, 1(2). <https://doi.org/10.25105/jakt.v1i2.15477>
- zulfikar, yudhastuti ririh, & haksama setya. (2023). the effect of water storege and humidity on the incidence of dengue hemorrhagic fever in the work area of the kebayakan health center, central aceh regency. *Journal of Public Health in Africa*, 14, 6–11. <https://doi.org/10.1524/itit.2006.48.1.6>

RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND NUTRITIONAL STATUS WITH BLOOD SUGAR LEVELS OF TYPE 2 DIABETES MELLITUS PATIENTS AT PUSKESMAS I WEST DENPASAR

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ABSTRACT

Background: According to the 2021 Denpasar Health Profile, Denpasar has the highest number of DM sufferers, which is 10.353 people. This study aims to determine the relationship between physical activity and nutritional status with fasting blood glucose levels in type 2 diabetes patients at Puskesmas I West Denpasar.

Method: This type of study is observational with a cross sectional design. The population is type 2 DM patients who come to Puskesmas I West Denpasar and a total of 40 samples with purposive sampling techniques. The data collected are primary and secondary data. The primary data collected were sample identity, physical activity, weight, height, and fasting blood glucose levels. The data analysis technique used is univariate and bivariate analysis using the spearman rank test in SPSS.

Result: The results showed that from 40 samples, there were 62,5% who had controlled fasting blood glucose, 72,5% had normal nutritional status, and 42,5% had moderate physical activity levels.

Conclusion: The conclusion of this study is that there is a relationship between physical activity levels and fasting blood glucose levels (p value = 0.015) and there is no relationship between nutritional status and fasting blood glucose levels (p value = 0.623).

Keywords: Fasting Blood Glucose; Physical Activity; Nutritional Status; Diabetes Mellitus

INTRODUCTION

The quality and management of individual health have been affected by changes in people's lifestyles and lifestyles that are more sedentary. Diabetes mellitus (DM) is one of the degenerative diseases that has dominated the shift in infections and nutritional diseases. Every year, 41 million people die from Non-Communicable Diseases (NCDs), or 71% of all deaths worldwide. More than 15 million people die from NCDs in the age range of 30 to 69 years, and 85% of these deaths occur in lower-middle-income countries. Diabetes contributes as many as 1.5 million people to deaths from non-communicable diseases every year (WHO, 2018). WHO estimates that the number of

people living with type 2 diabetes in Indonesia will increase from 8.4 million in 2000 to around 21.3 million by 2030. In addition, the World Diabetes Federation estimates that from 2013 to 2017, the number of people with diabetes mellitus will increase from 10.3 million to 16.7 million by 2045 (Soelistijo et al., 2019). Indonesia is ranked 7th with the most people with diabetes mellitus, with a total of 10.7 million people. Indonesia is the only country in Southeast Asia that is in the top 10 diabetics (Infodatin, 2020).

The prevalence of diabetes mellitus based on a doctor's diagnosis at the age of ≥ 15 years according to the national Riskesdas in 2018 is 2%, this data shows an increase from 1.5% in the 2013 Riskesdas. According to the Bali Provincial Riskesdas in 2018,

Denpasar City was ranked fourth "in the prevalence of diabetes mellitus in residents over 15 years old", which is 1.81%, still higher than the average of the province of Bali, which is 1.74%. Meanwhile, according to the Denpasar Health Profile 2021, Denpasar has the highest number of DM sufferers, which is 10,353 people. Diabetics who received health services in 2021 have exceeded the target, namely 148.4% or as many as 15,366 people have received health services. This percentage is the highest percentage compared to other districts/cities and also compared to the province of Bali itself. Diabetic mellitus patients in Denpasar City itself have experienced unstable development, in 2018 there were 9,123 people which then increased to 14,353 people in 2020, in 2021 itself there was a decrease to 10,354 people but Denpasar City is still ranked first with the most people with diabetes mellitus.

Diabetes mellitus is the most common endocrine disease. There are several classifications of diabetes mellitus, one of which is type 2 diabetes mellitus. Type 2 DM requires controlling blood glucose levels to prevent complications from occurring. One of the pillars of DM management to control blood sugar levels is physical activity. When doing activities, individuals with sufficient physical activity can experience an increase in glucose consumption by active muscles so that it can directly cause a decrease in blood glucose (Wisnawa & Priandini, 2021). Physical activity is a step to control type 2 diabetes mellitus that centers on the individual's ability to manage himself. The pandemic period has made people accustomed to technological developments and lifestyle habits that lead to a sedentary lifestyle where there is a decrease in physical activity to the point that it does not meet the standards of physical activity that must be done in a day (Sagita et al., 2023). Based on data on the proportion of physical activity, in 2018 low physical activity in Bali increased by 45.38%

from 2013 (Bali Health Office, 2018). Research by Widagdyo shows that 56.08% of people with type 2 diabetes still have poor physical activity for a week. Poor physical activity in question means that in a week the sufferer has light physical activity including sitting at work, watching television, and not exercising. Low physical activity can affect one of the pillars of diabetes mellitus. Previous research found that 100% of diabetic mellitus patients with low physical activity had high blood glucose levels (Karwati, 2022).

The management of type 2 diabetes can be supported by ideal nutritional status because nutritional status is an expression of the state of balance between nutrient intake from food and nutrient needs, so nutritional status is a description of the results of eating arrangements of DM patients (Wulandari, 2020). Undernutrition makes a person vulnerable to infectious diseases, while overnutrition can interfere with insulin signaling pathways that cause insulin resistance (Mukhayarjon, 2021). In a study at the Sinjai Regional Secretariat Office, individuals with non-ideal nutritional status had higher blood sugar levels than individuals with normal nutritional status (Febriza et al., 2019). Based on Health Profile data, West Denpasar Health Center I has the highest number of type 2 diabetes mellitus patients in the Denpasar City area, which is 1,498 people. Research by Wisnawa in 2021 showed that as many as 41.9% of DM patients at Puskesmas I West Denpasar had non-ideal physical activity (Wisnawa & Priandini, 2021). In addition, based on monthly visit reports, there are 65.53% of DM patients with suboptimal nutritional status at the West Denpasar I Health Center.

Based on previous exposure to physical activity and nutritional status, the researcher was interested in conducting research at the Puskesmas I West Denpasar related to the self-management of diabetics, namely by controlling blood sugar levels and doing

physical activity. Therefore, the researcher has an interest in conducting research on the relationship between physical activity and nutritional status with blood sugar levels in patients with type 2 diabetes mellitus at the Puskesmas I West Denpasar.

METHODS

This research was carried out at UPTD Puskesmas I West Denpasar from December to March 2024. The selection of this place is based on the number of people with type 2 diabetes mellitus of 1,498 people. This study is an observational research with a *cross sectional design*. The implementation of this research uses direct interview and recording methods. The variables in this study consisted of independent variables in the form of physical activity and nutritional status of people with diabetes mellitus and the bound variable was the fasting blood sugar level of people with diabetes mellitus.

The population in this study is type 2 DM patients who came to Puskesmas I West Denpasar for the past month. The samples in this study were sorted by sampling techniques in the form of *purposive sampling* based on inclusion and exclusion criteria. The inclusion criteria in this study are DM patients who are domiciled in the working area of Puskesmas I West Denpasar, aged 30-60 years, can communicate well, their weight and height can be measured, and can perform normal physical activity. The number of samples used in this study is 40 samples.

The type of data collected is primary data in the form of sample identity with direct interviews which are then analyzed by descriptive methods, fasting blood sugar level data samples are collected based on examinations by health center officers and then categorized according to PERKENI, physical activity data is obtained by interviews using guidelines in the form of *Global Physical Activity Questionnaire* (GPAQ) was then categorized, the nutritional

status of the samples was assessed based on body weight weighing using digital scales and height measurement using *microtoise* directly and then classified according to the nutritional status category by the Ministry of Health. This study also collected secondary data in the form of the number of type 2 DM patients in the working area of Puskesmas I West Denpasar. The data that has been collected will then be processed and analyzed using the *Spearman Rank* correlation test.

RESULTS AND DISCUSSION

3.1 Characteristics of the research sample

Based on the interviews that have been conducted on 40 research samples, the results regarding the characteristics of the research sample are as follows.

Table 1. Characteristics of the research sample

Sample Characteristics	Frequency (f)	Percentage (%)
Gender		
Man	14	35
Woman	26	65
Amount	40	100
Age		
30-39	4	10
40-49	11	27.5
50-59	25	62.5
Amount	40	100
Last Education		
Not in school	1	2.5
Elementary School	6	15
Middle School	9	22.5
High School	12	30
Bachelor	10	25
Master	2	5
Amount	40	100
Occupation		
Civil servants	3	7.5
Private	12	30
Self employed	9	22.5
Laborer	1	2.5
IRT	10	25
Other	5	12.5
Amount	40	100
Long Suffering		
<5 years	21	52.5
>5 years	19	47.5
Amount	40	100

Diabetes mellitus is a metabolic disease caused by the pancreatic gland being unable to produce insulin strongly. Insulin is a hormone that can regulate the balance of blood sugar levels. Insulin deficiency can lead to an increase in sugar levels in the blood (Priyanto,

2022). Based on the results of the research that has been carried out, as many as 40 samples of type 2 diabetes mellitus patients were obtained in the working area of the West Denpasar I Health Center. Most of the samples were female. During menopause, women experience a decrease in the chemicals estrogen and progesterone, which then leads to fat building that leads to insulin disruption as well as increased blood glucose levels. A decrease in progesterone can make cells more sensitive to insulin (Rusydi, 2020). In addition, women have a tendency to experience a higher body mass index physically, the prevalence of type 2 diabetes in women is higher (Komariah, 2020).

Looking at other characteristics, namely the age of the samples, most of which are in the age range of 50-59 years (62.5%), this is in line with research by Komariah that there is an increased risk of diabetes in samples with an age of more than 40 years due to the aging process causing a decrease in the ability of pancreatic beta cells to produce insulin. Physiological decline in humans is common, drastically decline occurs at age after 40 years which can have an impact on the pancreatic organs. Blood sugar levels are also more susceptible to increase due to decreased insulin sensitivity so that it can affect glucose levels in the blood (Trisnawati, 2013 in Komariah, 2020).

3.2 Physical activity

Physical activity level data was obtained based on the results of interviews on each sample using the *Global Physical Activity Questionnaire* (GPAQ) form. Based on interviews on the research sample, the results of the level of physical activity were obtained as follows.

The graph of physical activity level in figure 1 shows the results of the interviews which are then processed into three categories.

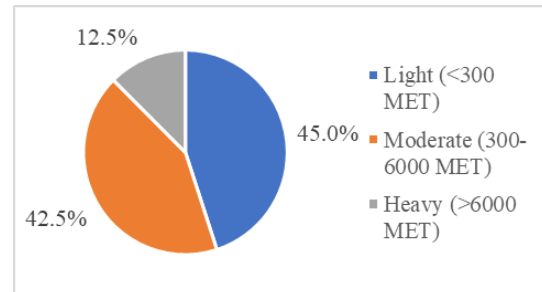


Figure 1. Distribution of samples according to physical activity level

The sample with the largest number was a sample with a light activity level of 18 samples (45%) with the most types of activities being washed dishes, ironing, and sitting and working in front of a computer. Meanwhile, the sample with a moderate activity level amounted to 17 samples (42.5%) with activities carried out were gymnastics, cycling, and *jogging*. In addition, the least sample was a sample with a heavy activity level, namely 5 samples (12.5%) with the activities carried out being work that involved lifting heavy weights regularly.

One of the pillar of diabetes mellitus control is physical activity. Physical activity in this study was measured using the *Global Physical Activity Questionnaire* (GPAQ) form. The level of nutritional activity obtained ranges from mild to severe. Most of the samples had a light activity level of 18 samples (45%). Lack of physical activity indicates that the sample has a high sedentary time. Sedentary time or time spent sitting or sleeping for a long time can increase the risk of heart disease, cancer, and other complications in patients with type 2 diabetes mellitus (Haseler, 2022).

3.3 Nutritional Status

Based on the results of weight and height measurements on the research sample, the following results were obtained.

In the collection of sample nutritional status data, the nutritional status of 40 samples in this study ranged from 18.7-32.4 kg/m² with the average nutritional status at 24.2 kg/m². This shows that the sample consists of normal nutritional status to overweight at the

severe level. Most of the samples had normal nutritional status according to the BMI, which was 29 samples (72.5%).

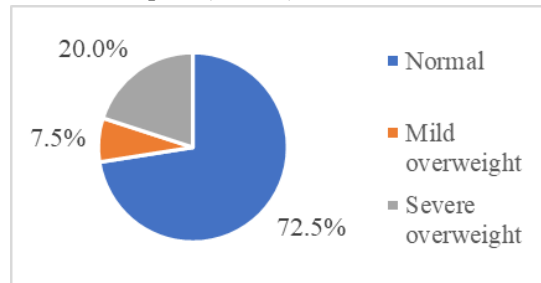


Figure 2. Distribution of samples according to nutritional status

Nutritional status is a state that results from the balance between nutrient intake from food and nutrient needs by the body (Candra, 2020). Samples with normal nutritional status showed that there was a balance between nutrient intake from food and energy expended by the body, both needed to meet basal energy and needed to meet daily activities. Patients with type 2 diabetes mellitus are encouraged to achieve and maintain normal nutritional status because it is to prevent a decrease in insulin sensitivity due to fat loss (Rihi Leo, 2021). Therefore, nutritional status is also one of the parameters in the goal of controlling diabetes mellitus (PERKENI, 2021).

3.4 Fasting blood glucose

Based on the results of examining fasting blood glucose levels in the research sample, the following results were obtained.

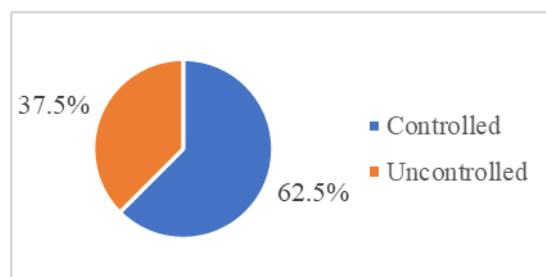


Figure 3. Distribution of samples according to fasting blood glucose levels

According to PERKENI (2021), the target range of fasting blood glucose levels, namely blood glucose measured after the patient fasts for 8-12 hours, for people with diabetes mellitus is 80-130 mg/dl. Based on

40 samples that have been assessed for fasting blood glucose levels, the fasting blood glucose levels of the samples ranged from 97-178 mg/dl with an average fasting blood glucose level of 128 mg/dl. Most of the samples had controlled blood glucose levels, which was 25 samples (62.5%). Patients with diabetes mellitus need to regulate and control high blood glucose levels to avoid other disease complications. The reduction of diabetes mellitus complications is carried out by the implementation of five pillars of diabetes mellitus control, one of which is the independent examination of blood sugar levels.

3.5 Relationship between Physical Activity Level and Fasting Blood Sugar Levels

One of the treatments for diabetes mellitus is physical activity. This study showed that of the 40 research samples, there were 12 samples (30%) with moderate activity levels that had controlled fasting blood glucose levels and 10 samples (25%) with light activity levels that had uncontrolled fasting blood glucose levels. The relationship between physical activity level and fasting blood glucose level was then tested using the spearman rank correlation test and obtained a p value of 0.015 ($p < 0.05$), so it can be said that there is a significant relationship between physical activity level and fasting blood glucose levels. The strength of the relationship is shown by a correlation coefficient (r) of -0.380.

Table 2. Relationship between Physical Activity Level and Fasting Blood Sugar Levels

Physical Activity	Blood Glucose				p-value
	Controlled		Uncontrolled		
	f	%	f	%	
Light	8	20	10	25	0.015
Moderate	12	30	5	12,5	
Heavy	5	12,5	0	0	
Amount	25	62,5	15	37,5	

This study is in line with research by Rahayuningsih (2023) which showed that there was a relationship between physical activity and blood glucose levels in type 2 DM patients at the Penebel I Health Center (p

value = 0.01). The research sample had a diverse physical activity routine. Based on the physical activity data taken, the average physical activity of the research sample was 1771 METs per week which was at a moderate activity level. This moderate activity was caused by a study sample that had a habit of exercising.

Based on interviews, the sample with moderate activity had the habit of exercising in the form of gymnastics, walking, jogging or cycling with a duration of 30-45 minutes for three to five days a week. Samples with light activity tend to be samples with jobs that are mostly done by sitting or being housewives while samples with high activity consist of samples with jobs such as labor or routinely lifting heavy objects. Blood glucose absorption during physical activity is not accompanied by an increase in insulin (Rahayuningsih, 2021).

Physical activity helps the absorption of glucose into cells without the need for insulin because muscle contraction increases insulin receptor sensitivity, cell permeability increases in active state, especially when doing aerobic physical exercise which causes an increase in oxygen in the blood (Tua H., 2020). This oxygen then provides an insulin-like effect that causes an increase in glucose transport from the blood into the cell (Rahayuningsih, 2021). Physical activities that involve muscle movements will use glucose stored in the muscles, if there is a glucose deficiency, the muscles will take glucose from the blood which helps lower blood glucose levels so that it plays a role in controlling diabetes mellitus (Arania, 2021).

The results of this study are also in line with research by Karolus (2023) that there is a relationship between physical activity and blood glucose levels in type 2 DM patients at Koja Hospital (p value = 0.000). People with type 2 diabetes are advised to carry out physical activities such as moderate intensity aerobic exercise for at least 150 minutes every week (PERKENI, 2021). In addition to

physical activity, there are other pillars that affect blood glucose levels in the management of diabetes mellitus. In samples with a light level of physical activity but with controlled blood glucose levels, it can be affected from other pillars, one of which is education about the management of diabetes mellitus, education is carried out with the aim of increasing knowledge and interest in doing a healthy lifestyle which is important in the management of diabetes.

Another pillar in the management of diabetes mellitus is eating arrangements. Eating arrangements in people with diabetes mellitus are nutritionally balanced and in accordance with the calorie needs of each individual. The eating regimen of DM patients emphasizes three principles, namely a consistent meal schedule, the type of carbohydrates consumed, and the number of calories contained. In addition, pharmacological therapy can also affect the patient's blood glucose levels. Pharmacological therapy itself is given along with eating arrangements and physical exercise to support a healthy lifestyle for DM sufferers (PERKENI, 2021).

3.6 Relationship between Nutritional Status and Fasting Blood Sugar Levels

Based on the nutritional status of the samples, it was shown that there were 19 samples with normal nutritional status having controlled blood glucose and 10 samples with normal nutritional status having uncontrolled blood glucose.

Table 3. Relationship between Nutritional Status and Fasting Blood Sugar Levels

Nutritional Status	Glucose Levels				p-value
	Controlled		Uncontrolled		
	f	%	f	%	
Normal	19	47.5	10	25	0.623
Mild overweight	1	2.5	2	5	
Severe overweight	5	12.5	3	7.5	
Amount	25	62.5	15	37.5	

Based on the results of the relationship analysis using the spearman rank test, it was found that there was no meaningful relationship between nutritional status and fasting blood glucose levels. It is known that

most of the samples have uncontrolled blood glucose levels even though they have normal nutritional status. The assessment of nutritional status in this study uses the Body Mass Index (BMI). BMI is not only determined by fat proportion, but also determined by bone density and muscle density (Setyawati, 2023). The BMI also does not show the distribution of fat in the body although it can indicate a person's nutritional status. BMI is vulnerable in determining nutritional status, especially to determine obesity status because it does not take into account the distribution and function of adipose tissue, so that the measurement of nutritional status should be accompanied by other anthropometric measurements such as abdominal circumference and waist-hip circumference measurements (ADA, 2023). Fat distribution needs to be known because visceral fat causes higher metabolic activity than subcutaneous fat. This visceral fat stored in the cavity will increase the number of hormones and cytokines which will then lead to an increase in blood sugar (Jo, 2009 in Paleva, 2019). This is in line with Sari's (2023) research, which showed an insignificant relationship between nutritional status and fasting blood glucose levels (p value = 0.098) due to the accumulation of fatty tissue in the abdomen which produces excessive amounts of free fatty acids that release cytokines and produce insulin resistance.

Assessment of nutritional status in addition to using BMI needs to be accompanied by abdominal circumference measurements for accuracy of assessment (Feller, 2010 in Sari, 2023). In addition, blood glucose levels in general can also be affected by factors such as adherence to taking medication, dietary adherence, and positive family support. This study is also in accordance with Suryanti (2019) that there is no relationship between nutritional status and fasting blood glucose levels due to low medication adherence factors can be related to high blood sugar

levels, dietary adherence which affects individual nutrient intake which can also be influenced by family support can have an impact on the management of diabetes mellitus. Unhealthy consumption such as the consumption of coconut milk, fat, or excess sugar can affect blood glucose levels (Suryanti, 2019).

CONCLUSION

This study showed that the level of physical activity and fasting blood glucose levels of people with type 2 diabetes at Puskesmas I West Denpasar had a significant relationship, while the nutritional status and fasting blood glucose levels of people with type 2 diabetes at Puskesmas I West Denpasar had no relationship. The suggestion that can be given based on this study is to increase the role of nutritionists at the West Denpasar I Health Center in providing education to patients who come every month to control blood glucose to ensure that DM patients carry out DM management compliantly.

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CONFLICT OF INTEREST

There is no conflict of interest in this research.

REFERENCES

- ADA. (2023). American Diabetes Association Professional Practice Committee: Obesity and Weight Management for the Prevention and Treatment of Type 2 Diabetes: Standards of Care in Diabetes 2024. *Diabetes Care* 1, 145-

- 157, <https://doi.org/10.2337/dc24-S008>.
- Arania et al. (2021). The Relationship Between Work and Physical Activity and the Incidence of Diabetes Mellitus at Mardi Waluyo Clinic, Central Lampung Regency. *Journal of Medika Malahayati*, 5(3), 163-169.
- Candra, Aryu. (2020). Nutritional Status Check. Semarang: Faculty of Medicine, Diponegoro University.
- Bali Health Department. (2018). Basic Health Research (RISKESDAS). Denpasar; Denpasar City Health Office
- Denpasar City Health Department. (2021). Denpasar City Health Profile. Denpasar; Denpasar City Health Office
- Ekasari, E., and Dhanny, D. R. (2022). Factors Affecting Blood Glucose Levels of Type II Diabetes Mellitus Patients Aged 46-65 Years in Wakatobi Regency. *Journal of Nutrition College*, 11(2), 154-162.
- Febriza et al. (2019). The Relationship of Nutritional Status to Current Blood Sugar Levels and Blood Pressure. *Celebes Health Journal*, 1(1), 40-48.
- Haseler, T., & Haseler, C. (2022). Lack of Physical Activity is a Global Problem. *BMJ (Clinical Research ed.)*, 376(348), <https://doi.org/10.1136/bmj.o348>
- Karolus et al. (2023). The Relationship between Physical Activity and Blood Glucose Levels in Diabetic Mellitus Patients in the Internal Medicine Room of Koja Hospital Jakarta. *Cikini Journal of Nursing*, 4(1), 32-39.
- Karwati. (2022). The Relationship between Physical Activity and Blood Sugar Levels in Elderly Patients with Type 2 Diabetes Mellitus in the Working Area of the Situ Health Center. *JIKSA-Journal of Nursing Sciences* Eleven April, 4(1), 11-17.
- Ministry of Health of the Republic of Indonesia. (2013). Basic Health Research (RISKESDAS). Jakarta: Ministry of Health of the Republic of Indonesia
- Ministry of Health of the Republic of Indonesia. (2018). Basic Health Research (RISKESDAS). Jakarta: Ministry of Health of the Republic of Indonesia
- Ministry of Health of the Republic of Indonesia. (2020). Infodatin 2020 Diabetes Mellitus Data and Information Center of the Ministry of Health of the Republic of Indonesia.
- Komariah, & Rahayu, S. (2020). Relationship between Age, Gender, and Body Mass Index with Fasting Blood Sugar Levels in Type 2 Diabetes Mellitus Patients at Proclamation Outpatient Primary Clinic, Depok, West Java. *Kusuma Husada Health Journal*, 11(1), 41-50.
- Mukhyarjon et al. (2021). Overview of Nutritional Status of Type 2 Diabetes Mellitus Patients Based on Anthropometry. *Journal of Medical Sciences*, 15(1), 41-47.
- Paleva, R. (2019). Mechanisms of Obesity-Related Insulin Resistance. *Sandi Husada Health Scientific Journal*, 10(2), 354-358.
- PERKENI. (2021). Guidelines for Independent Blood Glucose Monitoring 2021. Jakarta: PB of the Indonesian Endocrinology Association.
- Priyanto, Yulianingsih, N., & Asyari, H. (2021). The Relationship between Knowledge about Diabetes Mellitus and Compliance with Treatment in Diabetes Mellitus Patients in Kertasemaya District in 2021. *Journal of Health Science Service*, 2(1), 17-24.
- Rahayuningsih et al. (2023). The Relationship between Physical Activity and Dietary Adherence to Blood Glucose Levels in Type 2 DM Patients. *Journal of Nutrition Science: Journal of Nutrition Science*, 12(3), 155-165.
- Rihi Leo, A. A., & Valentina K. R. (2021). Analysis of Nutritional Status, Anxiety Level, Age, and Blood Sugar Levels with Quality of Life of Type 2 DM Patients. *Scientific Journal of Health Nutrition (JIGK)*, 2(2), 1-6.
- Rusydi Bayu, M. (2020). Overview of blood glucose and weight in menopausal women of Muhammad. In

- Sustainability (Switzerland) (Vol. 4, Issue 1).
- Sagita et al. (2023). Sedentary Life Levels on Adolescent Cardiovascular Fitness. *Indonesian Physiotherapy Scientific Magazine*, 11(2), 91-95.
- Sari et al. (2023). The Relationship Between Body Mass Index and Fasting Blood Sugar Levels in Medical Students. *Journal of Nursing*, 15(4), 1887-1892.
- Setyawati et al. (2023). The Relationship Between Body Weight and Fasting Blood Glucose Levels in Students of The Faculty of Medicine, Tadulako University of 2022. *International Journal of Health, Economics, and Social Sciences (IJHESS)*, 5(3), 265-269.
- Soelistijo et al. 2021. Guidelines for the Management and Prevention of Adult Type 2 Diabetes Mellitus in Indonesia 2021. Jakarta: PB of the Indonesian Endocrinology Association.
- Suryanti et al. (2019). The Relationship between Body Mass Index and Fasting Blood Sugar Levels in Type 2 Diabetes Mellitus Patients. *Poltekita: Journal of Health Sciences*, 13(2), 86-90.
- Tua et al. (2020). Impact Aerobic Toward Body Physiology and VO₂max. *Journal of Physical Education, Health, and Sport*, 7(2), 25-30.
- Wicaksono, A. & Handoko, W. (2020). *Physical Activity and Health*. Pontianak: IAIN Pontianak Press.
- Widagdyo et al. (2022). Physical Activity in Type 2 Diabetes Mellitus in Indonesia (Literature Review). *Tunas Medika, Journal of Medicine & Health*, 8(2).
- Wisnawa et al. The Relationship of Physical Activity Levels and Exercise Habits to Blood Sugar Levels of Type 2 Diabetes Mellitus Patients at the Diabetes Association of West Denpasar I and II Denpasar Health Center, Bali. *E-Journal Medika Udayana*, 10(4), 56-62, doi: <https://doi.org/10.24843/MU.2021.V10.i4.P09>.
- World Health Organization. (2021). *Global Physical Activity Questionnaire. Analysis Guide Surveillance and* Population-Based Prevention of Non Communicable Diseases Department.
- Wulandari, D. S., & Adelina, R. (2020). The Relationship of Nutritional Status to Current Blood Sugar Levels and Blood Pressure. *Food Nutrition Media*, 27(1), 167-178.

RELATIONSHIP WITH COMPLIANCE WITH BLOOD SUPPLEMENTING TABLET CONSUMPTION WITH THE INCIDENT OF ANEMIA IN ADOLESCENT GIRLS

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ABSTRACT

Background: Iron deficiency can cause anemia. Anemia is a global public health problem that most often occurs in adolescent girls and the most common cause is iron deficiency. The effects of anemia seen in teenagers are stunted growth, the body is easily infected, decreased body fitness, decreased enthusiasm for learning, and decreased achievement. The Ministry of Health explained that young women obtain iron through animal protein such as liver, fish and meat because young women cannot access these foods so they need additional intake of the substance obtained through Fe tablets. The World Health Organization (WHO) in the world prevalence of anemia in 2015 shows that the prevalence of anemia in the world is around 40%-88%, in Southeast Asia 25%-40% of young women experience mild and severe anemia. The population of teenagers (10-19 years) in Indonesia is 26.2%, consisting of 50.9% men and 49.1% women. The aim of the research was to determine the relationship between adherence to consuming blood supplement tablets and the incidence of anemia in young women in the study program. Nutrition Science at STIKes Baiturrahim.

Method: This research is a quantitative research with a cross sectional study design. This research was conducted to see the relationship between the independent variable and the dependent variable at the same time, this research involved 67 respondents.

Result: Based on the research results, results were obtained ($p - \text{value } 0.005 < 0.05$).

Conclusion: It can be concluded that there is connection Compliance with blood supplement tablet consumption and the incidence of anemia in young women at STIKes Baiturrahim.

Keywords: Anemia, and Blood Supplementing Tablet

INTRODUCTION

Nutrition is one of the determining factors in the quality of human resources. Lack of nutritional needs, both micronutrients and macronutrients, can cause suboptimal physical growth and decreased the body endurance, resulting the highest morbidity and mortality rates. Adolescence is a period where growth occurs rapidly, so nowadays the nutritional needs increase as well. One nutrient whose needs are increasing is iron. Iron is needed in all body cells and is basic in physiological processes, such as the formation of hemoglobin (red blood cells) and enzyme

function (Fikawati S at el, 2017).

Iron deficiency can cause anemia. Anemia is defined as a decrease in the number of red blood cells in circulating blood or the amount of hemoglobin which is below the normal limit, and the normal limit varies for each age and condition (Corwin, 2009). Anemia is a health problem throughout the world. The prevalence of anemia in the world is very high, especially in developing countries, including Indonesia (WHO, 2013).

World Health Organization(WHO) on the world prevalence of anemia in 2015 shows that the prevalence of anemia in the world is around 40%-88%, and in the

Southeast Asia is around 25%-40% of young women had experience mild and severe the anemia. The population of the teenagers (10-19 years) in Indonesia is 26.2%, consisting of 50.9% men and 49.1% women (Ministry of Health, 2018). Nowadays anemia often occurs in adolescent girls, because currently there is an increasing in iron requirements due to growth and menstruation (Fikawati S at el, 2017).

The prevalence of anemia according to Basic Health Research (Riskesdas, 2018) states that anemia in children (5-12 years) in Indonesia is 26%, in adolescent girls (13-18 years) it is 23%. The increase in the prevalence of anemia in pregnant women is from 37.1% in 2013 to 48.9% in 2018. This cannot be separated from the role of nutritional consumption during adolescence which has an impact on nutritional status and anemia during pregnancy (Ministry of Health of the Republic of Indonesia , 2018).

The 2018 Riskesdas results show that the proportion of young women who received iron tablets was 76.2%, and 80.9% received TTD at school. From this data, only 1.4% consumed ≥ 52 iron tablets, while 98.6% consumed < 52 tablets (Ministry of Health, 2018).

Giving Fe tablets to junior and senior high school students in Jambi City is a form of preventing anemia which often occurs by looking at the students' weak condition and decreased immune system. This can be seen from the frequent fainting during ceremonies and lack of concentration when studying. Students are given counseling. and providing blood-boosting supplements by the Health Service in collaboration with the Jambi City Health Center, to anticipate anemia which is often experienced by female students (Jambi Provincial Health Office, 2017).

The results of the initial survey in August 2022 at STIKes Baiturrahim through interviews with 10 young women, some young women already understand the benefits of consuming TTD but there are still

those who have not implemented it, and as many as 15.6% of young women consuming TTD have become healthy teenagers.

Based on the data above and looking at the situation and conditions that exist among students of the STIKes Baiturrahim Nutrition Study Program, the author is interested in conducting further research regarding "The Relationship between Adherence to Consuming Blood Supplement Tablets and the Incidence of Anemia in Young Women in the STIKes Baiturrahim Nutrition Department".

METHOD

This research was carried out from August 2022 to July 2023. The population in this study were young women from the STIKes Baiturrahim Nutrition Science Study Program, totaling 178 students, the sample size was 67, with the inclusion criteria being students of the Baiturrahim Nutrition Science Study Program who were active in the 2022 academic year. /2023 and exclusion criteria for students who experience illnesses related to anemia (Thalassemia, kidney failure). The sample was selected using Purposive Random Sampling technique.

RESULTS AND DISCUSSION

Respondent Characteristics

Respondent characteristics were created with the aim of seeing the general condition of the respondents studied. Respondent characteristics.

Table 1. Frequency distribution of respondents' ages at Baiturrahim Jambi College of Health Sciences

Age	Frequency (n)	Percentage (%)
18	5	7.5
19	13	19.4
20	17	25.4
21	24	35.8
22	11	11.9
Total	67	100

Based on table 1, it shows that of the 67 respondents, the most respondents were 21

years old, 24 students (35.8%) while the least respondents were 18 years old, 5 students (7.5%).

Univariate Analysis

Description of Compliance with Blood Supplement Tablet Consumption at STIKes Baiturrahim

An overview of compliance with the consumption of blood supplement tablets at STIKes Baiturrahim can be seen in the following table:

Table 2. Description of Compliance with Blood Supplement Tablet Consumption at STIKes Baiturrahim

Compliance	n	%
Obedient	32	47.8
Non-obedient	35	52.2
Total	67	100.0

Based on the research results in table 2, it is known that as many as 35 (52.2%) young women of STIKes Baiturrahim were not obedient in implementing consumption of blood supplement tablets and as many as 32 people (47.8%) of young women at STIKes Baiturrahim adhered to consuming blood supplement tablets.

The results of this study are in line with the research results of Lestari et al (2015) showing that there were only 8 respondents (12.5%) out of 68 samples who consumed Fe tablets during menstruation, which means that more young women were disobedient in consuming blood supplement tablets. Yuniarti, et al (2015) The number of young women who do not comply with the consumption of Fe tablets is due to many factors, such as laziness and the side effects that are often felt after taking Fe tablets. Based on research (Budiarni and Subagio, 2012), it is known that 51.8% of subjects experienced the side effect of nausea which resulted in non-compliance. Other causes of non-compliance are constipation and changes in stool color to black. Another reason revealed by 48.2% of subjects was that Fe tablets had an unpleasant taste and fishy smell, apart from that the subjects also felt

bored, forgot and were lazy about consuming Fe tablets.

Based on the research results, it is known that the low level of compliance with consuming blood tablets is because many students do not like consuming blood supplement tablets because they taste bad and smell bad.

Description of the incidence of anemia in adolescent girls at STIKes Baiturrahim

An overview of the incidence of anemia in young women at adolescent girls at STIKes Baiturrahim can be seen in the following table:

Table 3. Description of the incidence of anemia in adolescent girls at STIKes Baiturrahim

Category of Anemia Occurrence	n	%
Not Anemic	42	62.7
Anemia	25	37.3
Total	67	100.0

Based on the research results in table 4, it is known that as many as 42 (62.7%) young women did not experience anemia and as many as 25 (37.3%) young women experienced anemia.

This research is in line with Basith. A, et al (2017), where 50 respondents had their hemoglobin levels checked, it was found that more than half (54%) of the respondents had anemia.

According to the Ministry of Health of the Republic of Indonesia (2018) anemia is a medical condition where the hemoglobin level in the blood is lower than normal. Hemoglobin itself is a component in red blood cells whose function is to bind oxygen and deliver it to all body tissue cells. Without adequate oxygen supply, many tissues and organs throughout the body can be disrupted. According to Arisman (2010), the main causes that can cause anemia in women are blood loss during menstruation and a lack of nutrients in blood formation, for example iron, protein, folic acid and B12. Because when women are menstruating, iron is

released, making young women more susceptible to anemia.

Bivariate Analysis

Relationship between Adherence to Consuming Blood Supplement Tablets and the Occurrence of Anemia

The relationship between compliance with the consumption of blood supplement tablets and the incidence of anemia in young women in the Baiturrahim STIKes Nutrition Science Study Program can be seen in the following table:

Based on the research results in table 6, the results obtained (p – value $0.005 < 0.05$). So it can be concluded that There is connection Compliance with blood supplement tablet consumption and the incidence of anemia in young women at STIKes Baiturrahim. This research is in line with Savitri, et al (2021) where the research results show a significant relationship between compliance with the consumption of blood supplement tablets and the incidence of anemia in young women in Indonesia.

Table 4. Relationship between Compliance with Taking Blood Supplement Tablets and the Incidence of Anemia in Adolescent Girls at STIKes Baiturrahim

Compliance with Fe Tablet Consumption	Occurrence of Anemia				Total		p value
	Not Anemic		Anemia				
	F	%	F	%	F	%	
Obedient	26	81.2	6	18.8	32	100	0.005
Not obey	16	45.7	19	54.3	35	100	
Total	42	62.7	25	37.3	67	100	

This means that the more obedient you are in consuming TTD, the more young women's Hb levels will increase. Based on the results of the analysis carried out, the incidence of anemia in young women is influenced by compliance with TTD consumption.

Kamidah (2015) stated that there are several factors that influence compliance, including knowledge, level of education and motivation. Meanwhile, according to Priyoto (2014) factors that influence patient

awareness in undergoing treatment include knowledge, education and motivation.

Based on the results of the questionnaire analysis, it was found that there are still many young women who are disobedient in consuming blood supplement tablets, especially during menstruation.

Researchers assume that young women are disobedient at STIKes Baiturrahim caused by a lack of motivation and information. Therefore, researchers suggest that the health service needs to provide information and motivational support in order to increase the compliance of young women in consuming blood supplement tablets.

Research Limitations

Data was obtained using a goggle form on respondents so that the quality of the data really depends on the cooperation and perception and honesty of respondents in answering the questions given. The questions in the questionnaire are answered with multiple choices. Researchers use informed consent as approval to become a respondent.

CONCLUSION

Based on the research results, results were obtained (p – value $0.005 < 0.05$). So it can be concluded that There is The Relationship between Knowledge and the Occurrence of Anemia. Based on the research results, results were obtained (p – value $0.005 < 0.05$). So it can be concluded that There is connection Compliance with blood supplement tablet consumption and the incidence of anemia in young women at STIKes Baiturrahim.

REFERENCES

- Basith A, Agustina R, Diani N. 2017. Factors Associated with the Incidence of Anemia in Adolescent Girls. Nursing World, Volume 5, Number 1, March 2017.

- Budiarni W and Subagjo. (2012). Relationship between Knowledge, Attitude and Motivation with Compliance with Taking Iron Folate Tablets in Pregnant Women. *Journal of Higher Education Nutrition*, Volume 1, Number 1, 2012.
- Fikawati S, Syafiq A, Veratamala A. *Nutrition for Children and Adolescents*. Depok: Rajawali Press; 2017
- Kamidah. (2015). Factors That Influence Pregnant Women's Compliance in Consuming Iron Tablets at the Simo Boyolali Community Health Center. *Gaster XII* (1)
- Ministry of Health of the Republic of Indonesia. (2018). Main Results of Riskesdas 2018, Jakarta, Health Research and Development Agency, Ministry of Health of the Republic of Indonesia.
- Ministry of Health of the Republic of Indonesia. (2018). Guidebook for the Prevention and Management of Anemia in Adolescent Girls and Women of Childbearing Age (WUS). Jakarta. Directorate of Public Health.
- Lestari, et al. (2015). Knowledge Related to Consuming Fe Tablets During Menstruation in Adolescent Girls at Sman 2 Banguntapan Bantul. *Indonesian Journal of Nursing and Midwifery*. 2015;3(3):145-149.
- Savitri M, et al (2021). The Relationship between Adherence in Consuming Blood Supplement Tablets and the Incidence of Anemia in Adolescent Girls. *Tambusai Health Journal*. Volume 2, Number 2, June 2021
- Yuniarti, Rusmilawaty, Tunggal T. 2015. The relationship between adherence to taking Fe tablets and the incidence of anemia in young women in Ma Darul Imad, Tatah Makmur District, Banjar Regency. *Indonesian Journal of Public Health Publications*, Vol. 2 No. 1, April 2015
- WHO. Adolescent Health. Information Systems. Geneva: WHO 2013.
- WHO. prevalence of anemia worldwide. Geneva: World Health Organization; 2015.
- Wong, D, et al. (2009). *Pediatric Nursing Textbook*. Volume 1. EGC Medical Book Publisher: Jakarta.

RELATIONSHIP BETWEEN SELF-EFFICACY AND MEDICATION ADHERENCE IN HYPERTENSIVE PATIENTS AT SIMPANG IV SIPIN HEALTH CENTER

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ABSTRACT

Background: Hypertension is a condition where there is an increase in systolic blood pressure >140 mmHg and diastolic pressure >90 mmHg. Hypertension generally makes sufferers think they have a low life expectancy and decide to continue living side by side with hypertension. To increase life expectancy, hypertension sufferers needed a high self-efficacy. Patients with high levels of self-efficacy will have twice the chance of adherence to taking medication compared to patients with low self-efficacy. This study aims to determine the level of self-efficacy and medication adherence along with the relationship between self-efficacy and medication adherence in hypertensive patients at Simpang IV Sipin Health Center.

Method: The design of this research is observational analytic with a cross-sectional approach. Sample selection used purposive sampling technique with a total 80 respondents who suffered in hypertension. The research instruments were Medication Adherence Self Efficacy Scale-Revision (MASES-R) questionnaire to measure the level of self-efficacy and Morisky Medication Adherence Scale-8 (MMAS-8) questionnaire to measure the level of medication adherence. Data analysis used the Kendall's tau b statistical test to determine the relationship between the two variables.

Result: The results showed that the number of respondents with a low level of self-efficacy was 41 people, a low level of medication adherence was 30 people, and there was a relationship between self-efficacy and medication adherence in hypertensive patients at Simpang IV Sipin Health Center where P Value = 0.000 < 0, 05.

Conclusion: From the results, it can be concluded that the level of self-efficacy and compliance with taking hypertension medication at Simpang IV Sipin Health Center is at a low level and there is a relationship between self-efficacy and medication adherence.

Keywords: Hypertension; Medication Adherence; Self Efficacy

INTRODUCTION

Hypertension generally creates thoughts among sufferers that those who have this disease have a low life expectancy and choose to continue living side by side with hypertension even though hypertension treatment aims to maintain the sufferer's quality of life. In an effort to increase life expectancy, sufferers need high self-efficacy (Mulyana & Irawan, 2019).

Self-efficacy is the confidence or belief that a person has in carrying out an activity and believes himself to continue doing it even though there are obstacles in achieving a goal (Kauric-Klein et al., 2017). A hypertensive patient who has high self-efficacy has the

opportunity to show that they are twice as good at medication adherence compared to patients with a low level of self-efficacy (Novitasari, 2017).

Compliance with treatment is an important thing that greatly influences the continued health of hypertensive patients. Through patient adherence with treatment, it can be seen whether the hypertension therapy carried out has an effective output or not. Apart from that, compliance is also a measure of whether or not the patient's behavior is good in controlling hypertension. Therefore, patient non-compliance with hypertension treatment is the main factor in not achieving the expected therapy (Annisa & Ansar, 2013)

One of factor in medication adherence is related to the patient themselves, because they think that undergoing treatment can cause various long-term effects such as disturbing side effects and dependence. All of this can affect patient adherence with treatment (Sari, 2019). The patient's thoughts regarding the disease he is suffering from and the treatment process accompanied by the patient's beliefs about the treatment he is carrying out can be a factor in health behavior as the patient adherence to the treatment process (Martin et al., 2018).

According to data from the 2022 Jambi Province Health Profile, hypertension is ranked second among the 10 most common diseases in Jambi Province after acute ISPA with a percentage of 25.48%. This shows an increase in percentage from 2020, as big as 23.63%. This high percentage shows that Jambi Province is one of the provinces that has experienced an increase in the prevalence of hypertension cases in recent years (Jambi Provincial Health Office, 2022).

The number of hypertension sufferers aged over 15 in Jambi City in 2022 was 32,836 (Jambi Provincial Health Office, 2022). This shows an increase from the previous year, namely 25,966. If we look at the number of hypertension cases in Jambi City in 2021, Simpang IV Sipin Health Center is ranked highest of all health centers in Jambi City with a total of 5511 cases. In 2022, starting from January to March, the number of hypertension cases in Simpang Health Center IV Sipin as many as 589 cases (Kusumadayanti et al., 2023).

Based on previous research conducted by (Khoirunnisa, 2022) regarding the description of self-efficacy in hypertension sufferers at one of the community health centers in Karanganyar district, the results showed that of the 45 respondents, 24 respondents had a low level of self-efficacy with a percentage of 53.3%, and 21 respondents had a high level of self-efficacy with a percentage of 46.7 %. Then according to research conducted

(Febyanti, 2022) regarding the relationship between motivation and medication adherence in hypertension sufferers in Jember district, said that there was a significant relationship between motivation and medication adherence in hypertension sufferers.

Similar research has never been carried out at Simpang IV Sipin Health Center. It is hoped that this research can provide information about the level of self-efficacy and medication adherence also determine the relationship between self-efficacy and medication adherence in hypertensive patients at Simpang IV Sipin Health Center.

METHODS

In this research, the type of method used is a quantitative method. The design of this research is observational analytic with a cross sectional design approach, where only one measurement is carried out on respondents (Nursalam, 2020).

The population in this research was hypertension patients at Simpang IV Sipin Health Center with a total of 389 people. The sampling technique in this research uses a purposive sampling technique, namely the technique of determining the sample by conducting an assessment according to the criteria that have been determined by the research (Nursalam, 2020). The criteria in this research include:

A. Inclusion Criteria:

1. Hypertension sufferers who are willing to become respondents
2. Hypertension sufferers aged ≥ 18 years
3. Hypertension sufferers undergoing a hypertension treatment program
4. Hypertension sufferers who took hypertension medication at the research site

B. Exclusion Criteria

1. Hypertension sufferers who have difficulty communicating or have

hearing problems

2. Hypertension sufferers who suffer from complications

Determination of sample size can be calculated using the Slovin formula:

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{389}{1 + 389(0,10)(0,10)}$$

$$n = \frac{389}{4,89}$$

$$n = 79,55$$

$$n = 80$$

Information:

N: population size

n: number of samples

e: significance level (0.10)

Based on calculations using the formula above, the total sample in this study was 80 respondents.

The research was conducted from 27 May 2024 to 11 June 2024 at Simpang IV Sipin Health Center. The data used in this research is primary data namely the Medication Adherence Self Efficacy Scale-Revision (MASES-R) questionnaire as a measuring tool for the level of self-efficacy and the Morisky Medication Adherence Scale-8 (MMAS-8) questionnaire to measure the level of adherence to taking medication which was carried out by interview.

Validity and Reliability

Research regarding the validity and reliability test of the MASES-R questionnaire has been carried out by (Ivana, 2020) with research entitled "Validity and Reliability of the Indonesian Version of the Medication Adherence Self-Efficacy Scale-Revised (MASES-R) Questionnaire in Hypertension Patients". This research was conducted at RSD dr. Soebandi Jember Regency with a sample size of 150 respondents. The tests carried out were in the form of validity tests using the exploratory factor analysis method (KMO value = 0.861; Bartlett's test $p = 0.000$) and reliability tests with a Cronbach alpha value of 0.898. This shows that the Indonesian

version of the MASES-R questionnaire was proven to be valid and reliable.

The MMAS-8 questionnaire is patented for use because it has been validated by WHO. The psychometric properties results show that the Indonesian version of MMAS-8 has validity and reliability with internal consistency reliability results assessed using Cronbach's alpha of 0.824 (Riani et al., 2017). This shows that the Indonesian version of the MMAS-8 questionnaire is declared valid and reliable.

Data processing

According to (Surahman & Rachmat, 2016) there are 4 steps carried out in data processing, including:

1. Editing

Editing is an activity to check the list of questions in the collected questionnaires.

2. Coding

Activities to change questionnaire data from letters into numbers or numbers.

3. Processing

This step is carried out to enter data into the computer using the numeric code from the results of the questionnaire answers.

4. Cleaning

The final step is to double-check the data that has been transferred to the computer.

Data processing the level of self-efficacy and medication adherence is based on answers to questions given to respondents. The instrument used was the MASES-R questionnaire which contained 13 questions about self-efficacy and MMAS-8 questionnaire that contained 8 questions regarding medication adherence. The assessment conditions are as follows:

MASES-R Questionnaire:

1. Very confident answers are given a score of 4
2. Answers that are quite confident are given a score of 3

3. A slightly confident answer is given a score of 2
4. Answers that are not sure at all are given a value of 1

The results of measuring self-efficacy using the MASES-R questionnaire are categorized as follows (Fernandez et al., 2008):

1. Low, if the scoring results are $< \text{mean}$
2. High, if the scoring results are $\geq \text{mean}$

MMAS-8 Questionnaire:

Wrong answers are given a value of 0

The correct answer is given a value of 1

The results of measuring medication adherence using the MMAS-8 questionnaire are categorized as follows (Morisky et al., 2008):

1. Low, if the total score is < 6
2. Moderate, if the total score is 6-7
3. High, if the total score is 8

Data analysis

Data analysis carried out in this research was in the form of univariate analysis and bivariate analysis.

1. Univariate Analysis

Univariate analysis is a descriptive explanation and analysis of the frequency distribution of each variable (Nursalam, 2020). Univariate data in this research consisted of age, gender, level of self-efficacy and adherence to taking medication.

2. Bivariate Analysis

Bivariate analysis was carried out to determine the relationship between self-efficacy and medication adherence in hypertensive patients using statistical tests via the SPSS application. This research uses Kendall's tau-b test to assess the relationship of two variables with an ordinal scale and the strength (correlation coefficient) between variables in correlation analysis. The interpretation of bivariate analysis is that when the p-value in the Sig column (2-tailed) $< \alpha$ value (0.05), then H_0 is rejected so that it can be concluded that there is a significant relationship between the variables studied. However, when the p-value in the Sig

column (2-tailed) $> \alpha$ value 0.05, then H_0 is accepted, which means there is no significant relationship between the two variables being tested (Donsu, 2016).

RESULTS AND DISCUSSION

Univariate Analysis Results

Based on table 1, it shows that of the total 80 respondents in this research, 38 people (47.5%) were categorized as adult and 42 people (52.5%) were categorized as elderly. This shows that the majority of respondents in this research were elderly.

Table 1. Frequency Distribution of Respondents Based on Age

	n	(%)
Adult (19-59 year old)	38	47.5
Elderly (< 60 years old)	42	52.5
Total	80	100

The results obtained are in line with research which states that those aged > 60 years have a 4,76 times higher risk of developing hypertension compared to those aged < 60 years (Sugiharto et al., 2018).

This incident is caused by changes in the structure and function of the peripheral blood vessel system which works as a responsibility for changes in blood pressure in the elderly, whereas in hypertensive sufferers whose at younger age occurs due to unhealthy lifestyles, genetic factors, obesity, and lack of exercise (Aristotle, 2018). From the results of observations, researchers often find that the majority of hypertension patients who come for treatment are elderly people who say they have suffered from hypertension for a long time. This makes sufferers routinely undergo treatment in order to control their disease and avoid the uncomfortable symptoms that arise due to hypertension.

Table 2. Frequency Distribution of Respondents Based on Gender

Gender	n	%
Female	54	67.5
Male	26	32.5
Total	80	100

From the table 2, it can be seen that there were 54 female respondents (67.5%) and 26 male respondents (32.5%). These results are

in line with research (Listiana et al., 2020) which states that the number of female respondents is greater than male respondents. This happens because women experience menopause, where hormonal changes occur so that the hormones estrogen and androgen decrease in ratio which causes increased release of renin, resulting in high blood pressure (Sundari & Bangsawan, 2015).

Table 3. Frequency Distribution Based on Self-Efficacy Level

Self Efficacy	n	%
Low	41	51.3
High	39	48.8
Total	80	100

From the table above, data is obtained that respondents who have a low level of self-efficacy are 41 people (51.3%) and respondents with a high level of self-efficacy are 39 people (48.8%). These results are in line with research conducted by (Khoirunnisa, 2022) which shows that the number of hypertensive patients who have low self-efficacy dominates compared to patients who have high levels of self-efficacy.

Low levels of self-efficacy indicate that sufferers do not have a better understanding of how to undergo the healing process because self-confidence represents an important thing for improving the patient's health status. Meanwhile, a high level of self-efficacy allows sufferers to assess that they are worthy of receiving the best results according to what is expected (Putri & Fakhruddiana, 2019).

From the results of observations during the research, many respondents felt hesitant about undergoing hypertension treatment. This is largely based on respondents' lack of belief in taking hypertension medication for life, only taking hypertension medication if they experience symptoms when their blood pressure rises, stopping taking hypertension medication when they feel healthy, and not being able to make taking hypertension medication a daily routine. Based on research results, it was revealed that the level of self-efficacy possessed by hypertensive patients at

the Simpang IV Sipin Community Health Center was at a low level in their efforts to control their blood pressure and remain stable.

Table 4. Frequency Distribution Based on Level of Medication Adherence

Medication Adherence	n	%
Low	30	37.5
Moderate	24	30.0
High	26	32.5
Total	80	100

Based on data from table 4, out of a total of 80 respondents, 30 people (37.5%) had a low level of medication adherence, 24 people (30%) had a moderate level of medication adherence, and 26 people (32.5%) had high level of medication adherence. This is in line with research conducted by (Rizal, 2022) which shows the low number of hypertensive patients who have a high level of medication adherence.

According to (Nurmalita et al., 2019), non-adherence with hypertension treatment can be the biggest factor in failure of hypertension therapy. Taking hypertension medication is one way to control blood pressure. When the level of adherence with taking medication is low, it means that blood pressure will become increasingly uncontrolled, which can cause complications in other body organs. Therefore, adherence in treating hypertension is an important thing that sufferers must have.

Based on the results of observations made at the research site, many respondents stated that they had difficulty remembering to take hypertension medication, were irregular in taking medication, then only took medication if they felt symptoms when their blood pressure rises and stopped when they felt healthy, and stop taking medication if they feel the side effects from taking hypertension medication without informing or consulting with the doctor. Many people even say that they feel afraid because they have to take hypertension medication for the rest of their lives and refuse to make taking hypertension medication part of their daily routine.

Bivariate Analysis Results

Self Efficacy	Medication Adherence			Total	p-value	Correlation coefficient
	Low	Moderate	High			
Low	30	8	3	41	0.000	0.709
High	0	16	23	39		
Total	30	24	26	80		

Based on the crosstab results in table 5, it can be described that of the total respondents of 80 people, 30 people had low self-efficacy with a low level of medication adherence, 8 people had low self-efficacy with a moderate level of medication adherence, 3 people had low self-efficacy with a high level of medication adherence. Then, at a high level of self-efficacy, there were no respondents who had a low level of medication adherence, 16 people had high self-efficacy with a moderate level of medication adherence, and 23 people had high self-efficacy with a high level of medication adherence.

The bivariate analysis test in the table 5 was carried out using the Kendall's tau b statistical test and obtained a significance value of p-value = 0.000. This means that the P value is $< \alpha 0.05$, so it can be decided that H_0 is rejected and H_a is accepted, which means there is a relationship between self-efficacy and adherence to taking medication in hypertensive patients at Simpang IV Sipin Health Center. The correlation coefficient value from this research was 0.709 so it can be interpreted that there is a strong relationship between self-efficacy and medication adherence and leads to a positive relationship. This means that apart from having a strong relationship between each other, both of them are also moving in a positive direction where the higher the level of self-efficacy they have, the higher their adherence to taking medication.

The results of this research are in line with research conducted by (Kawulusan et al., 2019) and obtained the results using the Fisher's exact statistical test, obtained a P value = $0.000 < 0.05$. Therefore, H_0 is rejected, which means there is a significant relationship between self-efficacy and the level of

treatment compliance in hypertensive patients.

This is in accordance with theory (Bandura, 1982) which states that self-efficacy has a relationship in changing a person's behavior. Confidence or self-efficacy is one of the factors that can influence patient adherence in treating hypertension by regularly taking hypertension medication. If hypertension treatment is not carried out regularly or even stopped, then control of blood pressure will become increasingly uncontrolled, especially as it can cause a decrease in the function of other body organs or complications. Therefore, in order to remain adherence with treatment, hypertension sufferers need to have self-efficacy.

In treating hypertension, self-efficacy is needed because hypertension is a disease that requires lifelong treatment, so if a hypertensive patient has a low level of self-efficacy, it can influence the treatment they are undergoing, as well as thinking about the failure of the treatment which can hinder healing. As a result of a low level of self-efficacy, hypertension sufferers stop taking antihypertensive drugs because they think that hypertension is a disease that cannot be cured, so they choose to live side by side with hypertension and only take antihypertensive drugs when they feel complaints about the impact of their disease (Kauric-Klein et al., 2017).

The results of this study prove that there is a relationship between self-efficacy and medication adherence in hypertensive patients at Simpang IV Sipin Health Center. Apart from that, from interviews and filling out questionnaires, respondents explained that when you have the desire to be healthy even though you suffer from hypertension, you need to believe in yourself that the sufferer is able to control their disease by remaining compliant in undergoing hypertension treatment.

CONCLUSION

Based on the results of research conducted with a total of 80 respondents, it can be concluded that the level of self-efficacy and level of medication adherence in hypertensive patients at Simpang IV Sipin Health Center is at a low level with the number of respondents being 41 people (51.3%) and 30 people (37.5%). The results of the Kendall's tau b statistical test found that there was a significant relationship between self-efficacy and medication adherence in hypertensive patients at the Simpang IV Sipin Health Center also the two variables had a strong relationship and pointed in a positive direction.

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REFERENCES

- Annisa, AFN, & Ansar, J. (2013). Factors Associated with Compliance with Hypertension Treatment in the Elderly at the Pattingalloang Health Center, Makasar City. 1–11.
- Aristotle. (2018). Correlation of Age and Gender with Hypertension in the Emergency Center Unit of the Siti Khadijah Islamic Hospital, Palembang, 2017. 9–16.
- Bandura, A. (1982). Self-efficacy mechanisms in human agency. *American Psychologist*, 37(2), 122–147. <https://doi.org/10.1037/0003-066X.37.2.122>
- Jambi Provincial Health Office. (2022). Jambi Province Health Profile. *Journal of Chemical Information and Modeling*, 192.
- Donsu, J. D. T. (2016). *Nursing Research Methodology*. Yogyakarta; New Library Press.
- Febyanti, AV (2022). The Relationship between Motivation and Compliance with Medication in Hypertension Patients at the Summersari Community Health Center.
- Fernandez, S., Chaplin, W., Schoenthaler, A.M., & Ogedegbe, G. (2008). Revision and Validation of the Medication Adherence Self-Efficacy Scale (MASES) in Hypertensive African Americans. *Journal of Behavioral Medicine*, 31(6), 453–462.
- Ivana, F.N. (2020). Validity and Reliability of the Indonesian Version of the Medication Adherence Self-Efficacy Scale Revised (Mases-R) Questionnaire in Hypertension Patients. i–64.
- Kauric-Klein, Z., Peters, R. M., & Yarandi, H. N. (2017). Self-Efficacy and Blood Pressure Self-Care Behaviors in Patients on Chronic Hemodialysis. *Western Journal of Nursing Research*, 39(7), 886–905. <https://doi.org/10.1177/0193945916661322>
- Kawulusan, KB, Katuuk, ME, & Bataha, YB (2019). The Relationship between Self-Efficacy and Compliance with Taking Hypertension Medication at the Ranotana Weru Community Health Center, Manado City. *Journal of Nursing*, 7(1), 1–9. <https://doi.org/10.35790/jkp.v7i1.24340>
- Khoirunnisa, R. (2022). Description of Self Efficacy in Sufferers. *Nursing Science Study Program, Faculty of Health Sciences, Muhammadiyah University, Surakarta*.
- Kusumadayanti, HY, Hamim, N., & Sunanto. (2023). The relationship between family support and blood pressure control behavior in hypertension sufferers at the Kanigaran Community Health Center, Probolinggo City. *Journal of Health*

- Sciences: Mandiraa Cendikia, 2(10), 514–523.
- Listiana, D., Effendi, S., & Saputra, YE (2020). Factors Associated with Compliance of Hypertension Sufferers in Undergoing Treatment at Karang Dapo Community Health Center, Muratara Regency. *Journal of Public Health*, 8(1), 11–22. <https://doi.org/10.37676/jnph.v8i1.1005>
- Martin, L.R., Feig, C., Maksoudian, C.R., Wysong, K., & Faasse, K. (2018). A perspective on nonadherence to drug therapy: Psychological barriers and strategies to overcome nonadherence. *Patient Preference and Adherence*, 12, 1527–1535. <https://doi.org/10.2147/PPA.S155971>
- Morisky, D. E., Ang, A., Krousel-Wood, M., & Ward, H. J. (2008). Predictive Validity Of A Medication Adherence Measure In An Outpatient Setting. *The Journal of Clinical Hypertension*, 10, 348–354. <https://doi.org/doi:10.1111/j.1751-7176.2008.07572.x>
- Mulyana, H., & Irawan, E. (2019). Description of the Self-Efficacy of Hypertension Sufferers in One of the Community Health Centers in the City of Bandung. *Indonesian Community Health Journal*, 15(1). <https://doi.org/10.37058/jkki.v15i1.988>
- Novitasari, R. (2017). The Relationship between Self-Efficacy and Patient Compliance at the Patrang Community Health Center, Jember Regency. In *Digital Repository, University of Jember*.
- Nurmalita, V., Annisaa, E., Pramono, D., & Sunarsih, ES (2019). Relationship between Adherence to Taking Antihypertensive Medication and Quality of Life in Hypertensive Patients. 8(4), 1366–1374.
- Nursalam. (2020). *Concepts & Application of Research Methodology* (Ed. 5). Salemba Medika.
- Putri, FAR, & Fakhruddiana, F. (2019). Self-Efficacy. *JPK (Journal of Special Education)*, 14(1), 1–8. <https://doi.org/10.21831/jpk.v14i1.25161>
- Riani, DA, Ikawati, Z., & Kristina, SA (2017). Validation of the Indonesian Version of the 8-Item Morisky Medication Adherence Scale in Adult Hypertension Patients at Community Health Centers in Sleman Regency and Yogyakarta City Defilia Anogra Riani, Prof. Zullies Ikawati., Ph.D., Apt.;Dr. Susi Ari Kristina, S. Farm., M. Kes., Apt. UGM Repository, xiii–xiv.
- Rizal. (2022). Relationship between levels of compliance with the use of antihypertensive drugs in primary and advanced health facilities. *Journal of Science and Health*, 6(1), 37–45. <https://doi.org/10.57214/jusika.v6i1.94>
- Sari, CY (2019). Factors that Influence the Recovery of TB Sufferers in the Medan City Health Service Work Area 2017. 2(1), 6–12.
- Sugiharto, A., Hadisaputro, S., Adi, S., & Chasani, S. (2018). Risk Factors for Grade II Hypertension in Communities in Karanganyar Regency. 26.
- Sundari, L., & Bangsawan, M. (2015). Factors Associated with the Incident of Hypertension.
- Surahman, & Rachmat, M. (2016). *Research Methodology* (1st Editio). PPSDM Agency.

THE RELATIONSHIP BETWEEN THE LEVEL OF KNOWLEDGE AND COMPLIANCE WITH THE USE OF TYPE 2 DIABETES MELLITUS DRUGS AT THE PUTRI AYU HEALTH CENTER, JAMBI CITY IN THE PERIOD JANUARY – MARCH 2024

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ABSTRACT

Background: Diabetes mellitus is a non-communicable disease that is still the most widely suffered disease. Adherence to medication in people with diabetes mellitus is important for the success of therapy and the patient's quality of life. One of the factors that affect compliance is the patient's knowledge of diabetes mellitus. This study aims to determine the relationship between patient knowledge and the level of compliance with the use of type 2 diabetes mellitus drugs at the Putri Ayu Health Center.

Method: The method of this research is cross sectional. The population in this study is all type 2 diabetes mellitus patients who are treated at the Putri Ayu Health Center. The sample in this study was 83 people and the sampling method using the purposive sampling. The data analysis used was univariate analysis and bivariate analysis using the chi-square statistical test.

Results: The results of this study showed that there was a relationship between the level of knowledge and the level of compliance with the use of type 2 diabetes mellitus drugs at the Putri Ayu Health Center with a p value of 0.037 (<0.05). Knowledge with a good category was 39 respondents (47.0%) and high compliance was 36 respondents (43.4%).

Conclusion: There is a relationship between the level of knowledge and the level of drug adherence in patients with type 2 diabetes mellitus at the Putri Ayu Health Center, Jambi City. The researcher suggested that the Health Center should be able to provide more motivation to patients to be able to be obedient in taking medication and know the importance of taking medication by conducting counseling to people with diabetes mellitus.

Keywords: Knowledge, Compliance, Type 2 Diabetes Mellitus.

INTRODUCTION

One of the chronic diseases that is still suffered by many is diabetes mellitus. According to data from the World Health Organization (WHO) in 2014, the prevalence of diabetes mellitus is 8.5%, which affects 422 million people worldwide (WHO, 2016). Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia, which can result from disturbances in insulin action, insulin secretion, or even both (PERKENI, 2021). According to the International Diabetes Federation about 90% of diabetes mellitus cases worldwide are type 2 diabetes. Type 2

diabetes mellitus is a type of diabetes that is widely suffered. Ranked fifth after China, India, Pakistan, and the United States, Indonesia is one of the countries with the largest percentage of diabetics (IDF, 2021). According to the doctor's diagnosis, the prevalence of diabetes mellitus in Indonesia is 2.0% among those who are ≥ 15 years old. According to the doctor's diagnosis, in Jambi province the prevalence of diabetes mellitus in the population aged ≥ 15 years is 1.4% (Risksdas, 2018).

Adherence to a treatment regimen is defined as the extent to which the patient is taking medications that have been recommended by the healthcare provider by

following the instructions provided by the medical professional. Patient compliance is often expressed as a percentage of the overall total medication taken each day and the duration of the medication taken over a given period of time (Osterberg & Blashke, 2005). Knowledge is one aspect that can affect compliance. Having an understanding of diabetes is very important for sufferers to know behaviors that can reduce the risk of complications. Proper and accurate information will help patients understand their condition. People with diabetes mellitus need to know health information related to therapy and the impact of not following the recommended treatment. The better the patient knows about his disease, the better his compliance with treatment will be (Munandar, 2019). To encourage patient adherence to therapy, patients and families need to get information and education about disease history as well as prevention and treatment of diabetes mellitus.

Non-compliance with treatment can result in uncontrolled blood sugar levels that can lead to complications and other diseases. Optimal diabetes management is essential to prevent complications in patients with diabetes mellitus. This can include controlling blood sugar levels, taking medication as prescribed, and adhering to therapy. Based on research that has been conducted (Mokolomban et al., 2018) Of the 45 patients, 18 patients (37.78%) were compliant with treatment, while 27 patients (62.22%) were not compliant with treatment. Based on research conducted by (Marito & Lestari, 2021), it can be concluded that the higher the level of knowledge, the higher the patient's compliance, and vice versa.

METHOD

This research method is cross sectional which is carried out using a questionnaire about knowledge and a compliance questionnaire using MMAS-8 (Morisky

Medication Adherence Scale-8). This research was conducted at the Putri Ayu Health Center, Jambi City. The sample in this study was 83 respondents with type 2 diabetes mellitus patients with a sampling technique, namely purposive sampling. The data analysis used was univariate analysis and bivariate analysis using the chi-square statistical test.

RESULTS AND DISCUSSION

Frequency Distribution of Respondent Characteristics

The results of respondent characteristics describe the characteristics of respondents by gender, age, education and occupation. The results of univariate analysis of the respondents' demographic data are as follows:

Table 1. Characteristics of Respondents

Characteristic	Frequency	Percentage (%)
Gender		
Man	27	32,5
Woman	56	67,5
Total	83	100,0
Age		
46 – 56 years old	3	3,6
56 – 65 years old	45	54,2
≥ 65 years old	35	42,2
Total	83	100,0
Education		
Elementary School	29	34,9
Junior High School	14	16,9
Senior High School	28	33,7
College	12	14,5
Total	83	100,0
Work		
Housewife	32	38,6
Self employed	14	16,9
Civil servants	7	8,4
Private Employees	3	3,6
Not Working	27	32,5
Total	83	100,0

Based on Table 1, it can be seen that most of the respondents are women, namely 56 respondents (67.5%) while for male respondents there are 27 people (32.3%). Based on this data, the majority of type 2 diabetes mellitus patients are women. According to (Komariah & Rahayu, 2020), Compared to the male gender, women are more at risk of developing type 2 diabetes mellitus. In addition, the aging process associated with premenstrual syndrome or postmenopausal affects the body's ability to work, which ultimately affects insulin

function, so glucose cannot enter the body and be burned into energy. The results of this study are also in line with the research (Meidikayanti & Wahyuni, 2017) that of the 50 respondents, 42 respondents (84%) of them were women, the decrease in the hormone estrogen, especially during menopause, is one of the causes of many women suffering from type 2 diabetes mellitus. The hormones estrogen and progesterone have the ability to increase the insulin response in the blood. Low levels of the hormones progesterone and estrogen cause a reduced insulin response during menopause.

Based on Table 1, the majority of respondents were in the age range of 56 to 65 years, namely 45 respondents (54.2%). These results are in accordance with research conducted by (Nasution et al., 2021) that of the 23 respondents with diabetes mellitus, 21 respondents (91.3%) were in the age group ≥ 45 years. According to (Wicaksono, 2011) states that people ≥ 45 years old have a 9 times higher risk of developing type 2 diabetes mellitus compared to people ≤ 45 years old. Individuals ≥ 45 years of age have a higher risk of developing diabetes mellitus and glucose intolerance, which is caused by degenerative factors, which is a decrease in the body's function to metabolize glucose.

Based on table 1, the results of research based on education show that respondents with the last education of elementary school are 29 respondents (34.9%), the last education of junior high school is 14 respondents (16.9%), the last education of high school is 28 respondents (33.7%) and the last education of college is 12 respondents (14.5%). From the results of this study, the majority of respondents took their last elementary education. The results of this study are also in line with the research (Nugroho & Sari, 2020) with the results of 111 respondents, the majority of respondents took their last elementary school education which amounted to 40 respondents (36.0%). According to

(Nugroho & Sari, 2020) Patients who are more educated understand more about diabetes and its effects on health, thus, sufferers will have a positive attitude and try to keep blood sugar levels stable. According to (Notoatmodjo, 2007) A person with a higher education will have better knowledge than a person with a lower education.

Based on Table 1, the majority of respondents' jobs were housewives (IRT), which amounted to 32 respondents (38.6%). These results are in accordance with research from (Naba et al., 2021) namely with diabetic melitus respondents who are the majority of housewives (IRT) with a total of 205 people (42.04%). A person's activities inside and outside the home are related to their work. Housewives spend more time doing activities at home and receive more rest time than those who do activities outside the home, so the food consumed cannot be converted into energy properly and leads to the accumulation of carbohydrates, both of which can lead to obesity and the appearance of diabetic (Naba et al., 2021).

Frequency Distribution of Respondents' Knowledge Levels

Table 2. Frequency Distribution of Respondents' Knowledge Levels

Knowledge	Frequency	Percentage
Good	39	47,0
Enough	19	22,9
Less	25	30,1
Total	83	100,0

Based on the table, respondents with good knowledge amounted to 39 people (47.0%), 19 people (22.9%) had enough knowledge, and 25 people (30.1%) had less knowledge. Respondents who had good knowledge had a better understanding of diabetes mellitus, such as the symptoms of diabetes mellitus, risk factors, and causes of diabetes mellitus. The results of this study are in line with the research (Fania & Kumala, 2019) of the 47 respondents, 22 respondents (46.8%) had good knowledge, that the higher the level of knowledge, the higher the influence on a person's compliance with treatment standards. A proper understanding of the disease will

encourage patients to perform better treatment management. Patients will be more compliant with therapy and follow the instructions of healthcare workers if they have the knowledge. Lack of knowledge will affect a person's lifestyle, thereby increasing blood sugar levels (Arfania et al., 2023).

Frequency Distribution of Responen Compliance Levels

Table 3. Frequency Distribution of Responen Compliance Levels

Compliance	Frequency	Percentage
High	36	43,4
Moderate	17	20,5
Low	30	36,1
Total	83	100,0

Based on the table, it shows that of the 83 respondents, 36 people (43.4%) have high compliance, 17 people (20.5%) have moderate compliance, and 30 people (36.1%) have low compliance. Respondents with high compliance always take medication regularly and comply with the doctor's recommendation to always take medication or when on a long trip, the patient will always carry medication. The results of this study are in line with the results of the research (Fania & Kumala, 2019) the results of high compliance were obtained by 31 people (66%), and low compliance by 16 people (34%).

To avoid complications and achieve the goals of therapy effectively, adherence to medication is essential for people with diabetes mellitus. Proper and effective therapy is very beneficial, especially for those who need to take medication for a long period of time, non-adherence to medication can increase the risk and worsen the condition (Fania & Kumala, 2019). Patient compliance actions are actions taken by people with type II diabetes mellitus to carry out their obligation to take medication according to the prescribed schedule and dosage (Bulu et al., 2019).

The Relationship Between the Level of Knowledge and Compliance with the Use of Type 2 Diabetes Melitus Drugs

Table 4 The Realtionship Between the Level of Knowledge and Compliance with the Use of Type 2 Diabetes Melitus Drugs

Knowledge	Compliance							p-value	
	High		Moderate		Low		Total		
	N	%	N	%	N	%	N		%
Good	22	56.4	6	15.4	11	28.2	39	100.0	0.037
Enough	7	36.8	7	36.8	5	26.3	19	100.0	
Less	7	28.0	4	16.0	14	56.0	25	100.0	
Total	36	43.4	17	20.5	30	36.1	83	100.0	

Based on Table 4, the results show that of 83 respondents who have good knowledge as many as 39 respondents, 36 respondents have high compliance and respondents who have good knowledge with a high level of compliance are 22 people (26.5%) and in the results of the chi-square statistical test, a p-value = 0.037 is obtained. This shows that there is a relationship between knowledge and compliance with the use of type 2 diabetes mellitus drugs because the p value is no more than α (0.05).

These results are in accordance with research by (Marito & Lestari, 2021) that there was a meaningful relationship between the level of knowledge and adherence to the treatment of type 2 diabetes mellitus. People with diabetes mellitus who have good knowledge about the disease can better control their blood sugar levels and avoid potential complications by increasing their adherence to taking medication on time and regularly (Sevani et al., 2024). Knowing that knowledge is one of the factors that affect treatment adherence, it is very important to provide comprehensive information about diabetes mellitus to improve treatment adherence, reduce the risk of complications and disease severity, and help control blood sugar (Nazriati et al., 2018).

Patients with diabetes mellitus can control their blood sugar by adhering to a predetermined treatment regimen, as non-adherence to medication can have an impact on blood sugar levels (Nanda et al., 2018). Patients with type II diabetes mellitus who carry out the obligation to take medication

according to the prescribed schedule and dosage are referred to as patients who comply with treatment. Good and appropriate medication compliance will be very beneficial for patients, both in terms of health and recovery from the disease suffered. It is very important for type II diabetes mellitus patients to achieve treatment goals and be effective in preventing various complications of diabetes mellitus (Bulu et al., 2019).

Knowledge can also be obtained through information and counseling media, which is expected to increase awareness of medication adherence, in addition to formal education. It is expected that increased knowledge about treatment through socialization will result in a higher level of compliance. Low levels of knowledge and compliance can increase the risk of complications and increase the cost of diabetes care (Ningrum, 2017).

CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that there is a relationship between the level of knowledge and the level of compliance with the use of type 2 diabetes mellitus drugs at the Putri Ayu Health Center with a p value of 0.037.

REFERENCES

- Arfania, M., Aulia, P., & Gunarti, N. S. (2023). HUBUNGAN PENGETAHUAN DAN Sikap Terhadap Kepatuhan Minum Obat Diabetes Melitus Pasien Geriatri Di Puskesmas Karawang. *Majalah Farmasi Dan Farmakologi*, 22, 1–30. <https://doi.org/10.20956/Mff.Speciali> ssue.
- Bulu, A., Wahyuni, T. D., & Sutriningsih, A. (2019). Hubungan Antara Tingkat Kepatuhan Minum Obat Dengan Kadar Gula Darah Pada Pasien Diabetes Melitus Tipe Ii. *Ilmiah Keperawatan*, 4(1), 181–189.
- Fania, A., & Kumala, A. (2019). *Hubungan Tingkat Pengetahuan, Kepatuhan Minum Obat, Dan Kadar Gula Darah Puasa Pasien Diabetes Melitus Di Puskesmas X Kabupaten Batang*. 02, 4–7.
- International Diabetes Federation (Idf). (2021). *International Diabetes Federation Atlas 10th Edition*.
- Komariah, K., & Rahayu, S. (2020). Hubungan Usia, Jenis Kelamin Dan Indeks Massa Tubuh Dengan Kadar Gula Darah Puasa Pada Pasien Diabetes Melitus Tipe 2 Di Klinik Pratama Rawat Jalan Proklamasi, Depok, Jawa Barat. *Jurnal Kesehatan Kusuma Husada, Dm*, 41–50. <https://doi.org/10.34035/Jk.V11i1.412>
- Marito, R., & Lestari, I. C. (2021). Hubungan Antara Tingkat Pengetahuan Dengan Tingkat Kepatuhan Minum Obat Pasien Diabetes Melitus Tipe 2. *Jurnal Kedokteran Ibnu Nafis*, 10(2). <https://doi.org/10.30743/Jkin.V10i2.180>
- Meidikayanti, W., & Wahyuni, C. U. (2017). Hubungan Dukungan Keluarga Dengan Kualitas Hidup Diabetes Melitus Tipe 2 Di Puskesmas Pademawu. *Jurnal Berkala Epidemiologi*, 5(2), 240–252. <https://doi.org/10.20473/Jbe.V5i2.2017.240-252>
- Mokolomban, C., Wiyono, W. I., & Mpila, D. A. (2018). Kepatuhan Minum Obat Pada Pasien Diabetes Melitus Tipe 2 Disertai Hipertensi Dengan Menggunakan Metode Mmas-8. *Pharmacon*, 7(4).
- Munandar, P. A. (2019). *Studi Kasus Kepatuhan Minum Obat Pada Pasien Tb Paru Di Puskesmas Keputih Surabaya*.
- Naba, O. S., Adu, A. A., & Tedju Hinga, I. A. (2021). Gambaran Karakteristik Pasien Diabetes Melitus Di Wilayah Kerja Puskesmas Sikumana Kota Kupang. *Media Kesehatan Masyarakat*, 3(2), 186–194. <https://doi.org/10.35508/Mkm.V3i2.3468>

- Nanda, O. D., Wiryanto, B., & Triyono, E. A. (2018). Hubungan Kepatuhan Minum Obat Anti Diabetik Dengan Regulasi Kadar Gula Darah Pada Pasien Perempuan Diabetes Mellitus. *Amerta Nutrition*, 2(4), 340. <https://doi.org/10.20473/Amnt.V2i4.2018.340-348>
- Nasution, F., Andilala, & Siregar, A. A. (2021). Faktor Risiko Kejadian Diabetes Mellitus. *Jurnal Ilmu Kesehatan*, 6(1), 51–66.
- Nazriati, E., Pratiwi, D., & Restuastuti, T. (2018). Pengetahuan Pasien Diabetes Melitus Tipe 2 Dan Hubungannya Dengan Kepatuhan Minum Obat Di Puskesmas Mandau Kabupaten Bengkalis. *Majalah Kedokteran Andalas*, 41(2), 59. <https://doi.org/10.25077/Mka.V41.I2.P59-68.2018>
- Ningrum, D. K. (2017). Kepatuhan Minum Obat Pada Penderita Diabetes Melitus Tipe II Deskasari. *Higeia Journal Of Public Health Research And Development*, 1(3), 84–94.
- Notoatmodjo, S. (2007). *Promosi Kesehatan Dan Ilmu Perilaku*. Rineka Cipta.
- Nugroho, P. S., & Sari, Y. (2020). Hubungantingkat Pendidikan Dan Usia Dengan Kejadian Diabetes Melitus Di Wilayah Kerja Puskesmas Palaran Tahun 2019. *Jurnal Dunia Kesmas*, 8(4), 1–5. <https://doi.org/10.33024/Jdk.V8i4.2261>
- Osterberg, L., & Blashke, T. (2005). Adherence To Medication. *New England Journal Of Medication*, 487–497.
- Perkeni. (2021). *Pedoman Pengelolaan Dan Pencegahan Diabetes Melitus Tipe 2 Dewasa Di Indonesia 2021*. Pb Perkeni.
- Riskesdas. (2018). *Laporan Riskesdas 2018 Nasional*. Lembaga Penerbit Badan Penelitian Dan Pengembangan Kesehatan.
- Sevani, A., Mutmainna, A., & Anisa, R. N. (2024). *Hubungan Pengetahuan Dengan Kepatuhan Pengobatan Pada Penderita Diabetes Melitus Tipe 2 Di Wilayah Kerja Puskesmas Antang Kota Makassar*. 4, 108–114.
- Who. (2016). *Global Report On Diabetes. World Health Organization*.
- Wicaksono, R. P. (2011). Faktor-Faktor Yang Berhubungan Dengan Kejadian Diabetes Melitus Tipe 2 (Studi Kasus Di Poliklinik Penyakit Dalam Rumah Sakit Dr. Kariadi Semarang). *Majority*, 5(2), 27–31.

HEALTH PROMOTION USING MOZZLE HEALTH (MONOPOLY PUZZLE HEALTH) TOWARDS INCREASE KNOWLEDGE AND ATTITUDES ABOUT DIABETES MELLITUS PREVENTION ON ELEMENTARY SCHOOL STUDENTS IN JAMBI CITY

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ABSTRACT

Background: Diabetes mellitus (DM) is a chronic metabolic disease caused when the body is unable to produce insulin or has too little insulin, resulting in ineffective energy metabolism and dangerously high blood sugar levels. The purpose of the study was to determine the effect of health promotion using MOZZLE HEALTH (Monopoly Puzzle Health) media on increasing knowledge and attitudes about diabetes mellitus prevention in grade V students of SDN 42/IV Jambi City.

Method: Pre-Experimental with One Group Pre-Test Post-Test Design research design. The sample of this study is grade V students of SDN 42/IV Jambi City with a total population of 73 students. The sampling method is the Simple Random Sampling Technique. The analysis used in this study is the Willcoxon Test. The focus of this study is to examine the effect of health promotion using mozzle health media on increasing knowledge and attitudes about diabetes mellitus prevention in students of SDN 42/IV Jambi City. The variables studied were knowledge and attitude.

Result: The results of the study obtained data that health promotion using Mozzle Health media was effective in increasing knowledge and attitudes about diabetes mellitus prevention in grade V students of SDN 42/IV Jambi City.

Conclusion: The conclusions obtained are health promotion using Mozzle Health media is effective in increasing knowledge and attitudes about diabetes mellitus prevention in students.

Keywords: Knowledge, Attitude, Diabetes Mellitus, Mozzle Health

INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disease caused by the body's inability to produce insulin or a small amount of insulin so that the energy metabolism process is ineffective, causing blood sugar levels to increase and be dangerous (Ramdanila, 2023). IDAI (Indonesian Pediatrician Association) noted that there are 1,645 children with diabetes mellitus spread across 13 cities in Indonesia, namely Jakarta, Bandung, Surabaya, Malang, Semarang, Yogyakarta, Solo, Denpasar, Palembang, Padang, Medan, Makassar and Manado. Nearly 60% of sufferers are girls. Meanwhile, based on age, 46 were aged 10-14 years, and 31 aged 14 years and over (Putra et al., 2021). If this condition is left unchecked, the nation's

future generations will experience high rates of morbidity which will have an impact on the level of productivity of the Indonesian state and nation in the future. The prevalence of Diabetes Mellitus in Indonesia has increased due to a shift from non-communicable diseases to non-communicable diseases due to changes in disease patterns related to lifestyle (IDAI, 2017: Putra et al., 2022).

The results of the Jambi Province Riskesdas (Balitbangkes RI, 2018) showed that the prevalence of diabetes mellitus based on a doctor's diagnosis at the age of ≥ 15 years according to the Regency / City of Jambi Province was 2,674 patients (2.02%). In this case, of the 2 cities and 9 districts in Jambi Province, Jambi City has the highest prevalence of diabetes mellitus. Diabetes mellitus cases in Jambi City are still high.

Based on data from the Jambi City Health Service, it is known that diabetes mellitus data shows that the number of sufferers in 2018 was 5,245 people, then increased in 2019 to 8,202 people and in 2020 as many as 7,179 people (Meylani, 2023). Based on data on the 10 most common diseases at the Rawasari Community Health Center, Rawasari Village, Jambi City, in 2023, there were 2,596 Diabetes Mellitus sufferers. Part of the reason for the increase in the number of diabetes mellitus sufferers is due to a lack of knowledge about preventing diabetes mellitus. (Notoatmodjo Soekijo, 2014) states that knowledge will raises awareness and will cause people to behave in accordance with the knowledge they have. Thus, the level of children's knowledge regarding diabetes mellitus is an important point in children's behavior in knowing how to prevent diabetes mellitus.

Nasriyah et al., (2021) said that food consumption in the form of snacks often occurs in the school environment. Street food according to the Food and Agricultural Organisation (FAO) is food and beverages sold by street vendors on the streets or in crowds that are eaten directly without further processing or preparation. The Food and Drug Supervisory Agency stated that (78%) school children consume snacks in the school environment. This is reinforced by the finding that most schools have school canteens and some schools still allow mobile food vendors to sell in the school environment. Snacks sold in schools do not necessarily guarantee their nutritional content and safety. Children's food intake greatly influences children's health, especially children's nutritional status. The health of school children is a priority at this time. Good nutrition is needed for optimal growth and development of children with diabetes mellitus, and to prevent acute & chronic complications (IDAI, 2017). According to (Ismayati et al., 2021) children spend most of their time at school, therefore the development of a healthy environment

and the adoption of health-promoting behaviours need to be provided in schools. School student interventions are carried out with the aim that learning about diabetes mellitus prevention can be implemented as early as possible to increase students' knowledge about the importance of maintaining health, especially diabetes mellitus prevention and behaviour in choosing healthy snacks.

For elementary school age children, learning while playing is an effective method that can be used to increase knowledge. A game is an activity that is fun and is done of one's own free will, without coercion, with the aim of getting pleasure while playing. There is a need for easy and fun educational media using game-based educational media, such as puzzle and monopoly where health messages or knowledge can be expressed in the game so that children are more enthusiastic in receiving health education material (Dwi Permata, 2020). Alternative educational media in the form of media Mozzle Health (Monopoly Puzzle Health) or called monopoly puzzle health is designed to improve children's understanding, especially elementary school students, in elementary school research.

It is hoped that with this research student can be motivated and increase students' knowledge and attitudes towards preventing diabetes mellitus and can apply it in everyday life. Based on the background of the problem, there is still a lack of knowledge and attitudes of students towards preventing diabetes mellitus, the questions in this research are: Is there an influence on health promotion using the media? mozzle health towards increasing knowledge and attitudes about preventing diabetes mellitus in fifth grade students at SDN 42/IV Jambi City in 2024. The purpose of this study was to determine the effect of health promotion using mozzle health media on increasing knowledge and attitudes about the prevention of diabetes mellitus in class V students of SDN 42 / IV Jambi City in 2024

with the following description to determine the average value of knowledge and attitudes about the prevention of diabetes mellitus in children before and after being given a puzzle health monopoly game (MOZZLE HEALTH) in elementary school students and to determine the effect of puzzle health monopoly media (MOZZLE HEALTH) on the knowledge and attitudes of elementary school children.

METHODS

This research is a quantitative study with a pre-experimental method and a one group pre-test and post-test design. Univariate and bivariate analyses were conducted to study the relationship between 2 variables, namely the independent variable and the dependent variable. This test is also used to test the average difference of each variable between before being given an intervention using Mozzle Health media and after being given an intervention using Mozzle Health media. To determine the effect of health promotion with Mozzle Health media on knowledge and attitudes towards diabetes mellitus prevention, it was tested using the Shapiro Wilk statistical test using the SPSS programme, using the condition that the data was normally distributed. The significance value of the Shapiro Wilk statistical test, if the significance value is > 0.05 ($p > 0.05$) then the data is in normal distribution and if the data is not normally distributed then the test used with the Wilcoxon test. The results of the analysis show that there is an effect of health promotion with Mozzle Health media on knowledge and attitudes, if the p value < 0.05 and is not effective if the p value > 0.05 (Notoatmodjo, 2018).

RESULTS AND DISCUSSION

Differences in knowledge of diabetes mellitus prevention before and after intervention

Table 1. Average value of knowledge about diabetes mellitus pre-test and post-test by using media mozzle health

Variable		Intervention	Mean	Std. Deviation	Min-Max
Knowledge of Diabetes Mellitus	Media Mozzle Health	Pre-test	4.84	1.381	1-7
		Post-test	9.80	.457	8-10

Source: Primary Data (2024)

Knowledge before being given health promotion using the media Mozzle Health regarding the prevention of Diabetes Mellitus (Pre Test) mean value 4.84 and after being given health promotion using the media Mozzle Health on the prevention of diabetes mellitus (Post-Test) the mean value increased to 9.80.

In line with research entitled MOLEGI conducted by (Hutami et al., 2019) There was an increase in the average score of knowledge of grade IV students after being given the MOLEGI game media with a pre-test score (64.11) after the post-test to (82.94). The results of this study are supported by research (Hutami et al., 2019) which states that there is an increase in the average score of knowledge of grade IV students about oral health after being given the application of MOLEGI (Monopoly Puzzle Gigi) media as an educational media with an increase in student scores of 29.4% at SD Negeri 1 Bumi.

Table 2. Normality Test Results for Diabetes Mellitus Knowledge Pre-test and Post-test Class V Students of SDN 42/IV Jambi City

Knowledge of Diabetes Mellitus	Shapiro Wilk		
	Statistic	Df	Sig.
Pre-Test	.933	45	.012
Post-Test	.402	45	.000

Source: Primary Data (2024)

This research uses a data normality test Shapiro Wilk because the number of respondents was less than 100 respondents. Then the researcher used a test Willcoxon

because the data is not normally distributed with signed rank-test earned value $p = 0,000 \leq 0,05$ with a confidence level of 95%, then H_0 is rejected, which means there is an influence of health promotion using the media Mozzle Health towards increasing knowledge about preventing diabetes mellitus in class V students of SDN 42/IV Jambi City in 2024.

Table 3. Results willcoxon Knowledge of Diabetes Mellitus (n=100)

Variable	Median (min-max)	p
Knowledge of Diabetes Mellitus before the Mozzle Health promotion	5(1-7)	0.000
Knowledge of Diabetes Mellitus after the Mozzle Health promotion	10(8-10)	

Source: Primary data (2024)

From the Wilcoxon test, it is known that the amount of increase between the pre-test and post-test in students is 4.96. From the results of the Willcoxon test, it shows that 45 subjects have increased knowledge about the prevention of diabetes mellitus, there is a difference of 0.016 and p 0.000, it can be concluded that there are differences in the results of knowledge about the prevention of diabetes mellitus before and after treatment using Mozzle Health media.

Based on the results of research (Hutami et al., 2019) on the application of the MOLEGI (Monopoly Puzzle Gigi) game as a medium for dental and oral health education for students of SDN 1 Bumi, after being given health education using MOLEGI, the results of students pre-test and post-test scores were obtained which showed an increase in student scores before and after the game was played.

So that the results of data analysis show a value ($p < 0.05$) which shows that MOLEGI is able to increase students' knowledge about oral health. So, monopoly and puzzle media are effective and can be used as an alternative educational media based on existing data, student knowledge increases after playing.

Based on these results, it can be seen that there was an increase in the knowledge of class V students at SDN 42/IV Jambi City

after being given health promotion treatment using media. Mozzle Health (Monopoly Puzzle Health). So, monopoly and puzzle media are effective and can be used as alternative educational media based on existing data, students' knowledge increases after playing.

Differences in diabetes mellitus prevention attitudes before and after the intervention

Table 4. Average value of pre-test and post-test Diabetes Mellitus prevention attitudes using Mozzle Health media for fifth grade students of SD Negeri 42/IV Jambi City

Variable	Intervention	Mean	Std. Deviation	Min-Max
Diabetes Mellitus prevention attitudes	Media Mozzle Health	Pre-test 26.56 Post-test 48.67	2.149 1.446	21-31 46-50

Source: Primary Data (2024)

Based on table 4, it shows that the total pre-test value is 26.56 and the post-test value is 48.67. This means that systematically indicates that there is an increase in attitudes about preventing diabetes mellitus before and after being given health treatment using Mozzle Health media for fifth grade students of SD Negeri 42/IV Jambi City.

It can be seen that after being given health promotion using Mozzle Health media about preventing diabetes mellitus, the respondent's attitude has increased by 22.11. In a similar study, there was a change in the number of knowledge scores, attitudes and actions of fifth grade students after being given a nutrition puzzle promotion towards increasing knowledge, attitudes and actions about balanced nutrition. In research entitled the effect of counseling using nutritional puzzle promotional media on balanced nutritional behavior in class V students at SDN 6 Poasia, Kendari City (Hikmawati et al., 2016).

Table 5. Results of the normality test for diabetes mellitus prevention attitudes pre-test and post-test in class V students SDN 42/IV Jambi City

Diabetes Mellitus prevention attitudes	Shapiro Wilk		
	Statistic	Df	Sig.
Pre-test	.943	45	.027
Post-Test	.805	45	.000

Source: Primary Data (2024)

When carrying out a bivariate test, normality is first carried out and statistical tests are used Shapiro Wilk, shows that the statistical test results Shapiro Wilk, obtained a significant value of attitude regarding the prevention of diabetes mellitus at that time pre-test and post-test, each < 0.05 . This means that attitude data regarding the prevention of diabetes mellitus at the time pre-test and post-test not normally distributed. Therefore, statistical difference tests are used Willcoxon (table 6).

Based on the table above the test results Willcoxon showed that 45 subjects experienced an increase in attitudes about preventing diabetes mellitus, there was a difference of 0.041 and a p 0.000, so it can be concluded that there was a difference in the results of attitudes about preventing diabetes mellitus before and after treatment was given using media. Mozzle Health.

Table 6. Results willcoxon Diabetes Mellitus prevention attitude

	mean (Min-Max)	P
Attitude of Diabetes Mellitus before the Mozzle Health promotion	26(21-31)	0.000
Attitude of Diabetes Mellitus before the Mozzle Health promotion	49(46-50)	

Source: Primary Data (2024)

The increase in attitudes that occurred in the subjects was probably caused by the knowledge gained which was able to give rise to understanding and confidence in their needs as subjects who must have knowledge and attitudes about preventing diabetes mellitus. Apart from that, changes in the subject's attitude after treatment were due to the media Mozzle Health (Monopoly Puzzle Health) which is used is easy to understand and fun, not only increases knowledge but also has an effect on the subject's attitude and will motivate them to take steps to prevent diabetes mellitus. Therefore, it can be concluded that there is an influence of health promotion using the media Mozzle Health

(Monopoly Puzzle Health) on the knowledge and attitudes of fifth grade students at SDN 42/IV Jambi City regarding the prevention of Diabetes mellitus.

CONCLUSION

Based on the research results, it can be concluded that health promotion is provided using the media Mozzle Health (Monopoly Puzzle Health) has a significant effect on increasing knowledge and attitudes towards preventing diabetes mellitus in students. Thus, the Mozzle Health (Monopoly Puzzle Health) media can be used as a health promotion tool to increase knowledge and attitudes among students at SDN 42/IV Jambi City.

Suggestion, Mozzle Health (Monopoly Puzzle Health) media has been able to improve students' knowledge and attitudes. Thus, it is necessary to disseminate information related to Diabetes Mellitus through interesting and creative Mozzle Health media in schools to support the success of efforts to prevent diabetes mellitus and improve the health status of school children.

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CONFLICT OF INTEREST

This research, there are no conflicts of interest regarding funding, including names in published articles, and the data collection process.

REFERENCES

- Balitbangkes RI. (2018). *Laporan Riset Kesehatan Dasar Nasional Republik Indonesia Tahun 2018*.
- Dwi Permata, R. (2020). Pengaruh permainan puzzle terhadap kemampuan pemecahan masalah anak usia 4-5 tahun. *Jurnal Penelitian Inovasi Pembelajaran*, 5 (2), 1–10. <https://doi.org/10.29407/pn.v5i2.1423>
- Hikmawati, Z., Yasnani, Y., & Sya'ban, A. (2016). Pengaruh Penyuluhan Dengan Media Promosi Puzzle Gizi Terhadap Perilaku Gizi Seimbang Pada Siswa Kelas V Di Sd Negeri 06 Poasia Kota Kendari Tahun 2016. *Jurnal Ilmiah Mahasiswa Kesehatan Masyarakat Unsyiah*, 1(2), 183199.
- Hutami, A. R., Dewi, N. M., Setiawan, N. R., Putri, N. A. P., & Kaswindarti, S. (2019). Penerapan Permainan Molegi (Monopoli Puzzle Kesehatan Gigi) Sebagai Media Edukasi Kesehatan Gigi Dan Mulut Siswa Sd Negeri 1 Bumi. *Jurnal Pemberdayaan Masyarakat Universitas Al Azhar Indonesia*, 1(2), 72. <https://doi.org/10.36722/jpm.v1i2.341>
- IDAI. (2017). Diagnosis dan Tata Laksana Diabetes Melitus Tipe-1 pada Anak dan Remaja. *Ikatan Dokter Anak Indonesia*, 1–27. <https://pediatricfkuns.ac.id/data/ebook/Panduan-Praktik-Klinis-Diagnosis-dan-Tata-Laksana-Diabetes-Melitus-tipe-1-Anak-Remaja.pdf>
- Media, E., Tangga, U., Pendidikan, D., & Gigi, K. (n.d.). *The Effectiveness of Snakes and Ladders Media in Dental and Oral Health Education for SDN 1 Gereba Students*. 104–111.
- Meylani, A. S. (2023). *Faktor-faktor yang berhubungan dengan kepatuhan kontrol kadar gula darah pada pasien diabetes melitus tipe 2 di puskesmas simpang iv sipin kota jambi tahun 2022*.
- Nasriyah, N., Kulsum, U., & Trisanti, I. (2021). Perilaku Konsumsi Jajanan Sekolah Dengan Status Gizi Anak Sekolah Dasar Di Desa Tumpangkrasak Kecamatan Jati Kabupaten Kudus. *Jurnal Ilmu Keperawatan Dan Kebidanan*, 12(1), 123. <https://doi.org/10.26751/jikk.v12i1.913>
- Notoatmodjo. (2018). *Metodologi Penelitian Kesehatan*. Rineka Cipta.
- Notoatmodjo Soekijo. (2014). Promosi Kesehatan Dan Perilaku Kesehatan. In *Journal of Chemical Information and Modeling* (Edisi Revi, Vol. 53, Issue 9). Rineka Cipta.
- Putra, E. S., Junita, J., & Siregar, S. (2021). Konsumsi minuman manis prediktor risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 10(2), 89–97.
- Putra, E. S., & Junita, J. (2022). Rasio lingkar pinggang tinggi badan dan aktivitas fisik sebagai risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 11(1), 45–53.
- Ramdanila, A. R. (2023). *Pengaruh Senam Diabetes Melitus Terhadap Kadar Gula Darah Sewaktu Pada Pasien Diabetes Melitus di Rumah Sakit Sentra Medika Cibinong Tahun 2023*. <https://repository.medikasuherman.ac.id/xmlui/handle/123456789/5393>

FORMULATION AND PHYSICAL PROPERTIES TESTING OF A PREPARATION OF CARROT EXTRACT (*Daucus carota* L.) AS ANTI-AGING

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ABSTRACT

Background: Scrub cream is a cosmetic preparation used for skin care. The choice of ingredients significantly impacts the safety and effectiveness of the scrub. One natural ingredient that can be used in body scrub cream is carrot extract (*Daucus carota* L.). Carrots contain various secondary metabolites, including alkaloids, flavonoids, tannins, phenols, and terpenoids. Flavonoids and tannins are potent antioxidants that can prevent the harmful effects of UV rays and reduce skin damage caused by active compounds. This research aims to determine the physical properties of carrot extract scrub cream preparations with various extract concentrations.

Method: This research is experimental. Scrub cream formulations with carrot extract concentrations of 1%, 3%, and 5% were prepared. A negative control, which did not contain active substances, was used for comparison. The physical properties of each formula were tested, including organoleptic tests, homogeneity tests, pH tests, spreadability tests, and stability tests.

Results: The results indicated that scrub cream with a 1% carrot extract concentration met all the physical property test requirements for all replications. In contrast, the 3% carrot extract concentration in the third replication and the 5% carrot extract concentration in the first replication did not meet the requirements in the spreadability test.

Conclusion: From these results, it can be concluded that the body scrub cream formulas with 1% (Formula 1), 3% (Formula 2), and 5% (Formula 3) carrot extract meet all the physical property requirements for body scrubs, categorizing them as well.

Keywords: Formulation, Body Scrub Cream, Carrot Extract (*Daucus carota* L.)

INTRODUCTION

Cosmetics are materials or preparations intended for use on the outside of the human body or teeth and oral mucous membranes, especially to clean, perfume, and change the appearance, and/or improve body odor or protect or maintain the body in good condition. (BPOM RI, 2021). One treatment that can clean the skin deeply is by carrying out body care using a cosmetic body scrub. Scrub is a traditional cosmetic preparation that has long been used as a skincare product for generations (Isfianti, 2018).

Beta-carotene is useful for maintaining skin moisture, softening the skin, and preventing the appearance of wrinkles (Dewi & Wirahmi, 2019). Carrot flour contains

flavonoids as strong antioxidants and metal ion binders which are believed to be able to prevent the harmful effects of UV rays and reduce damage to the skin. Tannin is also an antioxidant that is able to protect against skin damage caused by free radicals due to exposure to UV rays and premature aging, so the content contained in carrots can be used as a skincare cosmetic and fight signs of premature aging (Siti & Megasari, 2019).

The use of white rice as a scrub ingredient has a chemical structure similar to ceramide which is able to influence the process of new cell regeneration and skin growth. Rice also provides a moisturizing effect, besides that it can also help increase collagen production which improves the skin and makes the skin bright and younger looking. The coarse

structure of rice is very suitable as a body scrub which can remove dead skin cells. One of the rice contains the compound gamma oryzanol which is useful as an antioxidant and is effective in warding off ultraviolet rays (Kusuma et al., 2023).

Extrinsic skin aging is mainly influenced by ultraviolet (UV) light and is also known as photoaging. The incidence of skin aging, especially photoaging, has increased over the last few decades. Although there is not much research on the incidence of skin aging, a study in Australia by Green stated that around 72% of men and 42% of women under the age of 30 experienced photoaging. Individuals who have a history of intensive sun exposure, live in areas that are geographically often exposed to sunlight and have light-colored skin have a higher risk of exposure to UV radiation and are therefore more susceptible to photoaging. Field workers such as farmers and fishermen have a higher risk of exposure to UV rays compared to office workers (Ahmad & Damayanti, 2018).

Based on research by Marlina (2023) regarding the antioxidant test of face mist preparations of carrot tuber extract (*Daucus carota* L.), it was stated that the antioxidant activity value of carrot tuber extract face mist (*Daucus carota* L.) at concentrations of 1%, 3% and 5% had IC_{50} values respectively. also 41.31 ppm, 34.64 ppm, and 28.80 ppm, this value is in the very strong category. (Marlina et al., 2023). Based on research by Shufyani (2023) regarding a body scrub cream preparation made from carrot juice (*Daucus carota* L.) as anti-aging, said that the use of a body scrub cream containing carrot juice (*Daucus carota* L.) at a concentration of 15% for 4 weeks showed changes in skin condition to a greater degree. good with water content increasing 19.3 to 40 (107.25%), skin smoothness becoming smoother 36.3 to 20.6 (43.25%), pores getting smaller 64 to 20.6 (67.81 %), the number of blemishes has decreased by 51 to 11.3 (77.97%), the wrinkles have decreased on the respondents'

skin, showing that better results have been obtained, namely changes in wrinkles from 45 to 13.6 with a recovery percentage of (69.77%). (Shufyani et al., 2023).

Based on the above background, there are many benefits of the carrot plant for cosmetics, the researchers want to make a body scrub cream formulation from carrot extract (*Daucus carota* L.) with varying concentrations of 1%, 3%, and 5% which according to research by Marlina (2023) was carried out Antioxidant activity test, carrot extract concentrations of 1%, 3% and 5% in making face mist showed antioxidant activity results in the very strong category. In making the scrub cream formulation from carrot (*Daucus carota* L.) extract, organoleptic tests, homogeneity tests, pH tests, spreadability tests, and stability tests were carried out.

METHODS

This research uses experimental research methods. Carrot extract (*Daucus carota* L.) was made into a body scrub cream preparation with varying concentrations of carrot extract, then physical evaluation tests were carried out on the body scrub cream preparation including organoleptic tests, homogeneity tests, pH tests, spreadability tests, and stability tests of the preparations.

Research instruments and materials

Table 1. Scrub Cream Formula

Material	Concentration %			
	F0	F1	F2	F3
Carrot Extract (g)	0	1%	3%	5%
Stearic Acid (g)	12	12	12	12
Cetyl Alcohol (g)	0.5	0.5	0.5	0.5
Sorbitol (g)	5	5	5	5
Propylene glycol (g)	3	3	3	3
Triethanolamine (g)	1	1	1	1
Methyl Paraben	0.2	0.2	0.2	0.2
White rice (g)	2	2	2	2
Oleum rosae	4 drops	4 drops	4 drops	4 drops
Aquadest	ad 100 ml	ad 100 ml	ad 100 ml	ad 100 ml

The research instrument used were digital scales, beakers, measuring cups, mortar and pestle, evaporating dishes, water baths, glass slides, parchment paper, dropper pipettes, stir sticks, pH meter, filter paper, rotary evaporator, water bath, spatula, glass bottle, scrub cream pot ruler.

The ingredients used include carrot extract, stearic acid, cetyl alcohol, sorbitol, triethanolamine, propylene glycol, methylparaben, white rice scrub, distilled water, and oleum rosae.

Research procedure

To prepare the carrot extract, 6 kg of carrot tubers were cleaned, washed, and chopped. The chopped carrots were dried using sunlight and covered with a black cloth during the drying process. Once dried, the carrot tubers were ground into a fine powder. A total of 300 grams of this powdered carrot was soaked in 70% ethanol until fully submerged, with the soaking process lasting for 3x24 hours and stirring every 6 hours. The mixture was then filtered, and the filtrate was evaporated using a rotary evaporator and water bath until a thick extract was obtained (Pangamanan & Rabima, 2020).

For the preparation of white rice powder, 500 grams of white rice were thoroughly washed with running water to remove any dirt. The cleaned rice was then dried and ground into a powder. This powder was sifted using a 60-mesh sieve to obtain a fine white rice powder (Kusuma et al., 2021).

Making Scrub Cream Preparations

To prepare the scrub cream, first heat the mortar and pestle using hot water and then wipe them dry. Next, mix the oil phase ingredients, which include stearic acid and cetyl alcohol, in an evaporating cup and melt them in a water bath. Set this mixture aside, referring to it as mass I. For the water phase, dissolve sorbitol, propylene glycol, triethanolamine, and methylparaben using hot water in a glass beaker to form mass II.

Transfer mass I into the heated and dried mortar. Slowly add mass II to mass I with constant grinding. Gradually add the remaining water while grinding until a homogeneous cream mass is obtained. Incorporate the white rice scrub and carrot ethanol extract into the cream base according to the specified concentrations. Grind the mixture again, add 4 drops of oleum rosae,

and homogenize thoroughly. Finally, evaluate the scrub cream preparation for its physical properties (Shufyani et al., 2023).

Data analysis

To determine the evaluation of the physical properties of body scrub cream preparations, several tests were conducted based on the Indonesia Farmakope. These tests included organoleptic tests, pH tests, homogeneity tests, spreadability tests, and stability tests. The results of these evaluations are presented in table form according to the data obtained.

RESULTS AND DISCUSSION

1. Organoleptic Test

Organoleptic testing is used to determine whether the body scrub cream preparation that is made meets the desired criteria. The parameters assessed in this test include smell, color, and shape. Organoleptic tests are carried out using the five senses (Agata & Jayadi, 2022). The results obtained from the organoleptic test of the carrot extract scrub cream preparation can be seen in Table 2.

Table 2. Organoleptic Test Results of Carrot Extract Scrub Cream (*Daucus carota* L.)

Formulas	Parameter	Results
F0	Form	Semi Solid
	Smell	Typical Rose Aroma
	Color	White
F1 (1%)	Form	Semi Solid
	Smell	Typical Rose Aroma
	Color	Light Beige
F2(3%)	Form	Semi Solid
	Smell	Typical Rose Aroma
	Color	Light Beige
F3 (5%)	Form	Semi Solid
	Smell	Typical Rose Aroma
	Color	Beige

Based on the examination, it shows that all formulas with the addition of carrot extract with concentrations of 1%, 3%, and 5% produce relatively the same physical form, namely semi-solid form, light cream to cream color and a distinctive odor of the fragrance added to the formula. The more carrot extract you add to each formula, the more intense the color will be, namely cream, the distinctive smell of the added fragrance, and the resulting

body scrub will become denser. The negative control without added carrot extract produces a white color, has a characteristic odor from the fragrance added to the formula, and is in semi-solid form.

2. Homogeneity Test

The homogeneity test is carried out to determine whether or not there are unmixed particles and the distribution of color on the surface and inside of the body scrub cream. Homogeneity was then confirmed again by smearing the sample on a glass plate (Kusuma et al., 2021). The results obtained from the Homogeneity test of the carrot extract scrub cream preparation can be seen in Table 3.

Table 3. Homogeneity Test Results for Carrot Extract Scrub Cream (*Daucus carota* L.)

Formulas	Check up result
F0	Homogeneous*
F1 (1%)	Homogeneous*
F2 (3%)	Homogeneous*
F3 (5%)	Homogeneous*

Scrub cream is declared homogeneous, indicating that there is no phase separation or particles that are not evenly distributed and the colors in the preparation are evenly mixed. The results of observing the homogeneity of the formula 1(1%), 2(3%), 3(5%), and the negative control scrub cream met the homogeneity requirements.

3. Test pH

pH measurements are carried out to determine the acidity level of the preparation being made. If a cosmetic product has a pH that is much different from the pH that the skin accepts, it will cause irritation and dry skin. The results obtained from the pH test of the carrot extract scrub cream preparation can be seen in Table 4.

Table 4. pH Test Results for Carrot Extract Scrub Cream (*Daucus carota* L.)

Formulas	Preparation	pH			Average
		1	2	3	
F0	1	6.3	6.3	6.3	6.3
	2	6.5	6.5	6.5	6.5
	3	6.4	6.4	6.4	6.4
F1 (1%)	1	6	6	6	6
	2	6.1	6.1	6.1	6.1
	3	6.1	6.1	6.1	6.1
F2 (3%)	1	6	6	6	6
	2	6.1	6.1	6.1	6.1
	3	6.4	6.4	6.4	6.4
F3 (5%)	1	6.2	6.2	6.2	6.2
	2	6	6	6	6
	3	5.8	5.8	5.8	5.8

The standard for scrub cream is based on the National Standardization Agency (1996), the appearance of a good scrub cream has a pH between 4.5-6.5. The pH test of the scrub cream preparation was replicated 3 times. The results of pH testing using a pH meter show value that are not much different and meet SNI requirements. The pH of all preparations obtained is not less than 4.5 and not more than 6.5 so that it will not cause skin irritation and make the skin dry when used. In this study, the negative control formula had a high pH compared to the formulas 1(1%), 2(3%), and 3(5%), so the addition of carrot extract could lower the pH in the body scrub cream preparation. Based on the pH test results, it was concluded that all body scrub cream preparations met the skin's pH requirements.

4. Spreadability Test

The spreadability test is carried out to ensure that the semi-solid preparation is able to spread easily without pressure so that it is easy to spread without causing pain when applied and to ensure user comfort. (Hakim et al., 2020).

Table 5. Test Results for Spreadability of Carrot Extract Scrub Cream (*Daucus carota* L.)

Formulas	Repetition	Spread Power	Average
F0	1	5.3*	5.33
	2	5.3*	
	3	5.5*	
F1(1%)	1	5.1*	5.32
	2	5.4*	
	3	5.4*	
F2(3%)	1	5.2*	5.14
	2	5.4*	
	3	4.8	
F3(5%)	1	4.7	5.07
	2	5.2*	
	3	5.3*	

The standard for scrub cream is based on the National Standardization Agency (1996), the appearance of a good scrub cream has a spreadability of between 5-7 cm. From the results of tests carried out using a load of 50 grams and adding 50 grams of weight every 1 minute, it show that the diameter of the spread of the scrub cream after being covered by the watch glass has an average of 4.7-5.4 cm, so based on the results of the spreadability test it can be said that it is only formula 2 (3%) and

formula 3(5%) there is 1 replication that does not meet the requirements.

In this study, increasing the extract concentration affected the resulting spreadability value. Because the higher the concentration value used, the denser the preparation, the viscosity of the preparation is higher so the spreading diameter is smaller, making it a little difficult for the preparation to spread.

5. Stability Test

An emulsion becomes unstable, one of which is caused by the clumping of the dispersed phase globules. Whether an emulsion preparation is damaged or not can be observed by changes in color and change in odor. To overcome material damage due to oxidation, you can add preservatives.

The results of observing the stability of the preparation by visually observing the phase separation, color, and odor at a temperature of 4°C hours and a temperature of 40 ± 2°C for 13 days.

Formulas	Observation for 12 days																	
	1			2			3			4			5			6		
	x	y	z	x	y	z	x	y	z	x	y	z	x	y	z	x	y	z
F0 (Negative Control)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F1 (1%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F2 (3%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F3 (5%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Information :
 x = Color Change
 y = Change in Smell
 z = Phase Separation
 - = No change occurs
 + = Change occurred

Based on the results of the table, it can be seen that the cream preparation does not experience changes in color, odor, or separation in the emulsion phase. This shows that all body scrub cream preparations are stable in storage at 4°C and 40 ± 2°C for 13 days. Addition of 1 day of stability to replace the first cycle on June 4 2024 due to a power outage.

CONCLUSION

Based on research that has been carried out on the Physical Properties Test of Carrot Extract Scrub Cream (*Daucus carota* L.) with various extract concentrations, 1%, 3%, and

5% are requirements for the physical properties of the scrub cream.

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REFERENCES

- Ahmad, Z., & Damayanti. (2018). Skin Aging: Pathophysiology and Clinical Manifestations. *Periodical of Dermatology and Venereology*, 30(03), 208–215.
- BPOM RI. (2021). Food and Drug Supervisory Agency Regulation Number 8 of 2021 concerning Certain Forms and Types of Cosmetic Preparations that Can Be Produced by Cosmetic Industries that Have a Class B Cosmetic Production Certificate. In *Drug and Food Supervisory Agency Regulations*.
- Dewi, B., & Wirahmi, N. (2019). Carrot Extract Lotion Formulation (*Daucus Carota* L) Maceration Method. *Pharmacy Scientific Journal*, 6(1), 128–139.
- Hakim, ZR, Meliana, D., & Utami, PI (2020). Formulation and Test of Physical Properties of Cream Scrub Preparation from Ethanol Extract of Soursop Leaves (*Annona muricata* L.) and Determination of its Antioxidant Activity. *Journal of Pharmaceutical & Clinical Sciences*, 7(2), 135–142. <https://doi.org/10.25077/jsfk.7.2.135-142.2020>
- Isfianti, DE (2018). Utilization of Lime Fruit Peel Waste (*Citrus aurantifolia*) and Moringa Leaves (*Moringa oleifera* Lamk) for Making Traditional Body Scrubs as an Alternative to "Green Cosmetics." *Journal of Cosmetology*, 07(2), 74–86.
- Kusuma, IM, Aunillah, S., & Djuhariah, YS (2021). Scrub Cream Formulation from

- Ethanol Extract of Purple Sweet Potato (*Ipomoea batatas* (L.) Lam.) and White Rice Powder (*Oryza sativa* L.). *Udayana Pharmacy Journal*, 10(2), 177–183.
- Kusuma, IM, Hidayat, T., & Abdillah, MF (2023). Assistance in Making the White Rice Scrub Cream Formula using a Herbal Medicine Calculator at the Gendong Tresno Asih Jamu Community, Depok, West Java. *PengabdianMu: Scientific Journal of Community Service*, 8(1), 41–52.
- Marlina, A., Agustien, GS, & Susanti. (2023). Formulation and Antioxidant Activity Test of Facemist Preparation of Carrot Tuber Extract (*Daucus Carota* L). *Health Sciences Student Journal*, 1(4), 69–82.
- Pangamanan, SD, & Rabima. (2020). Formulation and Antioxidant Activity Test of Peel-off Mask Preparation of Chantenay Variety Carrot Tuber Extract (*Daucus carota* L.). *Indonesian Natural Research Pharmaceutical Journal*, 5(2), 135–148.
- Shufyani, F., Andry, M., & Tarigan, RE (2023). Formulation of Scrub Cream Preparation from Carrot Juice (*Daucus carota* L.) as Anti Aging. *Journal of Pharmaceutical and Sciences*, 6(3), 1007–1025.
- Siti, M., & Megasari, DS (2019). Effect of Proportions of Carrots (*Daucus carota*) and Jasmine Flowers on the Shelf Life of Traditional Scrubs. *Journal of Cosmetology*, 08(3), 16–19.

THE RELATIONSHIP OF THE LEVEL OF KNOWLEDGE WITH COMPLIANCE IN TAKING ANTI-TUBERCULOSIS PULMONARY DRUGS IN THE COMMUNITY HEALTH CENTER TANJUNG PINANG JAMBI CITY YEAR 2024

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ABSTRACT

Background: Pulmonary tuberculosis (TB) is a disease caused by *Mycobacterium tuberculosis*. TB primarily affects the lungs and can be transmitted to others through airborne particles when an infected person coughs or sneezes. Despite being an ancient disease, TB remains the leading cause of death among infectious diseases globally. The world has yet to eradicate TB. This research aims to determine the relationship between the level of knowledge and compliance with taking anti-tuberculosis medication among patients at the Tanjung Pinang Health Center, Jambi City, in 2024.

Method: This study is a quantitative analysis conducted at the Tanjung Pinang Health Center in Jambi City. Data collection was performed using a survey methodology with questionnaires. The total sample size was 31 individuals, selected through a total sampling technique. The data were analyzed using the Chi-square test.

Results: The results indicated that respondents generally had a fairly good level of knowledge (45.2%) and a high rate of medication compliance (61.3%). Statistically, the p-value was 0.002 ($P < 0.05$), indicating a significant relationship between the level of knowledge and compliance with taking anti-tuberculosis medication.

Conclusion: There is a significant relationship between the level of knowledge and compliance with taking anti-tuberculosis medication among pulmonary tuberculosis patients at the Tanjung Pinang Community Health Center, Jambi City, in 2024.

Keywords: Knowledge, Compliance, Pulmonary Tuberculosis

INTRODUCTION

Pulmonary tuberculosis (TB) remains a significant public health issue in Indonesia, including in Jambi City. As of 2022, Indonesia recorded over 824,000 TB cases, with a detection rate of 34% and a treatment success rate of 74%. In Jambi Province, there were 3,431 detected TB cases in the Jambi City Health Center area in 2022. The recurrence rate of TB cases decreased from 11.8% in 2021 to 5% in 2022.

One of the critical factors influencing the success of pulmonary TB treatment is patient compliance with medication. In 2022, patient compliance in taking pulmonary TB medication in Indonesia was 85% for drug-sensitive TB and 55% for drug-resistant TB.

Other influencing factors include patient characteristics and knowledge about pulmonary TB.

According to the Tanjung Pinang Health Center report in Jambi City for 2023, pulmonary TB cases have been on the rise, with 78 new cases reported. In 2024, 31 patients sought treatment at the Tanjung Pinang Community Health Center, with the recurrence rate increasing to 8%. Additionally, it was found that in 2021, approximately 61.8% of patients had poor knowledge regarding pulmonary TB (Armidia, 2021).

From the existing problems, when drug compliance is lacking or the patient becomes bored with taking the medication, this can lead to therapy failure, increased morbidity

and mortality, and a rise in pulmonary TB cases with Acid-Fast Bacilli (AFB) that are resistant to Anti-Tuberculosis Drugs (ATDs). This phenomenon is widely known as Multi-Drug Resistant TB (MDR-TB) (Kirana et al., 2016).

Patient characteristics can also influence the relationship between the level of knowledge and adherence to taking pulmonary TB medication. Patients with lower levels of education tend to have less knowledge about pulmonary TB and lower adherence to medication regimens. This lack of knowledge can negatively impact both the treatment and prevention of the disease. For instance, patients may be unaware of basic aspects of pulmonary TB, such as its causes, symptoms, side effects, modes of transmission, and treatment protocols. Consequently, they may fail to comply with treatment guidelines and neglect appropriate preventive measures.

Based on previous research by (Marta et al, 2023) regarding the relationship between the level of knowledge and compliance with taking anti-tuberculosis medication in pulmonary TB patients, it was found that out of 60 patients, 31 (51.70%) had a good level of knowledge, 29 (48.30%) had a sufficient level of knowledge, and none had a low level of knowledge.

This study aims to determine the relationship between the level of knowledge and compliance with taking anti-pulmonary tuberculosis medication at the Tanjung Pinang Community Health Center, Jambi City, in 2024.

METHODS

This research employs a cross-sectional study design on pulmonary TB patients, conducted at the Tanjung Pinang Community Health Center in Jambi City in 2024. The sample size consists of 31 individuals, selected through total sampling. The data will be analyzed using the Chi-square test, with

significance determined by a p-value of <0.05 .

RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents

Characteristics	Group	Frequency	Percentage (%)
Gender	Man	14	45.2
	Woman	17	54.8
	Total	31	100
Education	No school	1	3.2
	Elementary school	10	32.3
	Junior high school	8	25.8
	Senior high school	9	29
	College	3	9.7
	Total	31	100
Work	Not working/housewife	22	71
	Employed	4	12.9
	Private employees	1	3.2
	Trader	1	3.2
	Farmer	3	9.7
	Total	31	100

Based on Table 1, the characteristics of respondents are as follows: Of the 31 respondents (100%), 17 (54.8%) were female and 14 (45.2%) were male. This indicates a higher number of female patients in the sample, likely due to a higher proportion of women visiting the health center during the sampling period. This finding is consistent with Oktavia et al. (2016), who reported no significant relationship between gender and the incidence of pulmonary TB. Since TB is an infectious disease caused by bacteria, other factors, such as environmental conditions like dampness and inadequate lighting, may contribute to its prevalence.

Among the 31 respondents (100%), 1 (3.2%) had no formal education, 10 (32.3%) had attended primary school, 8 (25.8%) had secondary school education, 9 (29.0%) had completed high school, and 3 (9.7%) had higher education. Additionally, research by Absor et al. (2020) indicates that education level can affect treatment compliance and dropout rates in pulmonary TB patients.

The highest percentage of respondents had only primary school education (32.3%). This is consistent with Pameswari (2016) as cited in Ahdiyah et al. (2022), which found that 48.15% of respondents had only primary school education. Regarding employment, 22 respondents (71.0%) were unemployed/

domestic workers, 4 (12.9%) were self-employed, 1 (3.2%) was a private employee, 1 (3.2%) was a trader, and 9 (29.7%) were farmers. The majority of respondents were unemployed or domestic workers, which reflects the common demographic of TB patients at the Tanjung Pinang Community Health Center, Jambi City. This finding aligns with Siregar et al. (2015), who reported that employment type is not significantly related to the incidence of pulmonary TB. In fact, working outside the home may reduce the risk of TB infection due to decreased time spent at home and potentially lower contact with TB patients.

Table 2. Respondents' level of knowledge

Knowledge	Frequency	Percentage (%)
Poor	8	25.8
Sufficient	14	45.2
Good	9	29.0
Total	31	100.0

Based on Table 2, the characteristics of respondents according to their level of knowledge are as follows: Among the 31 respondents (100%), 8 (25.8%) had poor knowledge, 14 (45.2%) had sufficient knowledge, and 9 (29.0%) had good knowledge about the causes, transmission, symptoms, and treatment of pulmonary TB. Thus, the highest percentage of respondents had sufficient knowledge, with 14 respondents (45.2%).

The prevalence of sufficient knowledge among respondents can be attributed to several factors. The average education level of respondents is elementary school, and many patients seeking treatment at the Tanjung Pinang Community Health Center, Jambi City, are elderly individuals or housewives. These groups often lack exposure to information that could be gained through working outside the home. This finding aligns with research by Marta (2023), which reported that 51.70% of respondents had quite good knowledge regarding the causes, prevention, and treatment of pulmonary TB.

According to Notoatmodjo (2012), a

person's knowledge can be influenced by their level of education, access to information, cultural background, and personal experiences. Based on Table 3, the characteristics of respondents according to their compliance with taking medication are as follows: Among the 31 respondents (100%), 9 (29.0%) had low compliance, 3 (9.7%) had moderate compliance, and 19 (61.3%) had high compliance with taking medication. Therefore, the highest percentage was found in patients with high adherence to taking medication, with 19 respondents (61.3%).

This high level of compliance is likely due to the presence of a PMO (Patient Medication Observer) at the Tanjung Pinang Community Health Center, Jambi City, who supervises and reminds patients to take their medication.

Table 3. Compliance with Taking Pulmonary TB Medication

Compliance	Frequency	Percentage (%)
Low	9	29.0
Moderate	3	9.7
High	19	61.3
Total	31	100.0

This finding is consistent with research conducted by Ahdiyah et al. (2022), which reported a high level of compliance (76.47%) with taking pulmonary TB medication at the Putri Ayu Community Health Center. The level of compliance in pulmonary TB patients is crucial, as irregular treatment can lead to the development of germ resistance to Anti-Tuberculosis Drugs (OAT) (Pameswari et al., 2016).

Table 4. Relationship between level of knowledge and compliance with taking anti-pulmonary tuberculosis medication

Knowledge	Compliance						Total	p-value
	Low	Moderate	High					
	N	%	N	%	N	%	N	%
Poor	6	75	0	0	2	25	8	100
Sufficient	3	21.4	3	21.4	8	57.1	14	100
Good	0	0	0	0	9	100	9	100
Total	9	29	3	9.7	19	61.3	31	100

Based on Table 4, the relationship between the level of knowledge and compliance with taking anti-tuberculosis medication (OAT) is as follows: Among the respondents, 6 (75%) with poor knowledge had low adherence to

taking OAT, while 3 (21.4%) with sufficient knowledge also had low adherence. There were 3 respondents (21.4%) with sufficient knowledge who had moderate adherence to taking OAT. Among the respondents with high compliance, 2 (25%) had poor knowledge, 8 (57.1%) had sufficient knowledge, and 9 (100%) had good knowledge.

The statistical analysis shows a P value of 0.002 ($P < 0.05$), indicating a significant relationship between the level of knowledge and compliance with taking anti-pulmonary tuberculosis medication at the Tanjung Pinang Community Health Center, Jambi City, in 2024. This result is consistent with the research conducted by Wulandari (2019), which found a significant relationship between the level of knowledge and adherence to medication in TB patients (P value = 0.002) with a correlation value of 0.602, indicating a very strong relationship. This suggests that the higher the level of knowledge in TB patients, the higher their adherence to taking medication.

The findings suggest that knowledge of TB patients is primarily obtained from information provided by health workers. Researchers hypothesize that non-compliance in this study could also be due to factors such as boredom with taking medication, perceived side effects, the size and amount of medication, and the support or role of family members/cadres who accompany them in taking medication.

A person's knowledge can change their beliefs and paradigms, influencing their attitudes or behaviors toward an object. Thus, knowledge is one of the key factors that influence the behavior of pulmonary TB patients in adhering to their treatment. Good knowledge among pulmonary TB patients will likely lead to better adherence to taking anti-tuberculosis medication. Conversely, a lack of knowledge can lead to non-compliance due to a lack of awareness of the benefits of adherence and the consequences of

non-compliance.

CONCLUSION

Based on the research results and discussion, it can be concluded that there is a significant relationship between the level of knowledge and compliance with taking antituberculosis medication at the Tanjung Pinang Community Health Center, Jambi City.

REFERENCES

- Absor, S. (2020). Hubungan Tingkat Pendidikan Dengan Kepatuhan Berobat Penderita TB Paru Di Wilayah Kabupaten Lamongan Pada Januari 2016-Desember 2018.
- Ahdiyah, N.N., Andriani, M.& Andriani, L. (N.D.). Tingkat Kepatuhan Penggunaan Obat Anti Tuberculosis Pada Pasien TB Paru Dewasa Di Puskesmas Putri Ayu.
- Armidia, Z.R. (2021). The Relationship between Knowledge Level and Family Motivation on Efforts to Prevent Pulmonary TB in the Working Area of the Tanjung Pinang Community Health Center, Jambi City. Palembang Muhammadiyah University.
- Hasina, SN, Rahmawati, A., Faizah, I., Sari, RY, & Rohmawati, R. (2023). The Relationship between Level of Knowledge and Compliance with Taking Anti-Tuberculosis Medication (OAT) in Pulmonary Tuberculosis Patients. *Permas Scientific Journal: STIKES Kendal Scientific Journal*, 13(2), 453–462. <https://Doi.Org/10.32583/Pskm.V13i2.908>
- Julianto, & Siregar, N. (2023). The Relationship between Knowledge Level and Compliance with Taking Anti-Tuberculosis Medication (OAT) in Pulmonary Tuberculosis Patients at Kindergarten Hospital. *IV 01 . 07 . 01. Tambusai Health Journal*, 4(September), 2093–2102.

- Kirana, RC, Lutfiyati, H., & Wahyu, I. (2016). Description of the Compliance Level of Tuberculosis Patients at the Magelang Community Lung Health Center for the Period February - March 2015. *Journal of Science and Practical Pharmacy*, I(2), 36–42.
- Marta, Vonny Nofrika, Rahmat Widiyanto, Dwi Puspitasari. (2023). Relationship between level of knowledge and adherence to taking anti-tuberculosis medication (OAT) in pulmonary TB patients. IKIFA College of Health Sciences.
- Notoatmodjo. (2012). *Health Research Methodology*.
- Oktavia, S. (2016). Analysis of Risk Factors for the Incidence of Pulmonary TB in the Working Area of the Kertapati Public Health Center, Palembang.
- Pameswari, Puspa, Aulia Halim, LY (2016). Level of Compliance with Medication Use in Tuberculosis Patients at the Mayjen HA Talib Hospital, Kerinci Regency.
- Siregar, PA, Gurning FP, Eliska, PM (2018). Analysis of Factors Associated with the Incidence of Pediatric Pulmonary Tuberculosis at Sibuhuan District Hospital.
- Siregar, A. (2015). The Relationship Between Physical Conditions of Houses and Work with the Incidence of Pulmonary Tuberculosis in Bandar Khalipah Village, Percut Sei Tuan District.
- Wulandari, NKS (2019). The Influence of Education on Behavior to Prevent Disease Transmission of Pulmonary Tuberculosis Sufferers. Final Project, 9–37.

THE RELATIONSHIP BETWEEN NUTRITIONAL KNOWLEDGE RELATED TO IMMUNITY AND HISTORY OF COVID-19 ILLNESS AND VITAMIN C INTAKE IN WOMEN OF FERTILIZING AGE IN BOJONEGORO

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ABSTRACT

Background: Coronavirus Disease is an infectious disease caused by the SARS Cov-2 virus. Someone who has a history of COVID-19 illness complains of several ongoing symptoms and even experiences substantial organ dysfunction after being exposed to SARS-Cov-2 infection. Vitamin C contributes to maintaining immunity by supporting various cellular functions of the innate and adaptive immune systems. This study aims to determine the relationship between nutritional knowledge and history of COVID-19 illness with vitamin C intake.

Method: This type of study used a cross-sectional design. The population used was women of childbearing age (WUS) with a sample of 88 respondents using simple random sampling technique. The research was conducted in April 2023. The instruments used were a questionnaire and the SQ-FFQ form. Then the data analysis test used was the chi-square test.

Result: The results showed that there was a relationship between nutritional knowledge and a history of COVID-19 illness and intake of vitamin C with p values <0.000 and <0.008 with odds ratios of 10,633.

Conclusion: Knowledge of nutrition can shape behavior and create actions that determine a person's nutritional intake. In a history of COVID-19 illness, post-COVID-19 symptoms can cause chronic inflammation which will spread to other tissues and the bloodstream so that vitamin C has a role as an electron donor so that immune cells are protected from damage by free radicals.

Keywords: COVID-19, Nutritional Knowledge, Vitamin C

INTRODUCTION

Coronavirus Disease is an infectious disease caused by the Severe Acute Respiratory Syndrome Corona Virus-2 (SARS Cov-2). The disease caused by Coronavirus Disease attacks the respiratory tract and is characterized by symptoms such as fever, cough and shortness of breath. The serious symptoms caused by Coronavirus Disease are pneumonia, acute respiratory syndrome, kidney failure, and even death (Ministry of Health of the Republic of Indonesia, 2020). It is very important to emphasize a vigilant attitude in facing the COVID-19 pandemic to the public to prevent being infected with this virus. The main key in preventing COVID-19 is practicing a

healthy lifestyle to increase the body's immunity (Salman and Baru, 2021).

Nutritional knowledge of women of childbearing age (WUS) is one of the factors that can influence a person's intake, because nutritional knowledge is a determinant in choosing food to consume to fulfill the body's nutrition (Notoatmojo, 2012). One of the causes of a lack of nutritional intake in WUS is a lack of nutritional knowledge which can cause WUS to tend to make mistakes in choosing the food they consume. This can occur starting from irregular eating patterns and consuming food without knowing the nutritional needs that must be met.

Micronutrients or micronutrients include vitamins and minerals. To meet the needs of these vitamins and minerals, it is necessary to consume a balanced and varied diet. The body

only needs these nutrients in small amounts, but each one has an important role for the body. One of them is as an antioxidant in improving the body's immune system. Antioxidants are substances that can significantly reduce negative effects due to reactive species formed in the body (Amaliah and Fery, 2021). One vitamin that has an antioxidant role is vitamin C.

Vitamin C also has a role in reduction in maintaining iron and copper atoms in metalloenzymes in a reduced state (Gropner & Simth, 2012). The recommended need for vitamin C for Indonesians is based on the daily nutritional adequacy figure for each person aged 15-49 years of 75 mg (Ministry of Health, 2019). Ordinary people who don't understand about vitamin C often don't pay attention to their diet every day and tend to underestimate the lack of vitamin C in their bodies, for those who eat is important. Even though vitamin C deficiency can affect health. It could also be because we don't consume the right food, or the body cannot absorb it due to digestive problems.

The important reason for providing vitamin C nutrition in COVID-19 cases is that it has a role as an electron donor which can quickly break the reaction chain of Reactive Oxygen Species (ROS) and Reactive Nitrogen Species (RNS). Immune cells can be protected from damage caused by free radicals because vitamin C can easily donate electrons to free radicals. Therefore, vitamin C has a very close role with the body's immunity as an antioxidant (Siswanto et al., 2014).

Someone who has a history of COVID-19 complains that their health has not returned to perfection and there are several symptoms that persist continuously and even experience substantial organ dysfunction after being exposed to SARS-CoV-2 infection. These are what are called long-term symptoms or long-term post-COVID-19 symptoms. 19 (Greenhalgh et al., 2020). Based on surveys conducted, these symptoms can attack anyone

who has been infected with COVID-19 depending on a person's immune system and immunity. Therefore, someone who has a history of COVID-19 needs proper food intake and giving vitamin C also helps in returning vitamin C levels to normal (Carr & Maggini, 2017).

A dose of 1-2 grams/day has proven effective in preventing upper respiratory tract infections, because not only through food sources, but vitamin C supplementation is also recommended for individuals who are susceptible to respiratory infections, one of which is individuals who have a history of COVID-19 (Hasan et al., 2021). Taking vitamins should be in accordance with the recommended dosage because if you consume more than the maximum limit in the long term it will result in side effects, such as diarrhea, nausea and headaches (Wijaksana et al., 2022).

Based on the results of a survey using the SQ-FFQ form which was carried out in several villages, Bakalan village is a village with a low average intake of vitamin C, namely 42.31 mg/day. This intake is still below the AKG standard, namely 75 mg/day. This is caused by not consuming enough vegetables and fruit as a source of vitamin C. Based on the background of the problem above, researchers are interested in conducting research entitled "The Relationship between Nutritional Knowledge Related to Immunity and History of COVID-19 Illness with Vitamin C Intake in Women of Childbearing Age (WUS) in Bojonegoro".

METHOD

This research is a type of quantitative research using a cross-sectional design. The population used in this research was 470 respondents, while the sample used was 88 respondents. The sampling technique used simple random sampling which was carried out by creating a list of 470 respondents who constituted the population in Microsoft Excel

which was then randomized using the RAND program and adjusted to the sample size of 88 respondents.

Techniques for collecting data on nutritional knowledge and history of COVID-19 illness using questionnaires and data on vitamin C intake using the SQ-FFQ form with the interview method. The data analysis technique uses the chi-square test with the condition that if $p < 0.05$ then there is a relationship between variables, but if $p > 0.05$ then there is no relationship between variables.

Categories in the vitamin C intake variable, namely if vitamin C intake is ≥ 75 mg then the intake is good and if < 75 mg then the intake is insufficient. For the nutritional knowledge category, if the score is $> 50\%$ then knowledge is good and if the score is $\leq 50\%$ then knowledge is poor.

RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents

Subject Characteristics	N	%
Age		
25-30 Years	26	29.5
31-35 Years	19	21.6
36-40 Years	15	17.1
41-45 Years	28	31.8
Educational background		
elementary school	13	14.7
Middle school/equivalent	35	39.7
High school/equivalent	35	39.7
College	5	5.9
Work		
Work	54	61.4
Doesn't work	34	38.6

Based on table 1, the largest age group is 41-45 years old with 28 people or 31.8%. Age influences a person's level of maturity and strength in working and thinking. Someone being able to think maturely is one of the results of previous experiences and the maturity of their soul (Wawan and Dewi, 2019).

Most respondents' education was junior high school/equivalent and high school/equivalent, namely 35 respondents (39.7%). The respondent's education level influences their level of knowledge. A good

level of education of respondents makes it easier for respondents to receive information about nutritional knowledge related to immunity. The higher a person's education, the more knowledge they have. Behavior that is based on knowledge, positive attitudes and awareness will be better than behavior that is not based on knowledge (Damayanti & Sofyan, 2022).

The majority, namely 61.4% of respondents, work outside the home. Women who work outside the home tend to have less time to prepare food. It is very possible for eating patterns to be disturbed. In some communities in Indonesia, work is an important thing that must be a priority because it is related to income that can be used to fulfill daily living needs.

Table 2. Distribution of Nutrition Knowledge

Nutrition Knowledge	Frequency	Percentage (%)
Good ($>50\%$)	72	81.8%
Less ($\leq 50\%$)	16	18.2%
Total	88	100%

According to Budiman (2013), knowledge can be categorized into 2 categories, namely good knowledge and poor knowledge. Good knowledge has a score of $\geq 50\%$ while poor knowledge has a score of $< 50\%$. Table 2 shows that of the 88 respondents, 72 respondents (81.8%) had good knowledge and 16 respondents (18.2%) had poor knowledge.

Several factors characteristic of respondents that can influence knowledge include education, mass media, socio-economics, culture, environment, experience and age. Musriah (2018) also explains that a person's experience can influence his knowledge because valuable experience will be used by a person as a reference or basis for subsequent actions. Nutritional knowledge is the basis for implementing good and correct intake behavior, including consuming vitamin C intake among wus. An individual's lack of nutritional knowledge will also have an impact on nutritional intake, resulting in errors in choosing the food they consume. Starting from an irregular eating pattern and

consuming food without paying attention to its nutritional content can have a lasting impact on health (Puspasari, 2019).

Table 3. Distribution of Nutrition Knowledge

History of COVID-19 Illness	Frequency (n)	Percentage (%)
Yes	14	15.9%
No	74	84.1%
Total	88	100%

Based on table 3, it can be seen that there were 14 respondents (15.9%) who had a history of COVID-19 illness and 74 respondents (84.1%) who had no history of COVID-19 illness. COVID-19 infection with acute respiratory syndrome can begin with or without symptoms, causing illness that can threaten life (Greenhalgh et al., 2020). The description of the history of COVID-19 in this study was measured using a questionnaire with questions asking whether or not the respondent had ever been infected with COVID-19. If the respondent has been infected with COVID-19, it is also necessary to know the length of the COVID-19 infection period from the first test to the last test.

In research conducted by Greenhalgh et al (2020), 35% of 274 symptomatic respondents said that their health had not recovered after 2 weeks or more after receiving a positive result of being infected with COVID-19, including 26% of those aged 18-34 years. Symptoms that are often experienced are fatigue and dyspnea, as well as dysfunction of certain organs such as the heart and lungs. Many patients experience persistent respiratory symptoms several months after being infected with COVID-19, such as chronic cough, fibrotic lung disease, bronchiectasis, and pulmonary vascular disease (Fraser, 2020).

Table 4. Distribution of Vitamin C Intake

Vitamin C Intake	Frequency (n)	Percentage (%)
Good	63	71.6%
Less	25	28.4%
Total	88	100%

Table 4 shows that there are 63 respondents (73%) who have good vitamin C intake. This indicates that the respondent's vitamin C intake was sufficient. On the other hand, 23 respondents (27%) had insufficient

vitamin C intake. Vitamin C intake in this study was measured using the SQ-FFQ form over a period of three months. The principle of the SQ-FFQ method is to record the frequency of food consumed in the last three months.

The main function of vitamin C is its contribution to maintaining the body's immunity by supporting the epithelial barrier function in fighting pathogens and increasing the activity of cleaning skin oxidation so that it can potentially protect against environmental oxidative stress (Carr & Maggini, 2017). Based on the results of this research, it is known that subjects who had insufficient vitamin C intake were because the respondents rarely consumed fruit and vegetable sources of vitamin C or supplements.

The body can only store 1500 mg of vitamin C, so the recommendation for consuming vitamin C a day is around 100 mg/day. Consuming vitamin C can restore the immune system of a sick body, but it can also be used as a treatment so that it is consumed every day. Consuming vitamins should be in accordance with the recommended dosage because if you consume above the maximum limit in the long term it will result in side effects, such as diarrhea, nausea and headaches (Wijaksana et al., 2022).

According to the SQ-FFQ that was carried out, it was found that respondents who had less vitamin C intake were due to consuming fruit and vegetables that are sources of vitamin C in small amounts and frequency. Meanwhile, respondents who have a good intake of vitamin C are because they regularly consume fruit (apples, oranges, mangoes, pears, etc.) every day. Based on the data collection that has been carried out, a statistical description of the respondents' vitamin C intake variables is seen in table 5.

Table 5. Statistical Description of Vitamin C Intake Variables

Variabel	Min	Max	Mean	Std
Vitamin C Intake	32,7	146,4	82,77	21,3

Based on table 10, it can be seen that the average intake of vitamin C for respondents is 82.774 mg/day. This shows that the average intake of vitamin C for respondents is sufficient according to the 2019 AKG recommendations, namely for women aged 25-45 years, it is 75 mg/day. In the SQ-FFQ results, respondents consumed adequate sources of vitamin C in frequency and quantity. The minimum intake of vitamin C is 32.7 mg/day. This lack of intake could be caused by respondents consuming fruit and vegetables sources of vitamin C in small quantities and frequency.

Table 6. Relationship between Nutritional Knowledge and Vitamin C Intake

Nutrition Knowledge	Vitamin C Intake						p	OR
	Less		Good		Total			
	n	%	n	%	n	%		
Good	11	73,3	4	26,7	15	100	0,000	10,633
Less	15	20,3	48	79,5	73	100		

The results of cross tabulation regarding the relationship between nutritional knowledge and vitamin C intake in table 6 show that there were more respondents with good vitamin C intake than respondents with good knowledge, namely 58 respondents (79.5%). The results of the chi-square test show that p-value = 0.001 (p-value < 0.05), which indicates that there is a significant relationship between nutritional knowledge and vitamin C intake. The Odds Ratio value in this study shows the number 10.633 which can be interpreted as meaning that respondents who those who have poor nutritional knowledge are 10.633 times more likely to experience less vitamin C intake compared to respondents who have good nutritional knowledge.

Nutritional knowledge is often linked to a person's consumption patterns. Because if someone has extensive nutritional knowledge, they will tend to be able to choose nutritious foods. On the other hand, if someone's nutritional knowledge is low, their consumption of nutritious food will also be low because they do not pay attention to the nutrients in the food they consume

(Sulistiana, 2021). Based on the SQ-FFQ results from 88 respondents, those who have knowledge in the good category tend to have good vitamin C intake too. Food sources of vitamin C that are widely consumed by respondents, such as apples, oranges, mangoes, grapes, etc.

Respondents' nutritional knowledge was obtained from information in print and electronic media. The ease of respondents in obtaining nutritional knowledge apart from print media and online media, namely the availability of facilities such as socialization activities regarding nutrition provided by local health center officers. Respondents are generally good at operating gadgets, so this ability supports respondents in searching for information about types of nutritious food so that their knowledge about nutrition increases (Mardhina, 2014).

In line with research by Wahyuni et al., (2023) that knowledge includes everything that can be known directly through experience or even spontaneously. Based on suspicion, knowledge can be one of the factors that influences individual intake. From the results of the research conducted, there was a significant relationship between nutritional knowledge in efforts to increase immunity and food intake of food sources of vitamin C with the result that respondents who had good knowledge and good vitamin C intake were 45.8%. This is evidence that knowledge does have a significant relationship with an individual's vitamin C intake. This statement is also in line with Jenisdoong et al (2020) that good nutritional knowledge has an influence on a person's actions in fulfilling their nutrition through daily food consumption, this is because the knowledge a person has can shape behavior and create actions. So the higher a person's nutritional knowledge, the more adequate their nutritional intake will be because they can pay attention to their food consumption in terms of quality and type.

Table 7. Relationship between history of COVID-19 illness and vitamin C intake

History of Covid-19 Illness	Vitamin C Intake				Total		p
	Less		Good		N		
	n	%	n	%			
No	26	35.1	48	64.9	74	100	0.008
Yes	0	0	14	100	14	100	

The results of the cross tabulation of the relationship between history of COVID-19 illness and vitamin C intake in table 7 show that respondents who had a good intake of vitamin C were more likely than respondents who had no history of illness, namely 48 respondents (64.9%). This is due to their attitude of paying more attention to immunity so as not to be infected with COVID-19. During the ongoing pandemic, consuming vitamin C became one of the popular ways among the public to prevent this virus. Vitamin C was widely consumed during the COVID-19 pandemic because it has a role as an antioxidant that can increase immunity, so vitamin C is used to anticipate COVID-19 disease (Carr & Maggini, 2017).

Based on the chi-square test in table 13, it is known that the chi-square test does not meet the requirements because the Expectation value in chi-square is more than 20%. So the alternative test requirement is to look at the Fisher's Exact Test value. Fisher's Exact Test value = 0.008 (< 0.05) which indicates that there is a significant relationship between a history of COVID-19 illness and vitamin C intake. People who have a history of COVID-19 illness will experience cognitive impairment, sleep disturbances caused by oxidative stress and inflammation which can disrupt blood circulation and neurotransmitter function, besides that you tend to experience fatigue easily. This is what causes people with a history of COVID-19 to pay more attention to vitamin C intake because vitamin C is one of the most effective antioxidants that shows anti-inflammatory effects (Vollbracht and Kraft, 2021). According to Aisy's research (2021), someone with a history of COVID-19 can increase awareness of the importance of vitamin C

because when patients were infected with COVID-19 it was explained that they reported improvement in symptoms such as flu, fever and shortness of breath after almost 1 week of intervention.

The results of other research state that patients with a history of COVID-19 often experience shortness of breath as a symptom of long-covid. This shortness of breath has a prevalence of 4.6% at five weeks after COVID-19 (Suparti et al., 2022). This is in line with research by Crook et al., (2021), there are several mechanisms that cause respiratory problems after COVID-19, including the chronic inflammation that occurs will cause continued production of pro-inflammatory cytokine storms and Reactive Oxygen Species (ROS) so that they spread to the tissues. and other blood flow. Vitamin C itself has a role as an electron donor which can quickly break the Reactive Oxygen Species (ROS) chain. Immune cells can be protected from damage caused by free radicals because vitamin C can easily donate electrons to free radicals (Siswanto et al., 2014).

CONCLUSION

The conclusion of this research is that there is a relationship between nutritional knowledge and a history of COVID-19 illness with vitamin C intake. This is proven by the chi-square results on the variable nutritional knowledge and vitamin C intake, namely p-value = 0.000 ($p\text{-value} < 0, 05$) and for the variable history of COVID-19 illness with vitamin C intake, the result was p-value = 0.008 ($p\text{-value} < 0.05$). Suggestions for respondents are that it is hoped that respondents can increase their intake of vitamin C by consuming foods sourced from vitamin C every day and for the village it is necessary to collaborate with the local health service or community health center to provide education regarding the importance of vitamin C for body immunity.

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CONFLICT OF INTEREST

There are no conflicts of interest in this study.

REFERENCES

- Afriyani, Rahma., & Pahrul, Dedi. 2021. Pendidikan Kesehatan Terhadap Perilaku Gizi Mahasiswa Ilmu Keperawatan Stik Siti Khadijah Palembang. *Jurnal Kesehatan dan Pembangunan*. 11 (21).
- Agus Styawan D. Pandemi COVID- 19 Dalam Persepektif Demografi. *Semin Nas Off Stat*. 2020;2020(September):182-189
- Aisy SR. Pengaruh Vitamin C Dan Vitamin D Terhadap Imunitas Pasien Covid-19. 2021;19:63.
- Almatsier, S. 2015. *Prinsip Dasar Ilmu Gizi*. Jakarta: PT Gramedia Pustaka Utama.
- Amaliah, N., & Fery. (2021). Peran Beberapa Zat Gizi Mikro Untuk Meningkatkan Sistem Imunitas Tubuh Dalam Pencegahan COVID-19. *Science Education and Learning Journal*, 1(1), 16–23.
- Arifin ZA, Melati Inayati Albayani, Baiq Ruli Fatmawati, Marthilda Suprayitna. Identifikasi Karakteristik Penderita Covid-19 di Provinsi Nusa Tenggara Barat. *J*
- Aswatini No, M F. Konsumsi Sayur dan Buah Di Dalam Masyarakat dalam Konteks Pemenuhan Gizi Seimbang. Jakarta: Pusat Penelitian Kependudukan Lembaga Ilmu Pengetahuan Indonesia (PPK-LIPI); 2018.
- Bimantara DE. Peran Vitamin C dalam Pengobatan Covid-19. *MajorJ*. 2020;9(1):1-4.
- Budiarti novi yulia. Tinjauan Pustaka COVID-19: Virologi, Patogenesis, dan Manifestasi Klinis. *Sustain*. 2020;4(1):1-9.
- Budiman, A. R. (2013). Kapita Selekta Kuesioner Pengetahuan dan Sikap dalam Penelitian Kesehatan. Salemba Medika.
- Carol S and Arah K. Plasma saturated intakes of vitamin C confer maximal antioxidant protection to plasma. *Journal of the American College of Nutrition* 2021;20(6):623-627.
- Carr, A. C., & Maggini, S. (2017). Vitamin C and immune function. *Nutrients*, 9(11), 1– 25.
- Chandra. Overview Micronutrient and immune function. 1997
- Crook, H., Raza, S., Nowell, J., Young, M., & Edison, P. (2021). Long covid -Mechanisms, risk factors, and management. *The BMJ*, 374, 1–18.
- Damayanti EH, Budyono C. Tinjauan Pustaka : Pengaruh Vitamin C , Vitamin D , dan Zinc Terhadap COVID-19. *urnal Kedokt Unram*. 2021;10(4):694-702.
- Damayanti, M., & Sofyan, O. (2021). Hubungan Tingkat Pendidikan Terhadap Tingkat Pengetahuan Masyarakat di Dusun Sumberan Sedayu Bantul Tentang Pencegahan COVID-19 Bulan Januari. *Majalan Farmaseutik*, 220-226.
- Fraser, E. (2020). Longterm respiratory complications of covid-19. *BMJ (Clinical Research Ed.)*, 370, m3001.
- Greenhalgh, T., Knight, M., A’Court, C., Buxton, M., & Husain, L. (2020). Management of post-acute covid-19 in primary care. *The BMJ*, 370(17), 2020–2021.

- Gropper, Sareen. S dan Smith, Jack. L. 2012. *Advanced Nutrition and Human Metabolism*. Wadsworth: USA.
- Hasan M, Levani Y, Laitupa AA, Triastuti N. Pemberian Terapi Vitamin C pada COVID-19. *J Pandu Husada*. 2021;2(2):74. doi:10.30596/jph.v2i2.5754
- J Multidiscip Healthc*. 2021;14:555- 565. doi:10.2147/JMDH.S302891
- JI YL, WU Y, QIU Z, et al. The Pathogenesis and Treatment of COVID- 19: A System Review. *Biomed Environ Sci*. 2021;34(1):50-60. doi:10.3967/bes2021.007
- Kemenkes RI. 2019. *Peraturan Menteri Kesehatan Republik Indonesia Nomor 28 Tahun 2019 tentang Angka Kecukupan Gizi yang Dianjurkan untuk Masyarakat Indonesia*. Jakarta : Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan Republik Indonesia.
- Kementerian Kesehatan Republik Indonesia. (2020). Pedoman Pencegahan dan Pengendalian Coronavirus Disease (COVID-19). *Gernas*, 0–115.
- Kementerian Kesehatan Republik Indonesia. Pedoman Pencegahan Dan Pengendalian Coronavirus Disese (Covid-19)-Rev-5. Jakarta : Kementerian Kesehatan Republik Indonesia; 2020.
- Maulana L, Sirajuddin S, Najamuddin U. Gambaran Pengetahuan, Sikap dan Tindakan terhadap Status Gizi Siswa SD INPR. *Journal Unhas* 6, (2021).
- Maulidina, Fatharani. 2019. “Faktor-Faktor Yang Berhubungan Dengan Kejadian Hipertensi Di Wilayah Kerja Puskesmas Jati Luhur Bekasi Tahun 2018.” *ARKESMAS (Arsip Kesehatan Masyarakat)* 4(1):149–55. doi: 10.22236/arkesmas.v4i1.3141.
- Nasution, S., 1999, *Kurikulum dan Pengajaran*, Jakarta: Bumi Aksara, cet-ke-3.
- Notoatmodjo, S. (2007). *Promosi Kesehatan dan Ilmu Perilaku*. Jakarta: PT Rineka Cipta.
- Notoatmodjo, Soekidjo. 2012. *Pendidikan dan perilaku kesehatan*. Jakarta: Rineka Cipta.
- Peters EM. Exercise immunology and upper respiratory tract infection. *International Journal of Sport Medicine* 1997;18:(Supl1)S68-S69.
- Sahana ON, Sumarmi S. Hubungan asupan mikronutrien dengan kadar hemoglobin pada wanita usia subur (WUS). *Media Gizi Indones*. 2015; 10(2): 184–91.
- Salman, Y., & Baru, B. (2021). Edukasi gizi untuk meningkatkan imunitas tubuh (Asupan tepat di masa pandemi Covid-19). *Edukasi Gizi Untuk Meningkatkan Imunitas Tubuh (Asupan Tepat Di Masa Pandemi Covid-19)*, 3(1), 20–29.
- Samrah SM, Al-Mistarehi AH, Kewan T, et al. Viral clearance course of covid-19 outbreaks.
- Sartika, RAD. (2011). Pengaruh Pendidikan Gizi Terhadap Pengetahuan dan Perilaku Konsumsi Serat Pada Siswa.
- Sediaoetama. *Ilmu Gizi untuk Mahasiswa dan Profesi di Indonesia*. Jakarta: Dian Rakyat. (2000).
- Selaindoong, Sejanía J, dkk. 2020. Gambaran Pengetahuan Gizi Mahasiswa Semester IV Fakultas Kesehatan Masyarakat Universitas Sam Ratulangi Saat Pembatasan Sosial Masa Pandemi Covid-19. *Jurnal KESMAS*. Vol. 9. No 6.
- Sembiring et al. Pregnancy Induced Hypertension Accompanied With Anemia: Potential Stunting of Newborns. *Global Journal of Health Science*; Vol. 10, No. 6; 2018.

- Shofia Qothrunnada. 2021. Tingkat Pengetahuan Gizi Seimbang dan Perilaku PUDS Mahasiswa Program Studi Ilmu Gizi Universitas Muhammadiyah Surakarta Selama Pandemi COVID-19. Universitas Muhammadiyah Surakarta.
- Siswanto, Budisetyawati, & Ernawati, F. (2014). Peran Beberapa Zat Gizi Mikro Dalam Sistem Imunitas. *Gizi Indonesia*, 36(1), 57–64.
- Soetjiningsih. Tumbuh Kembang Remaja dan Permasalahannya. Jakarta:Sagung Seto;2014.
- Suparti, L. T., Maria Yunita Indriarini, & Wijaya, Y. M. (2022). Karakteristik Penderita Long Covid. *Jurnal Kesehatan*, 10(1), 60–66.
<https://doi.org/10.55912/jks.v10i1.53>
- Syam, F. M., Lubis, Z. and Siregar, M. A. Gambaran Asupan Zat Gizi, Status Gizi, dan Produktivitas Kerja pada Pekerja Pabrik Kelapa Sawit Bagerpang Estate PT. PP. Lonsom. *Jurnal Gizi, Kesehatan Reproduksi, dan Epidemiologi* 2, (2013).
- Wahyuni, S., Sumarmi, S., Raudhany, F. A., & Mahmudiono, T. (2023). Pengetahuan Terkait Gizi dalam Upaya Meningkatkan Imunitas melalui Kebiasaan Makan selama Pandemi Covid-19. *Amerta Nutrition*, 7(1), 63–69.
- Wasiaturrahmah Y, Perdana Putra AM, Nahdha N, Rahmah N. Profil Penggunaan Obat Pada Pasien Covid-19 Di Salah Satu Rumah Sakit Di Banjarmasin. *J Insa Farm Indones*. 2022;5(1):159-166. doi:10.36387/jifi.v5i1.917
- Wijaksana, A., Wijaksana, A., Sahera, A. N., Wardani, A. K., Sianturi, B. T., Wahyuningwidhi, A., Arum, F. S., Pramesthi, G. Y., Rosyidah, I., Afifah, L., Aina, N., & Puspitasari, H. P. (2022). Pengetahuan Masyarakat terkait Pengelolaan Vitamin di Rumah Tangga pada Era Pandemi COVID-19 di Pulau Jawa. *Jurnal Farmasi Komunitas*, 9(2), 169–175.
- Wijayanti, N. 2017. *Fisiologi Manusia dan Metabolisme Zat Gizi*. Malang: UB Press.
- Yonanda V. Open Acces Acces. *J Med Utama*. 2022;03(02):402-406.

THE EFFECT OF HEALTH EDUCATION USING POWERPOINT ON KNOWLEDGE AND ATTITUDES ON DIABETES PREVENTION MELITUS AT SMP IT AL MUTHMAINNAH JAMBI CITY

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ABSTRACT

Background: Diabetes mellitus or often called DM is a group of metabolic diseases which are usually characterized by frequent urination in large amounts, drastic weight loss and hyperglycemia or sugar levels that are above normal due to damage to insulin production. One effort to reduce the prevalence and improve attitudes towards preventing diabetes mellitus is health education using PowerPoint media. The aim of this research is to determine the effect of health education using PowerPoint media to increase knowledge and attitudes towards preventing diabetes mellitus in class VII students at SMP IT AL Muthmainnah, Jambi City.

Method: This research is non-probability research with a one group pre test post test design using total sampling. This research was carried out at SMP IT AL Muthmainnah Jambi City. Univariate descriptive analysis includes frequency and percentage distribution, bivariate test with Shapiro-Wilk and Wilcoxon signed rank test.

Result: It is known that Asymp.Sig (2-tailed) has a value of 0.000. Because the value of 0.000 is smaller than ≤ 0.05 , there is a difference in the results of health education using powerpoint media for class VII students at SMP IT AL Muthmainnah Jambi City in the pretest and posttest.

Conclusion: Present the main conclusions and their implications. There is an influence of health education using PowerPoint media on knowledge and attitudes towards preventing diabetes mellitus in class VII students of SMP IT AL Muthmainnah Jambi City

Keywords: Health education; Powerpoint; Diabetes mellitus

INTRODUCTION

The World Health Organization reported that 422 million people in the world suffered from diabetes mellitus in 2014, of which 1.6 million died due to diabetes mellitus. This number is predicted to increase to 642 people in 2040. Globally, the prevalence of Diabetes Mellitus in adults over 18 years of age increased from 4.7% in 1980 to 8.5% in 2014 (WHO, 2016)

Riskesdas data in 2018, there was an increase in the prevalence of DM in 17 provinces throughout Indonesia from 1.5% (2013) to 2.3% in 2018 from a total population of 250 million (Riskesdas, 2018). Based on the results of Basic Health Research

in 2018, it was reported that there was an increase in the prevalence of Diabetes Mellitus cases in residents aged ≥ 15 years, namely 6.9% in 2013 and 8.5% in 2018. The incidence of DM in Jambi Province in the 2007 Riskesdas was 5.2% and decreased in the 2013 Riskesdas results to 1.2% then increased to 1.4% in 2018 (Riskesdas, 2018).

Survei Kesehatan Indonesia (2023), the prevalence of Diabetes Mellitus at all ages according to Jambi province is 0.9% with 11,588 cases. The highest cases occurred in West Java at 1.7% with the most cases at 156,977 cases, while the lowest cases were in South Papua 1.1% with 1,684 cases.

Data from the Jambi City Health Service found that there were 2,725 diabetes mellitus sufferers in 2022, ranking 2nd among the 17

non-communicable diseases in Jambi City. Data from the Health Service found 5 health centers with the highest number of DM cases, namely Putri Ayu health center with 441 sufferers, Pakuan Baru health center with 355 sufferers, Rawasari health center with 334 sufferers, Kebun Handil health center with 204 sufferers and Simpang Kawat health center with 200 sufferers. Based on data obtained from the Jambi City Health Service, it is known that diabetes mellitus data shows that the number of sufferers in 2022 will reach 57.90% with a total of 12,232 people. Based on 2022 data, there were 389 cases of diabetes mellitus at the Rawasari Community Health Center and this will increase in 2023 by 44.73% with 582 cases. Based on this initial data, it can be seen that diabetes cases increase every year.

The increase in the prevalence of diabetes mellitus from children to teenagers can be caused by a lifestyle that tends to be at risk of non-communicable diseases such as daily snack habits such as frequently consuming fast food, sweet foods, sugary drinks, boba and not paying attention to diet patterns. healthy life (Putra, et al., 2021; Putra et al., 2022, Sunanda et al., 2023). Based on the description above, researchers are interested in conducting research with the title "The influence of health education using Powerpoint media to improve the knowledge and attitudes of class VII students in preventing diabetes mellitus at SMP IT AL Muthmainnah, Jambi City".

METHODS

This type of research is quantitative with a non-probability research design with one group pre-test and post-test design without control by providing a questionnaire on knowledge and attitudes towards preventing diabetes mellitus. Sampling in this research was total sampling using the entire population as the sample. The population in this study were all students in class VII A and B of SMP

IT AL Muthmainnah, Jambi City, totaling 39 respondents. The intervention carried out was health education in preventing diabetes mellitus for class VII students at SMP IT AL Muthmainnah, Jambi City, which was implemented on Tuesday, May 21 2024 in class VII.

The independent variable in this study is the use of PowerPoint media regarding diabetes mellitus, while the dependent variable is knowledge and attitudes in preventing diabetes mellitus which has a ratio data scale. The data collection method in this research is a questionnaire which has been tested for validity and reliability at SMP 14 Jambi City on 30 students and was declared suitable for use. Data processing in this research is Editing, Coding, Scoring, Tabulating, and Cleaning.

Data analysis was carried out using Univariate Analysis and Bivariate Analysis. Univariate analysis was carried out to determine the frequency distribution of knowledge and attitudes about preventing diabetes mellitus. Bivariate analysis to determine the effect of health education using PowerPoint media to increase the knowledge and attitudes of class VII students in preventing diabetes mellitus at AL Muthmainnah IT Middle School, Jambi City. The statistical test for bivariate analysis is using the Shapiro-Wilk and Wilcoxon signed rank test using the SPSS application tool at a confidence level of 95% ($\alpha = 0.05$). Hypothesis testing is carried out by comparing the P value at the 95% confidence level with the following criteria; if the distribution is normal ($P \geq 0.05$) then the analysis used is Paired T - Test. If the normality test is not ($P \leq 0.05$) if it is not normally distributed then the Wilcoxon test is carried out if the P-value $P \leq 0.05$ then H_a is accepted. Data is presented in tabular and textual form.

RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents

Characterisrics	f	%
Age (years)		
12	17	43,6%
13	19	48,7%
14	2	5,1%
15	1	2,6%
Gender		
Male	24	61,5%
Female	15	38,5%

Based on Table 1, it is known that the respondents were 24 students (61.5%) male and 15 students (38.5%) female and respondents aged 12 years were 17 students (43.6%), respondents aged 13 were 19 (48.7%), respondents aged 14 were 2 students (5.1%), and respondents aged 15 years were 1 student (2.6%).

The results of the statistical data analysis show that there is a difference in average knowledge (difference of 2.03) and average attitude (difference of 2.09) between before being given health education and after being given health education using PowerPoint media.

Table 2. Knowledge and attitudes towards preventing diabetes mellitus using powerpoint

Variabel	Mean±SD	Mean Different ± SD	Min-Max	95% CI Lower-Upper	P-value
Knowledge					
Before	6.38±0.910	2.03±0,025	3-7	6.08-6.69	$P \leq 0.001$
After	8.41±0.935		6-10	8.12-8.71	
Attitude					
Before	5.54±0.718	2.09±0,038	3-6	5.29-5.78	$P \leq 0.001$
After	8.44±0.756		7-10	8.20-8.67	

The results of this study show that there is an influence of health education using PowerPoint media in preventing diabetes mellitus

Powerpoint in the world of education can be used as a medium for conveying information to students. Powerpoint can position text, graphics, video, sound and other objects on one or more individual pages called "slides" (Berkhamas Mulyadi et al., n.d.)

According to previous research conducted by Maria Resti Andriani and Wahyudi (2016) with the title "Development of integrative thematic learning media for grade 2 students at SDN Bergas Kidul 03 Semarang Regency".

The research results show that interactive PowerPoint learning media is suitable for use as an alternative learning media, because in developing this media it can make students more active, think critically, focus on the learning process and also foster a sense of enjoyment in learning (Resti Andriani et al, 2016).

Hofsterer stated, "Multimedia is the use of computers to create and combine text, graphics, audio, moving images (video and animation) by combining links and tools that enable users to navigate, interact, create and communicate." Rusman stated that multimedia PowerPoint presentations are more often used using tools in the form of multimedia Liquid Cristal Displays or what we often know as LCD (Mutaharoh, 2017)

According to Yunita, who said that using interactive multimedia by optimizing PowerPoint, the learning motivation of class IV students at SD Negeri 01 Tawangmangu has increased. Apart from that, the interactive PowerPoint media used effectively provides positive student attitudes, students become motivated, increases understanding, and also helps teachers so that students are motivated in the process of learning activities (Yunita, 2014)

In line with research by Puspita et al (2020), the results of statistical tests using the Wilcoxon test obtained a p value of 0.000 (<0.05) using a confidence level of 95%, which means that there is an influence of interactive PowerPoint learning media on the learning outcomes of class 2 students at SDN 1 Karangsoko.

According to research conducted by (Khoiron, 2014) regarding the effectiveness of health education using leaflets and PowerPoint on changes in knowledge, attitudes and behavior in early detection of cervical cancer, it shows that PowerPoint is more effective than leaflets in changing respondents' attitudes.

Attitude is not an action or activity, but is the action of a behavior. This attitude is a

readiness to react to objects in a certain environment towards an object (Edyati, 2014)

Attitude itself has levels, namely receiving, responding, valuing, and responsible. The first level of receiving is that someone receives stimulation which means they can receive the material given. Then, responding where the respondent will provide an answer when asked. Next, by valuing, someone can invite other people to work on, implement or discuss a problem. As well as being responsible, meaning someone can be responsible for the attitude they have chosen (Notoadmodjo., 2010).

CONCLUSION

There is a difference in the average knowledge and attitudes towards preventing diabetes mellitus in class VII students of SMP IT AL Muthmainnah, Jambi City between before and after being given health education using PowerPoint media. Based on the research results, it was found to be significant in knowledge and attitudes. So it can be concluded "there is an influence of health education using PowerPoint media on knowledge and attitudes towards preventing diabetes mellitus in class VII SMP IT AL Muthmainnah Jambi City"

Thus, it is necessary to disseminate information related to the prevention of diabetes mellitus through interesting and creative health promotion methods and media in schools to support the success of prevention efforts and continue to implement prevention of diabetes mellitus by maintaining a healthy diet and lifestyle to avoid.

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CONFLICT OF INTEREST

The author has stated that in this article there is no or potential conflict of interest from either the author or the agency in connection with the research that has been conducted, both based on authorship and publication.

REFERENCES

- Berkhamas Mulyadi, Y., Elementary School Teacher, P., & Khatulistiwa, P. (N.D.). Development Of Interactive Cd Learning Materials Based On Power Point To Improve Students' Learning Outcomes.
- Edyati. (2014). The Influence Of Health Counseling Using Video Media On The Personal Hygiene Knowledge And Attitudes Of Students Of Primary School Negeri 1 Kepek Pengasih Kulon Progo..
- Development Policy, B., Ministry, K., & Ri, K. (N.D.). In Figures For The 2023 Ski Driving Team In Figures Ministry Of Health Of The Republic Of Indonesia.
- Khoiron, N. (2014). The Effectiveness Of Health Education Using Leaflet Media And Power Point Slide Media On Changes In Knowledge, Attitudes And Behavior In Early Detection Of Cervical Cancer In Pkk Women In The Working Area Of The Kartasura Sukohorjo Health Center.
- Riskesdas Report 2018. (2018). Ministry of Health of Republic of Indonesia.
- Mutoharoh. (2017). The Influence Of Health Education On The Level Of Knowledge About Diabetes Mellitus In Type 2 Diabetes Mellitus Patients In Ngadiwarno Village Sukorejo Kendal.

- Putra, E. S., Junita, J., & Siregar, S. (2021). Konsumsi minuman manis prediktor risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 10(2), 89-97.
- Putra, E. S., & Junita, J. (2022). Rasio lingkar pinggang tinggi badan dan aktivitas fisik sebagai risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 11(1), 45-53.
- Sunanda, E., Sofiyetti, S., & Muhaimin, A. (2023). Jenis dan Asupan Advanced Glycation EProducts (AGEs) dengan Obesitas Abdominal pada Remaja di Kota Jambi. *Pontianak Nutrition Journal (PNJ)*, 6(2).
- Resti Andriani, M., & Primary School Teacher Education Studies -Fkip Satya Wacana Christian University Salatiga, P. (N.D.). Development Of Interactive Power Point Learning Media Through A Scientific Approach For Integrative Thematic Learning For Class 2 Students Of Sdn Bergas Kidul 03 Semarang District.
- Who. (2016). *Global Report On Diabetes*.
- Yunita, C. (2014). Abstract Increasing Motivation For Learning Science Through The Implementation Of Interactive Multimedia By Optimizing Microsoft Powerpoint Media In Class Iv Students Of State 01 Tawamangu Primary School Year 2013/2014.

THE RELATIONSHIP BETWEEN COFFEE CONSUMPTION HABITS AND SCREEN TIME WITH THE INCIDENCE OF OBESITY STUDENTS SENIOR HIGH SCHOOL 2 JAMBI CITY IN 2024

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ABSTRACT

Background: Obesity is a condition in which there is an imbalance between the entry and exit of energy in the sufferer. Obesity is one of the diseases that afflicts many people around the world, especially teenagers. Obesity continues to increase, which is feared to be one of the triggers of the causative factors of type 2 diabetes mellitus. The purpose of this study is to determine the relationship between coffee consumption habits, *screen time* and the incidence of obesity in students of SMA Negeri 2 Jambi City.

Methods: The research design uses a *cross sectional* design with a sample of 70 respondents. The sampling technique uses the *proportional random sampling technique*. The results of this study were carried out data analysis test using *chi-square test*.

Results: The results of the statistical test using the *chi-square test* with a *p-value* of 0.1 (*p-value* > 0.05) which means that there is no relationship between coffee consumption habits and the incidence of obesity. For the relationship with coffee volume *P* value of 0.507 (*p-value* > 0.05) was obtained where there was no relationship between coffee volume and obesity in students at SMAN 2 Jambi City. The results of the *chi-square* test were obtained with a *P* value of 0.001 (*p-value* < 0.05) **Conclusion:** which means that there is a relationship between *screen time* and the incidence of obesity in students of SMA Negeri 2 Jambi City.

Keywords: Obesity; Coffee Consumption; Screen Time.

INTRODUCTION

Obesity is a condition in which body fat accumulates excessively, so that a person's weight exceeds the normal limit and poses a risk of health problems in sufferers (Wulandari, 2016). Obesity falls under the category of diseases according to *International Statistical Classification of Diseases and Related Health Problems 10th revision* (ICD-10) issued by WHO with the code E66 (WHO 2016). A person is said to be obese if his body weight reaches more than 20% of his normal body weight. Obesity is also affected by an imbalance in one's lifestyle and bad habits so that there is an imbalance between energy intake and energy expenditure (Dewi 2015).

Obesity can be experienced by children, adolescents, and adults regardless of whether

they are men or women (Khoirunnisa 2022; Sunanda et al., 2023). A teenager is someone aged 10-18 years (Permenkes 2014). Adolescence is a transition period from childhood to adulthood.

The World Health Organization (WHO) stated that the incidence of obesity in 2016 was 13.1% (340 million adolescents ≥aged 5-19 years were overweight or obese). WHO states that obesity is one of the risk factors that always increase every year which threatens the health of the world's people. In 2022, obesity in adolescents increased with an incidence rate of 16% (390 million adolescents are obese) (WHO, 2020).

In Indonesia, based on the results of Basic Health Research (RISKESDAS) in 2013, the prevalence of obesity among adolescents was 1.6 % and in 2018 the prevalence of obesity in adolescents > 15 years increased by 4.0%.

With the highest obesity prevalence data in DKI Jakarta province with a figure of 8.3% while the lowest obesity prevalence is in East Nusa Tenggara province with a figure of 1.0 %. (RISKESDAS, 2018). For Jambi Province, data from riskesdas 2018 shows the prevalence of overweight in the same adolescent age group of 2.7%. Data found from a survey by the Jambi City Health Office showed that there were 2,382 people with obesity in 20 Jambi city health centers with obesity in adolescents as many as 174 adolescents and the highest number was found in the Pal X Health Center, especially at the high school level as many as 45 people. The incidence rate of overweight in Jambi province is 11.3% for men and 15.9% for women (Jambi Provincial Health Office, 2022).

Obesity can result in premature death because it can trigger the emergence of degenerative diseases such as diabetes, heart problems, high blood pressure, problems in the growth/development stage, increasing the rate of illness and death (Masrul, 2018), Obesity can also cause problems in confidence and body image in adolescents (Dewi, 2015).

One of the factors that affect obesity is the problem of unhealthy food intake, for example, the habit of consuming sugary drinks causes a lot of calorie accumulation in the body which causes obesity, and other diseases. Coffee is a form of sweet drink that is in demand among teenagers, the type of coffee that can affect the occurrence of obesity is coffee that uses additional ingredients in its presentation such as sugar, milk, creamer, boba, and coconut milk. Changes in nutritional status caused by coffee are an increase in energy and lipotic activity in the body (Kusumawati et al, 2020; Putra et al., 2021). Side effects caused by caffeine are cardiovascular disease, type 2 diabetes mellitus, sleep pattern disorders, and some types of cancer due to an increase in body mass index (Putri et al., 2020). Coffee has

undergone many changes, in ancient times coffee was only served with sugar as a natural sweetener. The process of processing coffee and its ingredients to reduce its bitter taste such as the addition of milk, creamer, coconut milk, and boba, so that coffee becomes more preferred by teenagers and as a *Life Style* contemporary. According to (Brewing, 2020) As many as 60% of teenagers like milk coffee because they are trying to explore new flavors and additives in coffee presentation. International Coffee Organization (ICO) data noted that the trend of domestic coffee consumption in Indonesia has continued to increase over the past five years. In the 2018-2019 period, the number of domestic coffee consumption reached 4,800 bags with a capacity of 60 kilograms (International Coffee Organization, 2020). Brewing (2020) said that in 2019 there were >2937 coffee shop outlets that opened throughout Indonesia. According to the Insight Center (KIC) data survey, the most contemporary beverage consumers are from the millennial generation aged 15-19 years as much as 45% (Annur 2022).

Lack of physical activity is also a risk factor for the onset of obesity. physical activity can improve physical fitness and can control excess weight if done regularly, especially in adolescents, but many teenagers rarely do physical activity every day. Adolescents who do 9.0% of physical activity can be seen in a very large ratio with adolescents who do less physical activity as much as 84.9% and who do not do physical activity as much as 9.1% (Krismawati, 2018; Putra et al., 2022). This is due to many things such as lack of motivation, no time, and the influence of social media. Physical activity is necessary for adolescents to reduce their lifestyle *sedentary* and increase calorie expenditure and control weight. The popularity of gadgets as a technological development today can have a negative impact when used excessively (Jeki, 2023).

The development of today's technology makes teenagers feel easier to do something that results in monotonous behavior and laziness. Teenagers spend more time sitting for long hours and doing activities *Screen Time* accompanied by hanging out with other friends (Nabawiyah 2020). These activities make teenagers lazy to do physical activities and choose to play *smartphone* everyday. *Screen time* It is the duration of time that a person spends every day staring at the screen.

In the United States, adolescents 8-18 years old spend an average of about 7.5 hours per day in front of a screen. This significant amount of time is associated with the onset of nutritional problems in adolescents (Houghton, 2015). The results of research showed that 27.9% of adolescents used gadgets for less than or equal to 120 minutes per day, while 72.1% of adolescents used gadgets with a duration of more than 120 minutes per day (Kumala, 2019).

The results of Putri (2020) the incidence of obesity in students of the Faculty of Health Sciences, University of Muhammadiyah Pontianak It is known that there is a significant relationship between coffee consumption and the incidence of obesity, students who consume coffee >2 times a day are at risk of obesity by being influenced by the type of coffee consumed found to be related to the possibility of obesity. Instant coffee drinkers who use sugar and creamer have a higher risk of overweight (BMI > 23) and obesity than non-drinkers.

The results of Suraya's (2018) research on the incidence of obesity in adolescents at Madrasah Aliyah Negeri Binjai, adolescents who have *Screen Time* Longer/more than the recommended time tends to be obese. As a result, they do little physical activity. *Screen time* which is excessive will further increase the imbalance of incoming energy with the energy expended by the body (Suraya, 2018).

The objectives of this study are to find out the relationship between coffee drinking habits and *screen time* and the incidence of

obesity in students at SMA Negeri 2 Jambi City.

METHODS

The research design uses a *cross-sectional* design of the study risk factors between exposure (consumption caffeine and screen-time habits) with the incidence of obesity in students of SMA Negeri 2 Jambi City. This research was conducted on high school students in grade 11 in May-June. The population of this study is 396 students. This study uses a sampling technique using proportional random sampling with a sample of 70 respondents. The data analysis technique used is the Chi Square test.

This study obtained data using a questionnaire, the questionnaire sheet given to respondents was a nutritional status questionnaire, a coffee consumption habits questionnaire and a screen time questionnaire (QUEST).

RESULTS AND DISCUSSION

General Description of The Sample

The characteristics of the sample of students with female and male gender are equal to many with 35 people (50.0%). Based on age characteristics, most students were 16 years old as many as 37 people (52.9%) followed by students aged 17 years as many as 32 people (45.7%) and a small proportion of students aged 18 years as many as 1 person (1.4%).

Body Massa Index

Body mass index (BMI) is an indicator of nutritional status, both for undernutrition and overnutrition (Supriasa, 2016).

Table 1. Average Distribution of Adolescent Body Mass Index at SMA Negeri 2 Jambi City

Mean	S.D	Min	Max
25,357	4,799	15,0	36,9

The average Body Mass Index (BMI) of respondents at SMA Negeri 2 Jambi City in this study was 25.357, Standard Deviation (s)

= 4.7999, the smallest BMI was 15.0, and the largest was 36.9.

Table 2. Frequency Distribution of Body Mass Index of Adolescents in SMA Negeri 2 Jambi City.

Nutrition status	Frequency	Percent (%)
Non obese	46	65,7
Obese	24	34,3

The frequency distribution of Body Mass Index (BMI) of students at SMA Negeri 2 Jambi City in this study was 46 (65.7%) adolescents in the non-obese category and 24 (34.3) adolescents in the obese category.

Coffee Consumption Habits

The results showed that coffee consumption of 70 respondents who regularly consume coffee as many as 48 students (68.6%) and students who do not consume coffee as many as 22 students (31.4%).

Table 3. Frequency Distribution of coffee consumption of Adolescents in SMA Negeri 2 Jambi City.

Coffee Consumption	Frequency (n)	(%)
Yes	48	68,6
No	22	31,4

Frequency Daily Coffe Consumption

The results of the study showed the frequency of drinking per day in students of SMA Negeri 2 Jambi City. The frequency of 1 time was 16 students (22.9%). The frequency of 2 times was 21 students (30.0%). The frequency of 3 times was 10 students (14.3%), the frequency of 4 times was 1 student (1.4%) and the frequency of not consuming was 22 students (31.4%).

Table 4. Frequency Distribution of coffee consumption of Adolescents in SMA Negeri 2 Jambi City.

Frequency consumption	Frequency	Percent (%)
0	22	31,4
1	16	22,9
2	21	30,0
3	10	14,3
4	1	1,4

Volume Coffee Consumption

The results of the study show that the frequency distribution of the volume of coffee drunk is only in the medium and high categories. Coffee consumption in the medium category was 28 students (58.3%), and in the high category as many as 20 students (41.7%).

Table 5. Frequency Distribution of coffee consumption of Adolescents in SMA Negeri 2 Jambi City.

Volume Coffe Consumption	Frequency (n)	(%)
Medium	28	58,3
High	20	41,7

Screen Time

The results showed that the average value = 9.839, Median (Me) = 10,000, Standard Deviation (s) = 2.8044, the lowest screen time activity was 3.4 hours, while the highest value of screen time was 17.7 hours.

Table 6. Average Distribution of Adolescent Screen Time at SMA Negeri 2 Jambi City

Mean	S.D	Min	Max
9,839	2,8044	3,4	17,7

Meanwhile, in looking at the frequency of screen time data, it is categorized into sufficient and high, as in the table below:

Table 7. Frequency Distribution of Screen Time Adolescents in SMA Negeri 2 Jambi City.

Screen Time	Frequency (n)	(%)
Medium	30	42,9
High	40	57,1

The results of the study showed that the duration of adolescent screen time at SMA Negeri 2 Jambi City in this study was 30 (42.9%) screen time in the moderate category and 40 people (57.1%) in the high category.

The relationship between coffee consumption and obesity in students of SMA Negeri 2 Jambi City

Coffee consumption habits are an expression of each individual in consuming coffee every day or every occasion, the habit of consuming sugary drinks such as coffee excessively can lead to obesity. Distribution overview incidence of obesity according to coffee consumption habits listed in the table 8:

Table 8. The relationship between coffee consumption and obesity in students of SMA Negeri 2 Jambi City

Variable		Coffee Consumption		p
		Yes n (%)	No n (%)	
BMI	Obese	17	7	0.768
	Non obese	31	15	

Data analysis showed that adolescents who were obese and consumed coffee were 17 (70.8%) while adolescents who did not consume coffee were 7 (29.2%). The results

of the analysis used a chi-square P-value test of $0.768 > 0.05$ which means that there is no relationship between coffee consumption and the incidence of obesity in adolescents at SMA Negeri 2 Jambi City.

The relationship between screen time and obesity in students of SMA Negeri 2 Jambi City

Screen time is the duration of time that a person spends every day staring at the screen. Distribution overview incidence of obesity according to screen time listed in the table 9: Data analysis showed that adolescents who were obese with high screen time duration were 20 (83.3%) while obese adolescents with sufficient screen time were 4 (16.7%). The results of the statistical test analysis using the chi-square test obtained a p-value value of $0.001 < 0.05$ which means that there is a relationship between screen time and the incidence of obesity in students at SMA Negeri 2 Jambi City.

Table 9. The relationship between screen time and obesity in students of SMA Negeri 2 Jambi City

Variable		Coffee Consumption		p
		Yes n (%)	No n (%)	
BMI	Obese	4	20	0.001
	Non obese	26	20	

Obesity according to the World Health Organization (WHO, 2016) is one of the conditions where there is an accumulation of excess fat in the body which can interfere with health. Obesity is not only occurs in adulthood or the elderly, but can also occur among teenagers up to the younger group is children. Obesity that occurs during childhood can be at high risk become obese in adulthood.

The results of the study obtained the maximum value of the student's BMI was 36.9 which was included in the obesity category (>27.0). The frequency of students who are obese is 24 (34.3%) people. Obesity, if not controlled, can cause physical and psychological disorders and cause many kinds of degenerative diseases such as diabetes mellitus type 2 (Sajawandi, 2015).

One of the factors that affect obesity is the problem of unhealthy food intake, for example, the habit of consuming sugary drinks causes a lot of calorie accumulation in the body which causes obesity, and other diseases. Coffee is a form of sweet drink that is in demand among teenagers, the type of coffee that can affect the occurrence of obesity is coffee that uses additional ingredients in its presentation such as sugar, milk, creamer, and boba.

Trends today are a must that teenagers follow both from the way they dress to a variety of food and drinks. Coffee is one of the many drinks that are in demand in various circles, especially teenagers. Coffee consumption in this modern era has become one of the habits and lifestyles for prestige competitions between teenagers (Assegaf, 2021).

In this study, it was obtained that the prevalence of the habit of consuming coffee in adolescents eating fast food with frequent frequency in obese children was 17 (70.8%). The results of the *chi-square* test analysis of the relationship between coffee consumption habits and obesity obtained a value of $p = 0.768$, this shows that there is no significant relationship between coffee consumption habits and obesity at SMAN 2 Jambi City. The results of this study are in line with research (Khasanah et. al, 2023) which said that consuming coffee has no significant relationship with the increase in nutritional status in adolescents in southern jagakarsa, a person who consumes coffee has a normal nutritional status of 48 (53.5%). This study obtained results with p value = 0.116 which means that there is no relationship between coffee consumption and the incidence of obesity in adolescents.

The results of the chi-square statistical test obtained a P-value value of $0.507 > 0.05$ where it can be concluded that there is no relationship between coffee volume and obesity in students of SMA Negeri 2 Jambi City. The results of this study are in line with

research conducted by Megawati (2022) stating that a person with a high level of coffee consumption has a lower BMI. This study obtained a result of $p=0.388 > 0.05$ which means that there is no relationship between consumption volume and the incidence of obesity. This is because the consumption of coffee drunk is low, causing a lack of influence on the increase in the nutritional status of respondents, the average respondent consumes 1 time/day. Consumption of coffee without additives in normal amounts can help reduce the risk of sarcopenia, but if consumed $> 3x/day$, it will cause an increase in body mass index, especially in women.

The development of today's technology makes teenagers feel easier to do something that results in monotonous behavior and laziness. Adolescents often spend time sitting for hours and doing screen time activities accompanied by hanging out with other friends (Nabawiyah 2020). This activity makes teenagers lazy to do physical activities and choose to play smartphones all day. Among children and teenagers play computers, gadgets, video games, and the use of the internet turns out to be associated with advantages weight. This is due to the large number of television content that moves to computers and smartphone so that it is very easy to provide Effects of addiction on children. Light physical activity causes low energy output, causing an imbalance between more energy intake and less energy expenditure (Astika, 2023).

The duration of screen time recommended by the American Academy of Pediatrics (2016) adolescents do not use smartphones for more than two hours every day. Screen time affects a person's body mass index because it can cause an imbalance between incoming and outgoing energy.

Based on the results of this study, the average value of adolescent screen time duration was 9.387. And based on the analysis test using the *Chi Square* test, a P

value of $0.0001 < 0.05$ was obtained which shows a relationship between screen tie and the incidence of obesity in SMAN 2 students of Jambi City.

The results of this study are in line with Suraya's (2020) research which shows that screen time has a relationship with the incidence of obesity in adolescents with a value ($p= 0.026$). Another study from Putri (2020) showed that adolescents who did screen time ≥ 3 hours per day were at risk of experiencing obesity 14,538 times compared to students who had screen time.

CONCLUSION

It can be concluded that there is no relationship between coffee consumption and coffee volume and the incidence of obesity, but there is a relationship between screen time and the incidence of obesity in students of SMAN 2 Jambi City.

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CONFLICT OF INTEREST

There are no conflicts of interest in this study.

REFERENCES

- Annur, Cindy Mutia. 2022. "Konsumen Minuman Kekinian Paling Banyak Dari Generasi Milenial." 2022.
- Brewing Indonesia. 2020. "Insights for Successful Coffee Shop Business."
- Dewi, Mirna Candra. 2015. "Faktor-Faktor Yang Menyebabkan Obesitas." *Jurnal Majority* 4(8):53–56.
- International Coffee Organization. 2020. "Konsumsi Kopi Domestik Di

- Indonesia Terus Meningkatkan Selama 5 Tahun Terakhir.” *Databoks* 1–5.
- Jeki, Andicha Gustra, Windy Aprilia, and Indah Ariesta. 2023. “Determinan Kejadian Kegemukan Pada Remaja Kota Jambi.” *Jurnal Informatika Medis (J-INFORMED)* 1(2):73–85.
- Khoirunnisa, Tasya, and Ratih Kurniasari. 2022. “Pengaruh Edukasi Melalui Media Pada Kejadian Overwight Dan Obesitas : Literature Review.” *PREPOTIF: Jurnal Kesehatan Masyarakat* 6(2):1212–17. doi: 10.31004/prepotif.v6i2.4338.
- Krismawati, Luh Dwi Erna, Ni Luh Nopi Andayani, and Nila Wahyuni. 2018. “Hubungan Antara Aktifitas Fisik Dengan Indeks Massa Tubuh (IMT) Pada Remaja Usia 16-18 Tahun Di SMA N 2 Denpasar.” *Majalah Ilmiah Fisioterapi Indonesia* 25–28.
- Kumala, Anandita Mega, Ani Margawati, and Ayu Rahadiyanti. 2019. “Hubungan Antara Durasi Penggunaan Alat Elektronik (Gadget), Aktivitas Fisik Dan Pola Makan Dengan Status Gizi Pada Remaja Usia 13-15 Tahun.” *Journal of Nutrition College* 8(2):73. doi: 10.14710/jnc.v8i2.23816.
- Kusumawati, Evi, Teguh Fathurrahman, and Estin Sutriani Tizar. 2020. “Hubungan Antara Kebiasaan Makan Fast Food , Durasi Penggunaan Gadget Dan Riwayat Keluarga Dengan Obesitas Pada Anak Usia Sekolah (Studi Di SDN 84 Kendari).” *Jurnal Kedokteran & Kesehatan* 6(2):87–92.
- Mahasiswa dan Penelitian Kesehatan, Jurnal, Putri Manja, Fakultas Ilmu Kesehatan, and Universitas Muhammadiyah Pontianak. 2020. “Hubungan Antara Konsumsi Kafein, Screen Time, Lama Tidur, Kebiasaan Olahraga Dengan Obesitas Pada Mahasiswa Fakultas Ilmu Kesehatan Universitas Muhammadiyah Pontianak.” *Jumantik* 7(1):1–9.
- Nabawiyah, Arneliwati, and Yesi Hasneli. 2020. “Hubungan Tingkat Aktivitas Fisik Dengan Kejadian Obesitas Remaja.” *Detector: Jurnal Inovasi Riset Ilmu Kesehatan* 1(1):14–26.
- Putra, E. S., Junita, J., & Siregar, S. (2021). Konsumsi minuman manis prediktor risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 10(2), 89-97.
- Putra, E. S., & Junita, J. (2022). Rasio lingkaran pinggang tinggi badan dan aktivitas fisik sebagai risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 11(1), 45-53.
- Sunanda, E., Sofiyetti, S., & Muhaimin, A. (2023). Jenis dan Asupan Advanced Glycation EProducts (AGEs) dengan Obesitas Abdominal pada Remaja di Kota Jambi. *Pontianak Nutrition Journal (PNJ)*, 6(2).
- Suraya, Rani Siagian, Albiner Lubis, Zulhaida Nababan, and Agnes Sry Vera. 2018. “Pengaruh Konsumsi Makanan Jajanan, Aktivitas Fisik, Screen Time, Dan Durasi Tidur Terhadap Obesitas Pada Remaja.” *Jurnal Dunia Gizi* 3(2):80–87.
- Wulandari, Syamsinar, Hariati Lestari, and Andi Faizal Fachlevy. 2016. “Faktor Yang Berhubungan Dengan Kejadian Obesitas Pada Remaja Di SMA Negeri 4 Kendari Tahun 2016.” *Jurnal Ilmiah Mahasiswa Kesehatan Masyarakat* 1(3):1–13.

A THOUGHT STOPPING IMPLEMENTED TO DECREASE AUDITORY HALLUCINATIONS IN NURSING CARE APPROACH AT RAWASARI PUBLIC HEALTH CENTER

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ABSTRACT

Background: The schizophrenia prevalence was dramatically increase every year including auditory hallucination. The schizophrenia rate was 2.1 million people and increased in 2018 to 2.3 million people out of a total world population of 7.5 billion. It is estimated that more than 90% of schizophrenic of hearing hallucinations patients living with community. Halucinations patients had often experience that they could feel but cannot be felt by other people. This study aimed to identify a thought stopping hallucinations implementation among hearing hallucinations in nursing care approach.

Methods: This case study used a descriptive case study with nursing care approach, where the subject of the case study was carried out on 2 patients with auditory hallucinations on June 12th until June 14th 2024. Data collection was carried out using interview methods, filling out questionnaires and observation. The implementation results for 3 days among patients showed that there was a change in the level of hallucinations using Auditory Hallucination Rating Scale (AHRs) questionnaire, although it was not significant.

Results: Subjects had lower level of auditory hallucination by controlling voice resources from environments and managing of auditory halucination behavior.

Conclusion: Further investigation is needed health workers, especially nurses at Community Health Centers can frequently providing nursing care role in health education among families and patients with hallucinations on a regular basis by approaching a thought stopping therapy .

Keywords: Auditory; Hallucinations; Thought Stopping; Therapy

INTRODUCTION

The prevalence of schizophrenia increases every year. The recorded schizophrenia rate was 2.1 million people and increased in 2018 to 2.3 million people out of a total world population of 7.5 billion (WHO 2018). Indonesia also experiences an increase in the number of schizophrenia reported by around 1-2% every year (Ministry of Health Rim 2020).

The prevalence of schizophrenia cases in Indonesia in 2019 for Southeast Asia is in first place, followed by Vietnam, the Philippines, Thailand, Myanmar, Malaysia, Cambodia and finally East Leste. Epidemiological studies in 2018 stated that the prevalence rate of

schizophrenia in Indonesia was 3% to 11%, a 10-fold increase compared to data in 2013 with a prevalence rate of 0.3% to 1%, usually appearing at the age of 18-45 years (Ministry of Health, 2019). Cases of mental disorders in Indonesia based on the results of Basic Health Research (Riskesdas) in 2018 have increased. This increase can be seen from the increase in the prevalence of households with ODGJ in Indonesia. There was an increase in the number to 7 per mil of households. This means that per 1000 households there are 7 households with ODGJ, so the number is estimated to be around 450 thousand severely ODGJ (Indrayani and Wahyudi, 2019).

Schizophrenia has 2 symptoms, namely positive symptoms and negative symptoms. Positive (real) symptoms are social isolation,

hallucinations, delusions, risk of violent behavior. Negative symptoms (behavioral deficits) include dull and flat affect, withdrawal from society, no eye contact, inability to express feelings, inability to relate to other people, no spontaneity in conversation, decreased motivation and lack of energy for activities (Hawari, 2014).

Hallucinations are a loss of human ability to differentiate between internal stimuli (thoughts) and external stimuli (outside world) Direja, 2011 in Rustika, 2020). Patients with hallucinations often experience conditions/conditions that only they can feel but cannot be felt by other people. It is estimated that more than 90% of schizophrenic subjects experience hallucinations. The most common hallucinations suffered are auditory hallucinations reaching approximately 70%, while visual hallucinations occupy the second place with an average of 20%. Meanwhile, other types of hallucinations, namely verbal, olfactory, tactile, kinesthetic and cenesthetic hallucinations, only cover 10%. Although the forms of hallucinations vary, the majority of schizophrenia patients experience auditory hallucinations (Agustya, 2022)

Auditory hallucinations are part of positive symptoms, describing the subject's condition of experiencing errors in perceiving external stimuli related to the sense of hearing. This condition is caused by many factors, including anxiety and depression. Usually fear of not being accepted in a certain environment and traumatic experiences. The symptoms of anxiety alone, whether severe or moderate, constitute a psychiatric disorder (Elyani, 2021).

A person who experiences auditory hallucinations given harm themselves, others and the environment. Apart from that, hallucinations will affect functions, causing problems in biological, social and spiritual aspects. The seriousness of the problem is caused by the content of the auditory hallucinations experienced which sometimes

give orders to commit violence against other people, even attempting suicide (Suryani, 2023).

Management of auditory hallucinations is pharmacological and non-pharmacological approaches. Pharmacological therapy for hallucinating subjects consists of using chemical drugs whose aim is to quickly control the symptoms of psychosis because it involves the work of neurotransmitters in the brain. Long-term use of medication can have side effects that cause schizophrenia sufferers to become reluctant to take medication. Side effects include: stiffness of the tongue, decreased motivation, discomfort in the body, hypersaliva and Parkinson's symptoms. Non-pharmacological therapy in the form of therapeutic modalities. Modality therapy is the main therapy in mental nursing because it aims to develop style or personality patterns gradually (Yosep, 2018).

One of non pharmacology therapy among auditory is recommended to investigate an overcome hallucinations by providing a thought stopping therapy. Thought stopping is a technique used to heal self-destructive negative thoughts by saying "STOP" and replacing negative thoughts with positive thoughts. The basis of this technique is to consciously command yourself, "stop!", when experiencing repeated negative thoughts, don't essential and distorted. Then replace these negative thoughts with other thoughts that are more positive and realistic. In this research, difficulties often occurred, because subjects had difficulty concentrating on this therapy activity (Bayu, 2018).

In carrying out *thought stopping therapy* on hallucinating subjects, nurses carry out the role of providing nursing care by providing *thought stopping therapy* to hallucinating subjects in a comprehensive manner starting from assessment, diagnosis, intervention, implementation and evaluation. Nurses also play a role as educators or educators, in this case, nurses help increase patient knowledge. The nurse's role as a researcher is to collect

data about the problem of auditory hallucinations and analyze the data according to what is obtained so as to plan a solution or intervention by carrying out *thought stopping therapy* on subjects with auditory hallucinations. It is hoped that the success of nurses in carrying out their role can help subjects overcome auditory hallucinations, after being given nursing care (Astuti, 2017).

METHODS

This case study aimed to determine nursing care for subjects with auditory hallucinations by providing thought stopping therapy in the Rawasari Public Health Center, where the subject was carried out among 2 patients who diagnosed auditory hallucinations by physician. This study held on June 12th until June 14th 2024. The case study implemented thought stopping therapy among auditory hallucinations by providing nursing care.

The auditory hallucination content of first subject who aged 36 years experienced that subject heard a voice to ask him to leave and annoyed him, sometimes causing him to damage things in the house. The subject also wanted to commit suicide because a voice invited him to come with it. The subject often became angry, talking to himself. Voice was appearing every time and continuous at least one hour, sound originates in or near the ear and outside the head far from the ear, sound heard loud loudness and concentration is disturbed.

During the assessment, the second subject who aged 37 years heard whisper that threatened to hurt him if he didn't hit someone. whispering voices threatening to hurt him if he didn't hit someone else, the frequency was more than 2 minutes at

5-8 times a day, the sound most often appeared at night. the trigger factor when the subject is daydreaming. The subject's response when listening sounds is screaming, raging, and appearing during whispers. the subject was investigated a daydreaming, talking to himself, looking in only one direction, pacing back and forth.

In this research, a nursing plan was prepared to overcome the problem of sensory perception disorders in subjects experiencing schizophrenia. The nursing planning implied hallucinations management including behavior monitoring, assessing of hallucinations level using the AHRS questionnaire, discussing feelings and responses to hallucinations, recommending sensitive monitoring of situations where hallucinations occur. *Thought stopping* therapy observed the ability to control hallucinations using a questionnaire sheet, teaching how to stop thoughts using *thought stopping actions*. After nursing care is carried out 3 meetings a week, the subject joined 20-30 minutes each meeting.

Data collection was carried out using interview methods, filling in questionnaires and observation research at subject's home. In this study, patients and family agreed to participate by signing informed consent sheet.

RESULTS AND DISCUSSION

The results showed that bothb of subjects has sensory perception disorders reketed auditory hallucinations.

Table 1. Evaluation of the level of hallucinations with AHRS

Subject	Meeting	AHRS Score
1	Day 1	25
	Day 3	21
2	Day 1	26
	Day 3	22

Based on Table 1 showed that both subjects experienced decrease hallucination in 4 of AHRS scores after the third day of tough stopping therapy intervention was given.

Meanwhile, Mr. On the first day of MI, the score for the level of hallucinations using AHRS was 26, at the second meeting only *thought stopping therapy* was given but no measurement of the level of hallucinations was carried out. At the third meeting, *thought stopping* therapy was implemented, the level of hallucinations in subjects using AHRS was 22, meaning there was a change in the hallucination score or a decrease in the level of hallucinations.

The results of this study case were in line with research conducted by Mister, et al. (2022) investigated Auditory Hallucinations in Schizophrenia Subjects was occurs people aged 30-40 years old in Indonesian community. The data investigated that subject was taken mental hospitalization because of talking byself often shouted. Both subjects also revealed that there were whispers that invited the subject to join.

In accordance with the Indonesian Nursing Diagnosis Standards, the subject condition assessment related to major symptoms or signs has led to sensory perception disorders. Hearing whispers which are proven by voices whispers and appearing to act like he heard the whispers. Minor data found were the subjeect appeared to be daydreaming, talking to himself, the subject appeared to be looking in only one direction, the subject appeared to be pacing back and forth, the subject's concentration appeared poor (PPNI, 2016).

Hallucinations are disturbances or changes in perception where the subject perceives something that is not actually happening. An application of the five senses without any

external stimulation. An appreciation experienced by a perception through the five senses without external stimulus: false perception (Maramis, 2015).

According to the previously research when a nursing assessment was carried out, the subject said he heard whispers and the subject appeared to act as if subjects heard whispers, the subject appeared to be daydreaming, the subject appeared to be talking to himself, the subject appeared to be looking in only one direction, the subject appeared to be pacing back and forth, the subject's concentration appeared poor. When a subject experiences mental disorders, it will certainly affect the patient's thinking power. The hallucinations experienced by the subject contributed to his violent behavior. The content of hallucinations often takes the form of orders to harm oneself or others.

The results of this nursing diagnosis are in accordance with research conducted by Pratiwi & Setiawan (2018) with the title Rebuke Actions to Overcome Auditory Hallucinations in Schizophrenic Subjects in Mental Hospitals using interview and direct observation methods, it was found that it started from social isolation which was not immediately treated, the consequences that resulted can take the form of changes in sensory perception.

In accordance with the theory in the Indonesian Nursing Diagnosis Standards, hearing loss is one of eight factors that cause sensory perception disorders (PPNI, 2016). Social isolation is one of the impacts of hearing loss experienced by schizophrenic subjects. The social isolation experienced by subjects is that subjects withdraw and do not socialize with their environment.

According to the researcher's opinion, according to the theory, the cause of sensory perception disorders is indeed social isolation as one of the symptoms of psychological disorders in schizophrenia. Social isolation is a negative symptom used by subjects to avoid other people so that unpleasant experiences in

dealing with other people do not happen again .

After holding three tough stopping implementation meetings for both subjects, it was found that there was a reduction in hallucinatory symptoms and the subjects seemed relaxed when doing this therapy. The subject is able to control the whispering voice that appears by stopping thinking about it and replacing it with a pleasant past experience.

These nursing care implementation included monitoring behavior that identifies hallucinations, monitoring the content of hallucinations (eg violence or self-harm), taking safety measures when you cannot control them, discussing feelings and responses to hallucinations, recommending self-monitoring of situations where hallucinations occur, recommending talking to people you trust to provide support and corrective feedback on hallucinations, teach subjects and families how to control hallucinations (PPNI, 2018).

The results of the identification of theoretical analysis and related journals can be concluded that the management of hallucinations with the actions contained therein is one of the main interventions used in overcoming the nursing problem of sensory perception disorders in schizophrenic subjects. Subject implied negative thoughts, after those thoughts appear, then say Stop, immediately replace positive or pleasant thoughts

According to the researcher's opinion, according to the theory of hallucination management, it is very appropriate to be the main intervention that can be given to control the patient's hallucinations. Subjects with sensory perception disorders are subjects who experience changes in perception where the subject perceives something that is not actually happening, so hallucination management is needed to control the patient's hallucinations.

The results of the implementation are in accordance with similar research conducted

by Wati (2023) regarding the effect of thought stopping therapy on the ability to control hallucinations in schizophrenia subjects in the Kumun Community Health Center working area, Sungai Banyak, that *general* hallucination therapy is a form of therapy carried out individually by nurses. to subjects face to face (nurse-patient) in a structured manner and for a certain time duration according to the goals to be achieved. Discussing the content of the hallucinations (what was heard, seen), when the hallucinations occurred, the frequency and situation that caused the hallucinations and the subject's response at that time, training to control the hallucinations using drugs to rebuke the hallucinations, conversing with other people and carrying out scheduled activities. The application of *general therapy* in controlling hallucinations will affect the subject's cognitive and psychomotor abilities, so that hallucinating subjects will experience a decrease in the intensity of the signs and symptoms of hallucinations that appear.

The results of the identification of theoretical analysis and related journals can be concluded that implementation is based on a hallucination management nursing plan in collaboration with thought stopping therapy interventions. *Thought stopping* is a technique used to heal self-destructive negative thoughts by saying "STOP" and replacing negative thoughts with positive thoughts. The basis of this technique is to consciously command yourself, "stop!", when experiencing repeated negative thoughts, don't essential and distorted. Then replace these negative thoughts with other thoughts that are more positive and realistic.

The subject appears to be able to follow directions and is cooperative so he is able to control his hallucinations. According to researchers, nursing implementation carried out in accordance with the nursing plan will certainly provide good results in resolving the problems faced by patients, this is in

accordance with the Indonesian Nursing Intervention Standards.

CONCLUSION

The thought stopping therapy was effectively to decrease hallucinations level among auditory hallucination.

CONFLICT OF INTEREST

This study was declared without conflict of interest.

REFERENCES

- Arikunto. (2015). *Research Procedures: a practical approach*. Jakarta: Rineka Cipta
- Daryanto & Agus Dwi Paranata, et. all. (2023). *Mental Nursing*. Surabaya. Literacy Library
- Anggraini, K., & Nugroho, A. (2023). The effect of scolding on reducing the level of auditory hallucinations in schizophrenic patients at RSJD DR. Aminogondohutomo Semarang. *Scientific Work S. 1 Nursing Science*. Online: <http://ejournal.stikestelogorejo.ac.id/index.php/ilmukewarni/article/view/176>
- Astuti, et al. (2017). The Relationship Between Medication Adherence and Relapse Periods in Schizophrenia Patients: Hallucinations in a Mental Hospital Prof. Dr. Soeroyo Magelang. Vol. 6, no. October 2. Online: <https://Jurnal.Stikeskendekiautamakudus.Ac.Id/Index.Php/Stikes/Article/View/193/145>
- Azizah. (2023). Application of Therapeutic Communication to Hallucination Patients at Tampan Mental Hospital, Riau Province. Vol. 6 No. 2. Online: 473-478
- Article Text-1009-1-10-20180609 (2)
- Bayu, et al. (2018). Description of the Ability to Control Hallucinations of Schizophrenic Subjects in the Inpatient Room of the Regional Mental Hospital of Jambi Province. *Health Information Research*. Vol. 7.No. 1.
- Budi, N. (2020). Comparison of the effect of using individual therapy, group and combination activity therapy on the ability to control hallucinations in schizophrenic patients at RSJ Prof Dr Soeroyo Magelang. Online: <https://digilib.uns.ac.id/document/detail/12799/Perbandingan-influenced-cepat-cepat-individu-cepat-cepat-nomor-danbisnis-terhadap-besar-mengontrol-hallucinations-pada-schizophrenia-patients-di-RSJ-Prof-Dr-Soeroyo-Magelang>
- Dahrianis, R & Muhammad. (2023). The relationship between family involvement and the subject's ability to control hallucinations in the Samata Community Health Center working area, Gowa Regency. *Diagnostic Health Scientific Journal*. Vol.3, No.3. online: <http://ejournal.stikesnh.ac.id/index.php/jikd/article/view/252> (accessed 30 September 2019, 7:12:48 PM)
- Indonesian Ministry of Health. (2020). *Basic Health Research 2019*. Jakarta: Republic of Indonesia Health Research and Development Agency.
- PPNI (2016) *Indonesian Nursing Diagnosis Standards: Definition and Diagnostic Indicators*. 1st ed. Jakarta: DPP PPNI
- PPNI (2018) *Indonesian Nursing Intervention Standards: Nursing Definitions and Actions*. 1st ed. Jakarta: DPP PPNI.

- PPNI (2018) Indonesian Nursing Outcome Standards. 1st edn. Edited by the SLKI DPP PPNI Working Group Team. South Jakarta: DPP PPNI
- Pratiwi, A., & Rahmawati Arni. (2022). Case Study of the Application of Dhikr Therapy in Patients with Sensory Perception Disorders (Auditory Hallucinations) in the Arjuna Room at Banyumas Regional Hospital. *Journal of Social Sciences*, 1(6).
- Eliani. (2021). The Effect of Individual Therapy on the Frequency of Hallucinations. online: <http://www.google.com> Direja, AHA (2011). *Mental Nursing Care*. Nuha Medika: Yogyakarta
- Sugiyono. (2017). *Educational research methods:(quantitative, qualitative and R&D approaches)*. In Bandung: Alfabeta
- Yosep, HI, and Sutini, T. (2018). *Textbook of Mental Nursing and Advance Mental Health Nursing*. *Ejournal of Nursing*, 4(2).

WATER TEPID SPONGE REDUCING BODY TEMPERATURE AMONG CHILDREN WITH FEVER: CASE STUDY

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ABSTRACT

Background: Fever is a condition of increased temperature above normal caused by changes in the body's temperature regulation center, where the brain sets the temperature above the normal setting. Nursing interventions to address hyperthermia include warm compresses and tepid water sponges. The tepid water sponge technique affects the reduction of body temperature. This study aims to determine the effect of applying tepid sponge compresses on reducing body temperature in children with hyperthermia

Method: This study uses a descriptive case study design by conducting assessments on a unit case intensively to describe the problem.

Results: The results are after administering tepid sponge therapy for 3 consecutive days for 15 minutes in the forehead, armpits, and thigh folds areas, the child did not feel feverish, and the temperature dropped from 388°C to 372°C with the skin not feeling warm

Conclusion: It was concluded that there was an influence of water tepid sponge in reducing body temperature in children with hyperthermia

Keywords: Body; temperature; sponge

INTRODUCTION

Children are unique individuals with needs according to their developmental stages. As unique individuals, children have various needs that differ from one another according to their growth and development. Physiological needs such as nutrition and fluids, elimination activity, sleep, and others, as well as psychological, social, and spiritual needs, will be seen according to their growth and development (Erita et al., 2019).

Body temperature regulation is a complex process involving various physiological and behavioral mechanisms aimed at maintaining body temperature within a narrow range around 37°C in humans. Effective body temperature regulation is crucial for maintaining optimal cellular function and overall health. Fever is a common health problem, especially in children. According to

Sodikin (2012), fever can be a sign of an increase in the set point in the hypothalamus due to infection or an imbalance between heat production and heat loss. Diseases characterized by fever can attack the body system. Additionally, fever may play a role in enhancing the development of specific and nonspecific immunity in aiding recovery or defense against infections.

Fever can occur when someone experiences health disturbances. Increased body temperature can be caused by reactions to viral, fungal, or bacterial infections that can attack the body, such as coughs, colds, and sore throats. Symptoms that appear in children with fever usually include a body temperature exceeding normal limits in the head and neck areas or throughout the body. Other symptoms include chills in the hands and feet. High fever can cause seizures, dehydration, and inhibit the child's growth

and development. Therefore, fever needs to be handled properly because it will negatively impact the child (Ismoedijanto, 2016).

Fever can endanger the child's safety if not handled quickly and correctly, leading to other complications such as seizures and decreased consciousness. In this regard, fever management needs to be carried out through pharmacological and non-pharmacological measures. Pharmacological measures include administering fever-reducing medications or antipyretics. Non-pharmacological measures involve physical therapies to reduce fever, such as warm compresses, placing the child in a wellventilated room, and providing loose clothing (Zurimi, 2019).

Nursing interventions to address hyperthermia include warm compresses and tepid water sponges. The tepid water sponge technique affects the reduction of body temperature because direct compresses are applied to several places with large blood vessels, leading to increased circulation and capillary pressure. O₂ and CO₂ pressures in the blood increase, and blood PH decreases. Tepid water sponge is also done by wiping the entire body of the client with warm water (Rahayu & Muhsinin, 2022).

Water tepid sponge is a warm compress technique combining block compresses on superficial blood vessels with wiping techniques. WTS is performed on patients with fever by applying warm compresses on three points of the body, such as the forehead, armpits, and both groin areas. Add wiping the abdomen and chest or the entire body. If the cloth is dry, repeat the wiping procedure (Eliza, 2019).

METHOD

This research uses a descriptive case study design by conducting assessments on 1 child respondent who meets the criteria of experiencing fever with a body temperature increase > 37.5°C. The number of respondents in this study is one case

conducted over 3 days. Data collection was done through interviews, observations, interventions, and implementations. The research ethics used are non-maleficence, anonymity, beneficence, justice, and informed consent.

RESULTS AND DISCUSSION

Based on the assessment conducted, it was known that An. A, before the administration of tepid sponge therapy, complained of fever (febrile) with a temperature of 38.8°C, and the patient appeared weak. During a general examination, the results showed a pulse of 103 beats/minute and respiratory rate (RR) of 20 breaths/minute. On the first day, before the tepid water sponge therapy, the temperature was measured at 38.8°C, while after evaluation and body temperature measurement, the result was 38.1°C. On the second day, the body temperature before the tepid water sponge therapy was measured at 38.5°C, and after the therapy, it was evaluated at 37.7°C. On the third day, before the tepid water sponge therapy, the body temperature was measured at 37.9°C, and after the therapy, it was 37.2°C. This nursing intervention focuses on tepid sponge compresses for children with fever. Compresses are a physical method to reduce body temperature in children with fever. This is consistent with Pakpahan (2024), which states that the effectiveness of tepid sponge compresses in reducing the body temperature of children with fever for 3 days showed an average reduction in body temperature before and after the compresses.

The implementation includes identifying the causes of hyperthermia, preparing tools and materials, measuring body temperature before the procedure, compressing with a washcloth in areas with large blood vessels such as the axilla, groin, and neck for 10-15 minutes, wiping the patient's body towards the heart for 15 minutes, maintaining the

water temperature at 26-35°C during the procedure, and recommending the patient wear thin, sweat absorbing clothes after the procedure. This is consistent with the tepid sponge procedure by Rosdal et al. (2012).

The study results show that the average body temperature before tepid water sponge therapy was 38.5°C, and after the therapy, it was 37,7°C, with a temperature decrease of 0.7°C. Fever is a condition of increased temperature above normal caused by changes in the body's temperature regulation center, where the brain sets the temperature above the normal setting. Due to the increase in this setting, the body will produce heat (Lusia, 2015). Fever or febrile is a condition where the body temperature becomes higher than usual and is a symptom of disease (Erveline & Nanang, 2021).

The main nursing action given for hyperthermia diagnosis is tepid water sponge therapy. Consistent with Putri (2020), her research states that tepid water sponge therapy is more effective in reducing the body temperature of children with fever compared to warm water compresses. This is due to the body wiping technique in tepid water sponge therapy, which accelerates peripheral blood vessel vasodilation throughout the body, allowing heat evaporation from the skin to the surrounding environment more quickly compared to the reaction provided by warm water compresses, which rely only on hypothalamus stimulation.

Tepid Sponge combines block and wiping techniques. This compress technique is applied to areas with large arterial vessels, making it easy to quickly transmit signals to the hypothalamus. Additionally, wiping accelerates peripheral blood vessel dilation, facilitating heat transfer from the body to the surrounding area, thus accelerating body temperature reduction (Firmansyah, 2021). The study conducted shows that tepid water sponge therapy in the forehead, armpits, and groin areas results in a decrease in body temperature before and after the therapy. This

is consistent with Anita et al. (2024), who found that tepid water sponge therapy reduces body temperature with an average decrease of 0.7°C.

CONCLUSION

The administration of tepid water sponge therapy is effective in reducing body temperature. This is because the tepid water sponge can accelerate peripheral blood vessel vasodilation throughout the body, allowing faster heat release from the body through the skin.

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CONFLICT OF INTEREST

There was no conflict of interest in this article.

REFERENCES

- Ariyani, A.D., Theria, N.A., Satrianto, A., & Anitarini, F. (2024). The Effectiveness of Fever Plaster Compress with Warm Water Sponge in Reducing Body Temperature in Pediatric Patients. *Journal of Professional Health*, 5(2), 506-513.
- Erita, H., Hununwidiastuti, S., & Leniwita, H. (2019). *Children's Nursing Learning Material Book*. Indonesian Christian University.
- Firmansyah, A., S.H., & A.H. (2021). Case Study Implementation of EvidenceBased Nursing: Water Tepid Sponge Bath to Reduce Fever in Typhoid Patients. *Viva Medika: Journal of Health Midwifery and Nursing*.

- Ismoedijanto, I. (2016). Fever in Children. *Sari Pediatri*, 2(2), 103.
- Putri, R.H., Dwi, F, Yetty., Dewi, R, Sanjaya, R., & Mukhlis, H. (2020). Differences in the Effectiveness of Warm Compresses with Water Tepid Sponge in Reducing Fever in Children: A Study Using a QuasiExperimental Approach. *International Journal of Pharmaceutical Research* (09752366), 12(4).
- Rahayu, S.F. (2022). Application of Tepid Water Sponge to Reduce Fever in Children with Febrile Seizures at Dr. H. Moch Ansari Saleh Banjarmasin Hospital. *Journal Nursing Army*, 3(2), 36-40.
- Rosdahl, C.B., & Kowalski, M.T. (2012). *Textbook of Basic Nursing*. 10th ed. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins.
- Sodikin. (2012). *Principles of Fever Management in Children*. Yogyakarta: Pustaka Pelajar.
- Zurimi, S. (2019). The Effect of Warm Compresses on Meeting the Ineffective Thermoregulation in Typhoid Fever Patients at Dr. Pp Magretti Saumlaki *Global Health Science*, 4(3), 131 – 13.

MOBILE TRIGGERING ON STUDENT IMPROVING BEHAVIOR IN ERADICATING MOSQUITO NESTS

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ABSTRACT

Background: Every year Dengue Hemorrhagic Fever (DHF) always becomes a phenomenon, people do not have the motivation and culture to carry out PSN. The problem encountered is that the community still behaves poorly in implementing PSN. The aim of this research is to find out the influence of Mobile triggering people's behavior

Method: This research method is quantitative research with a Research and Development (R&D) research design. This research uses a one group pretest and posttest design. The focus of this research is testing the effectiveness of the educational model with the PSN reminder application in improving the culture of eradicating mosquito nests in the city of Jambi. The variable studied is behavior.

Result: The research results showed that mobile triggering was effective in increasing the behavior of school students to 100% in the implementation of eradicating mosquito nests in the school environment .

Conclusion: obtained is that students' behavior has increased in carrying out the eradication of mosquito nests, It is hoped that eradicating mosquito nests will become a culture among students

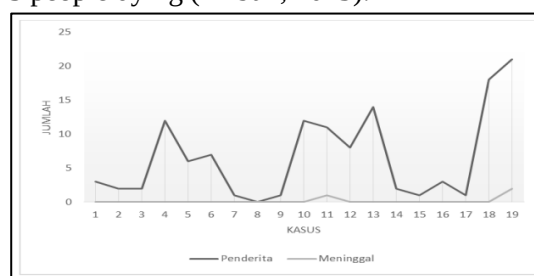
Keywords: Eradicating mosquito nests; Students; Triggering; Dengue hemorrhagic fever

INTRODUCTION

Dengue Hemorrhagic Fever is still a frightening specter, where this disease attacks many school-aged children (Ribek et al. 2021). Schools are places where students carry out various activities other than at home, students are usually at school from morning to evening where at that time students are vulnerable to being bitten. mosquitoes (Hafidz and Safrudin 2022), so efforts are needed in schools to reduce the possibility of mosquito bites by eradicating mosquito nests. Many efforts have been made to eradicate mosquito nests, such as forming student larva monitors, carrying out mutual cooperation, implementing simultaneous PSN and other efforts (Chandra et al. 2023)

Cases of dengue hemorrhagic fever (DHF) in Jambi City are still high, where in 2023 it

was recorded that as of July there had been 218 cases of dengue fever in Jambi City with 5 people dying (Tribun, 2023).



A lot of education has been carried out, such as education on the dangers of dengue fever which was carried out in Cipete Utara Subdistrict by holding a competition to eradicate mosquito nests. Several alternatives for eradicating mosquito nests have been widely implemented (Chandra et al., 2021). Research has also been carried out through several studies such as those conducted by (Hadi et al. 2012) using comics as an

educational medium for preventing dengue fever, as well as those conducted by (Sugiyono and Darnoto 2017) using education with a training model for elementary school children, other efforts using pocket book models and larva monitoring reports (Farasari Rizky 2018)

There is an Educational Model Product for Eradicating Mosquito Nests with Interactive Multimedia Triggering Mobile Learning called "PSN Mobile Triggering" which has implemented the "FINER" requirements, namely Feasible, Interesting, Novel, Ethical, Relevant. This model is easy to apply, the packaging and theme is attractive, provides new knowledge about PSN education, does not violate ethics and is relevant to apply in society (Chandra 2023)

It is hoped that with this research students can be more motivated and triggered in implementing PSN so that it can become a habit and culture for students so that it can also be applied in their home environment.

Based on the background of the problem, there is still a lack of behavior to eradicate mosquito nests, so the question in this research is: What is the impact of triggering mobile mosquito nest eradication on the behavior of elementary school students?

The aim of this research is to see the effect of mobile triggers on the behavior of elementary school students with the following description:

1. To analyze the influence of mobile triggers to eradicate mosquito nests on public knowledge;
2. To analyze the influence of mobile triggers to eradicate mosquito nests on community attitudes.

METHODS

This research uses the Descriptive-Quantitative Method (Bloomfield & Fisher, 2019) using bivariate analysis (Campisi et al., 2020) was carried out to determine the effect of providing education on increasing

respondents' knowledge in detecting high-risk pregnancies. The statistical test used is the dependent T-Test or paired samples T-Test, for non-normal data distribution the Wilcoxon test is used (Widyanto 2013). The Paired T-Test Test formula is as follows:

Information:

$d = \text{average deviation} / \text{difference between sample 1 and sample 2}$

$SD_d = \text{standard deviation of the deviation/difference between sample 1 and sample 2}$

Effectiveness Analysis

To see product effectiveness using the N-Gain Score. The N-Gain Score formula (Prabowo 2020) is as follows.

Note: Ideal Score = 100

The categorization of the N-Gain score can be determined based on the average N-Gain percent value. If the average N-Gain percent is <40 then it is categorized as ineffective, if the average N-Gain percent is 40-55 then it is categorized as less effective, if the average N-Gain percent is 56-75 then it is categorized as quite effective, and if the average N - Percent gain >76 is categorized as effective.

RESULTS AND DISCUSSION

Differences in Jumentik Knowledge Before and After the Intervention

Tabel 1. Differences in Jumentik Knowledge Before and After Intervention with the Wilcoxon Statistical Test

Knowledge	Mean	Mean Difference	P
Pre-test	1.97		
Post-test	15	13.03	<0.001

From the results of the Wilcoxon statistical test, a Probability (P-Value) value of 0.00 is obtained, which means that at alpha 5% there is a difference in the average jumentik knowledge score before the intervention and after the intervention.

Differences in Jumantik's Attitudes Before and After the Intervention

Tabel 2. Differences in Jumantik attitudes Before and After Intervention with Sample T-Test Statistical Test

Knowledge	Mean	Mean Difference	P
Pre-test	2.73	7.27	<0.001
Post-test	10		

From the results of the Wilcoxon statistical test, a probability value (P-Value) was obtained of 0.00, which means that at alpha 5% there was a difference in the average jumantik attitude score before the intervention and after the intervention.

Data N-Gain

The N-Gain Score test is carried out by calculating the difference between

The pretest and posttest scores or gain scores, based on these results, will be able to determine the effectiveness of applying a particular method. N-Gain is the final stage to determine the effectiveness of using educational products in increasing the knowledge, attitudes and behavior of Jumantik Rumah. The N-Gain results of respondents can be seen in Table 4.28 below:

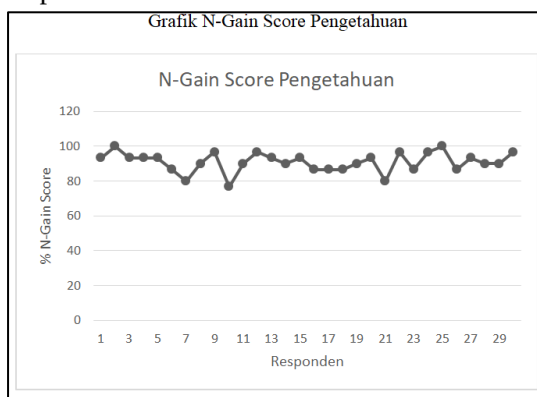


Figure 1. Knowledge N-Gain Score Graph

Based on the results of the N-Gain score test calculation, it shows that the average N-Gain score value for home jumantik given health education using the PSN education model is 96.67 or 96.67%, this value is included in the effective category. With a minimum N-Gain score of 80% and a maximum of 100%. Based on the results of the average N-Gain percent, it can be concluded that the PSN educational model

product is effective in improving Jumantik Home knowledge.

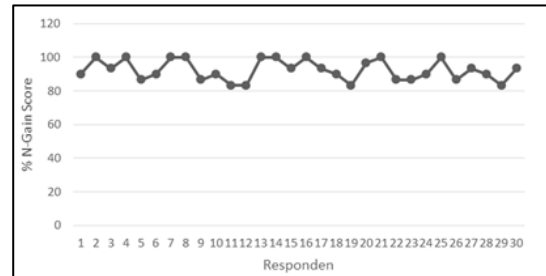


Figure 2. Attitude N-Gain Score Graph

Based on the results of the N-Gain score test calculation, it shows that the average N-Gain score value for home jumantik given health education using the PSN education model is 92.33 or 92.33%, this value is included in the effective category. With a minimum N-Gain score of 83.33% and a maximum of 100%. Based on the results of the average N-Gain percent, it can be concluded that the PSN educational model product is effective in improving the attitude of Jumantik Rumah.

An alternative for changing student behavior is a Triggering-Based Model with Interactive Multimedia Mobile Learning for Mosquito Nest Eradication (PSN) Behavior.

CONCLUSION

There was an increase in behavior before and after the implementation of the Dengue Hemorrhagic Fever (DBD) Prevention Education Model based on Triggering with Interactive Multimedia Mobile Learning towards Mosquito Nest Eradication (PSN) behavior.

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CONFLICT OF INTEREST

In this research there is no conflict of interest.

REFERENCES

- Bloomfield, J., & Fisher, M. J. (2019). Quantitative research design. *Journal of the Australasian Rehabilitation Nurses Association*, 22(2), 27–30.
- Campisi, T., Nahiduzzaman, K. M., Ticali, D., & Tesoriere, G. (2020). Bivariate analysis of the influencing factors of the upcoming personal mobility vehicles (PMVs) in Palermo. *International Conference on Computational Science and Its Applications*, 868–881.
- Chandra, E. (2023). *Pengembangan Model Edukasi Pencegahan DBD Dengan “Pemicuan Psn Mobile.”* Poltekkes Kemenkes Jambi.
- Chandra, E., Fahri, S., Johari, A., & Syaiful, S. (2023). School-Based Prevention Of Mosquito-Borne Diseases: A Systematic Review. *Journal Of Client-Centered Nursing Care*, 9(1), 15–24.
- Chandra, E., Johari, A., Syaiful, S., & Fahri, S. (2021). Alternatives To Improve Mosquito Eradication Behavior: A Systematic Review. *Journal Of Research Development In Nursing And Midwifery*, 18(2), 53–59. <https://doi.org/10.29252/jgbfm.18>
- Farasari Rizky, A. M. (2018). Model Buku Saku Dan Rapor Pemantauan Jentik Dalam Meningkatkan Perilaku Pemberantasan Sarang Nyamuk. *Jhe (Journal Of Health Education)*. <https://doi.org/...>
- Hadi, C., Sugiarto, K.Y, M., & Rahmah, Z. (2012). Pengaruh Penyuluhan Kesehatan Dengan Media Komik Tanggap Dbd Terhadap Peningkatan Pengetahuan Dan Sikap Tentang Pencegahan Dbd Di Sdn Banjarejo Ngadiluwih Kabupaten Kediri. *Prosiding Semnas Competitive*.
- Hafidz, M. I., & Safrudin, M. B. (2022). Pengaruh Live Modeling Terhadap Perilaku Pemantauan Jentik Pada Siswa Di Sekolah Dasar 003 Sangasanga. *Borneo Studies And Research*, 3(2), 1348–1356.
- Ribek, I. N., Asrini, K. M., Sulisnadewi, N. L. K., & Labir, I. K. (2021). Perilaku Kesehatan Anak Sekolah Dasar Memiliki Kerentanan Terjadinya Demam Berdarah Dengue. *Jurnal Gema Keperawatan*, 14(2), 174–184.
- Sugiyono, S., & Darnoto, S. (2017). Pengaruh Pelatihan Pencegahan Demam Berdarah Dengue (Dbd) Terhadap Tingkat Pengetahuan Dan Sikap Siswa Di Sdn Wirogunan I Kartasura Kabupaten Sukoharjo. *Jurnal Kesehatan*. <https://doi.org/10.23917/Jurkes.V9i2.4594>
- Tribun. (2023). *Dinkes-Kota-Jambi-Dr-Rini-Kartika*.

DETERMINANTS IN ACCELERATING REDUCTION OF STUNTING IN MARO SEBO DISTRICT: DESCRIPTIVE STUDY

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ABSTRACT

Background: Stunting is a condition in which a child's growth and development are hampered due to long-term malnutrition and frequent infections, resulting in the child's body being shorter than it should be. The negative impacts of stunting include physical and functional disorders in children, as well as an increased risk of disease. This research aims to identify the main factors contributing to stunting among toddlers in the working area of Jambi Kecil Community Health Center.

Method: This research is a cross-sectional with subject of 68. The variables analyzed included factors influencing the incidence of stunting among toddlers in the area. The research population consisted of toddlers who had experienced stunting, based on data from the Jambi Kecil Community Health Center. The sampling technique used was simple random sampling. Analysed with descriptive.

Results: result this study is low birth weight babies (51.5%), the majority of toddlers (79.4%) experiencing infections in the last month, lack of nutritional intake (55%), low protein intake (60%), and still 30% of toddlers do not receive exclusive breast milk, low level of education (80%), and the majority face low socio-economic challenges (60%).

Conclusion: determinat factor is low birth weight, nutritional intake (including exclusive breastfeeding), parental education level, and socio-economic conditions of toddlers' families.

Keywords: Low birth weight; Infectious disease; Low intake; Makronutrients

INTRODUCTION

Stunting is a condition where children experience disrupted growth and development due to chronic malnutrition and recurrent infections, resulting in their body length or height falling below the standards set by the Ministry responsible for health affairs (PP, 2021). According to the Ministry of Health, stunting is characterized by a failure in children's growth caused by long-term malnutrition, leading to shorter stature compared to their peers. Referring to World Health Organization (WHO) guidelines, stunting is defined as a condition where a z-score review indicates that body length or height relative to age falls within the range of -3 SD to <-2 SD (Ministry of Health of the Republic of Indonesia, 2020).

In Indonesia, the achievement of Sustainable Development Goals (SDGs) in eradicating hunger and malnutrition aims to reduce the incidence of stunting by 40% by 2025 (RI, 2019). Stunting contributes to nutritional problems in Indonesia due to its impact on the physical and functional development of children's bodies, increasing the likelihood of disease (Soliman et al., 2021).

The United Nations International Children's Emergency Fund (UNICEF, 2020a) reported that in 2015, there were 163.4 million children under five who were stunted. By 2017, approximately 22.2% or 150.8 million toddlers worldwide experienced stunting, with Asian toddlers accounting for 55%, followed by Africa at 39%. Specifically, Asia had a total of 83.6 million stunted

children, with South Asia having the highest rate at 58.7%. This report highlights global nutritional challenges among children, including obesity, malnutrition, and stunting, and projects that an estimated 149.2 million (22.0%) children worldwide will experience stunting by 2020.

In the 2022 Indonesian Nutritional Status Survey (SSGI), the prevalence of stunting in Indonesia was recorded at 21.6%, a decrease of 3.8 percentage points from 2021, which was 24.4% (Setwapres, 2023). This data indicates that stunting in Indonesia still exceeds the limit set by the World Health Organization, which is 20%. The high incidence of stunting highlights widespread malnutrition among children in Indonesia, potentially impacting the quality of future generations (Indonesian Ministry of Health, 2022). Based on the results of the 2022 Indonesian Nutrition Status Survey (SSGI), the prevalence of stunting in Jambi Province is 18%. By 2023, it has decreased to 13.5%, which is lower than the national stunting prevalence of 21.6% (Ministry of Health of the Republic of Indonesia, 2023).

Jambi Province's data for 2023 shows a significant decrease in the number of stunting cases, dropping from 8273 cases to 7025 cases (Jambi, 2023). The prevalence of stunting in Muaro Jambi Regency, based on the SSGI in 2022, was 18.6%. In 2023, it decreased slightly to 18.0%, and it is hoped that by 2024, it will further decrease to 16.0%. Currently, several areas in Muaro Jambi district still face challenges with stunting, including Maro Sebo District, which falls under the jurisdiction of the Jambi Kecil Community Health Center.

Maro Sebo District consists of 12 villages, which fall under the jurisdiction of the Jambi Kecil Health Center. According to the Health Profile of the Jambi Kecil Community Health Center for 2022, the population of the health center's working area is 23,584 people, comprising 12,058 men and 11,526 women. The dependency ratio, or dependent burden

figure, is 47.87%. Nearly 80% of the population in the health center's working area has a low level of education, primarily at the junior high school and elementary school levels. Additionally, the area faces low socio-economic conditions, with 80% of the population engaged in agricultural labor. Based on data, in 2021, 6735 people (28%) in the UPTD area of the Jambi Kecil Inpatient Health Center, Muaro Jambi Regency, received health insurance contribution assistance (PBI).

Data from the Muaro Jambi Health Service in 2024, recorded in mid-2024, shows that in the Jambi Kecil Health Center working area, 1443 babies were examined, with 5.7% experiencing stunting, 7.6% wasted, and 7.9% underweight. The impact of stunting can be observed in both the short and long term. In the short term, these impacts include suboptimal cognitive, motor, and language abilities, increased mortality and morbidity rates, and higher child medical expenses. Meanwhile, long-term effects encompass suboptimal adult height, reproductive health issues, obesity, poor academic performance with limited learning capacity, as well as reduced productivity and work capacity (Herawati et al., 2022).

The National Planning and Development Agency of the Republic of Indonesia (Bappenas RI) also revealed that stunting is a major problem related to nutrition that can affect social and economic life (RI, 2017).

According to UNICEF, there are several factors that influence children's nutritional conditions. Direct factors contributing to stunting include males being more at risk than females, low birth weight (LBW), low energy and protein intake from food, and a history of infectious diseases such as diarrhea and acute respiratory infections (ARI). Meanwhile, indirect factors influencing stunting include not receiving exclusive breast milk, low parental education levels, and low family economic status (Oktavianisya et al., 2021).

There are several steps that can be taken to prevent stunting, one of which is meeting nutritional needs optimally during pregnancy. This step is considered effective in preventing stunting in children. Additionally, the Ministry of Health recommends that pregnant women regularly visit health workers. Exclusive breastfeeding, coupled with healthy complementary foods starting at 6 months of age, can also prevent stunting. Nutrition experts from the University of Hohenheim, Germany, have stated that breast milk has great potential to reduce the incidence of stunting in children due to its nutritional content (RI, 2019). Active involvement of parents in monitoring children's development is very necessary, especially in measuring children's weight and height. Parents should regularly take their children to the posyandu at least once a month. Monitoring toddlers' weight and height is conducted to determine whether the child is stunted or not (BKKBN, 2023).

Maro Sebo District has 12 villages and health facilities, including the Jambi Kecil Community Health Center, 7 sub-district health centers, 7 polindes (integrated health posts), and 22 posyandu (integrated health service posts). The total number of cadres is 154, distributed across these 12 villages. Serving as the front line in combating and preventing stunting and malnutrition, several programs have been implemented.

The Jambi Kecil Community Health Center conducts early detection for toddlers under 2 years of age, provides health education for expectant mothers, and supplies iron and vitamin supplements, as well as additional food for pregnant women experiencing chronic energy deficiency (KEK). Despite these efforts, reducing stunting rates in the Jambi Kecil Community Health Center's working area has not yet yielded optimal results, as indicated by data from the Community Health Center showing that some children still experience stunting.

Based on these findings, a study is needed to identify the main factors in accelerating the reduction of stunting rates in Maro Sebo District. This research is the first to involve toddlers in the Jambi Kecil Community Health Center's working area, with the hope that the results can support more effective efforts to overcome and prevent stunting.

METHOD

This research uses quantitative methods with a retrospective approach as the main concept and was carried out in Maro Sebo District. Data collection took place from January to June 2024. The variables analyzed included factors influencing the incidence of stunting in toddlers in Maro Sebo District, such as low birth weight (LBW), energy and protein intake, history of infectious diseases, exclusive breastfeeding, parental education history, and family economic status. Toddlers experiencing stunting were identified from data obtained from the Jambi Kecil Community Health Center, totaling 82 children who constituted the research population. The sampling technique used was simple random sampling. The sample size was determined using the Slovin formula, resulting in a sample size of 68 respondents.

This research utilizes an instrument in the form of a standard questionnaire to identify risk factors contributing to stunting, as well as conducting a 1 x 24-hour food recall. The questionnaire captures respondent identities and factors associated with stunting, such as gender, birth weight, history of infectious diseases, exclusive breastfeeding, family economic status, and parental education. Additionally, a food recall questionnaire was employed to assess daily energy and protein intake based on the 2010 Riskesdas Questionnaire. The validity and reliability of both instruments were tested, yielding validity test results with calculated 'r' values ranging from 0.517 to 0.741, indicating their validity. Meanwhile, the reliability test

resulted in an alpha value of 0.725, affirming the questionnaire's reliability.

The data collection process commences following the feasibility testing of the proposal and obtaining research ethics approval. Initial data collection permission was granted by the Jambi Kecil Community Health Center to gather data on toddlers experiencing stunting in Maro Sebo District, forming the basis for defining the research population and sample. The research employs a door-to-door technique to approach parents or guardians of potential respondents, providing them with an explanation of the study. Parents or guardians who agree to participate can complete the questionnaire regarding the respondent's (stunted toddler) identity. Subsequently, the parents participate in an interview session with researchers regarding factors contributing to stunting and food recalls. The data processing involves several stages, including editing, coding, transferring, and cleaning.

Univariate analysis was employed to analyze the research data. This type of analysis aims to provide an overview of respondents based on the distribution and calculation of each variable's quantities, including the dominant factors influencing stunting in toddlers within the Jambi Kecil Community Health Center's jurisdiction. These factors include low birth weight (LBW), gender, infectious diseases, energy and protein intake, history of exclusive breastfeeding, parents' education level, and family economic status.

RESULTS AND DISCUSSION

Weight measurements categorized into LBW groups (<2500 to >4000 grams) and normal birth weight (2500-4000 grams) yielded the following results: 51.5% of infants in Maro Sebo sub-district were found to have low birth weight, while 48.5% had normal birth weight. This finding aligns with the research by Dwi et al. (2022), which

reported that 58.4% of stunted infants had below-normal body weight. Utami's study (2023) indicated that toddlers with a history of LBW face a 2,194-fold higher risk of stunting compared to those born with normal weight (BBLN). This underscores LBW as a significant risk factor for toddler stunting. Children born weighing less than 2500 grams are reported to have a 12 times higher risk of stunting (95% CI 0.616–4.97) than their normal-weight counterparts (Lestari et al., 2018). Research by A. Rahayu et al. (2015) similarly emphasizes LBW as a primary risk factor associated with stunting, noting a 5.87-fold increased risk among LBW children. Thus, a history of LBW plays a crucial role in the incidence of stunting among young children.

Furthermore, stunting in children is often attributed to parents' lower education levels, leading to inadequate family knowledge regarding child nutrition. According to the 2022 Health Profile of the Jambi Kecil Community Health Center, the population in its service area totals 23,584 individuals, comprising 12,058 men and 11,526 women. The Dependency Ratio, or the ratio of dependents to the working-age population, stands at 47.87%. Nearly 80% of the area's population has a low educational attainment level, primarily at the junior high school and elementary school levels, and is predominantly engaged in low socio-economic activities, with 80% working as agricultural laborers. Children born with LBW are at a significantly higher risk of stunting compared to those with normal birth weight (Thurstans et al., 2022).

LBW is not the sole cause of stunting, as toddlers born with normal weight can also experience stunting later in life (Soliman et al., 2021). Stunting can result from growth failure and insufficient growth; if these conditions persist inadequately, they can hinder optimal growth (WHO, 2015). Therefore, toddlers born with normal weight are still at risk of stunting if their nutritional

needs are not adequately met (Rahmadhita, 2020).

Based on the research results in Maro Sebo District, it is evident that 79.4% of toddlers experienced infections in the last month, while the remaining 20.6% did not. This study found that a majority of stunted toddlers had a recent history of infection. The most common infectious diseases among toddlers were diarrhea (33.8%), acute respiratory infections (22.1%), worms (14.7%), and other causes (8.8%). Causes of stunting can be categorized as direct or indirect factors. Direct causes include inadequate nutritional intake and infectious diseases, while indirect causes encompass parenting practices, healthcare services, food availability, cultural and economic factors, among others (WHO, 2022). Nutritional issues often coincide with infectious diseases that impact child health (UNICEF, 2020).

Malnutrition and bacterial infections of the digestive and respiratory tracts pose serious public health concerns. The increased incidence and severity of infections in malnourished children largely stem from compromised immune function (Rodríguez et al., 2011). Inadequate nutritional intake, coupled with chronic nutritional deficiencies, can lead to weakened immunity in toddlers, resulting in recurrent digestive infections such as diarrhea that hinder proper growth (Guerrant et al., 2014; Junita et al., 2023).

Infectious diseases are a significant cause of morbidity and mortality in developing countries, particularly among children. Growing evidence indicates that protein-calorie malnutrition is the primary factor contributing to increased susceptibility to infections in these regions. Additionally, certain infectious diseases themselves can lead to malnutrition, creating a vicious cycle (Rodríguez et al., 2011).

Infections can reduce children's appetite and diminish their desire to eat. These diseases also deplete proteins and calories that should otherwise support growth. Poor

nutritional status emerges as a significant risk factor for acute respiratory infections (ARI). Toddlers with inadequate nutrition are more vulnerable to ARIs due to weakened immune systems. Infectious diseases can suppress toddlers' appetites, leading to malnutrition (Siddiq & Nuzul, 2018). Children who experience ARIs often exhibit symptoms such as runny nose, fever, and cough. These conditions can impair children's ability to consume adequate nutrition, particularly during illness (Tadi et al., 2023).

The study results indicate that 45% of toddlers experiencing stunting in the Jambi Community Health Center Working Area have adequate nutritional intake, while the remaining 55% lack sufficient energy intake. This finding aligns with previous research by Azmy et al. (2018). Furthermore, the study reveals that a majority of stunted toddlers exhibit low consumption levels of essential nutrients such as energy, fat, protein, carbohydrates, zinc, and iron. In contrast, most non-stunted toddlers have adequate nutritional intake. These findings underscore the correlation between energy, protein, fat, carbohydrate, and zinc intake and toddlers' nutritional status (TB/U), emphasizing the critical need for adequate nutrition during early childhood growth. Toddler nutrition should adhere to the Balanced Nutrition Guidelines stipulated in Minister of Health Regulation Number 28 of 2019 concerning Recommended Nutritional Adequacy Rates for Indonesian Society (Putri et al., 2022; Junita et al., 2023).

Research utilizing food recall and nutrition surveys (Sabilla, 2020) indicates that over half of the surveyed stunted toddlers have low protein intake (60%). Stunting is a chronic nutritional deficiency resulting from various adverse environmental factors, including inadequate food intake, which impacts linear growth, brain development, and cognitive function. Interventions aimed at meeting the protein requirements of stunted children can help prevent further cognitive impairment.

High-protein foods are sourced from various local commodities in Indonesia, highlighting their crucial role in the diets of stunted children and promoting toddler growth (Endrinikapoulos et al., 2023).

Toddlers' insufficient protein intake can lead to linear growth disorders, resulting in stunting (Sudirman et al., 2023). Optimal nutrition during the first 1000 days of life (from conception to the second birthday) is crucial for the healthy development and lifelong well-being of the child. Throughout pregnancy and the postpartum period, physiological changes occur, including increased energy requirements and shifts in essential nutritional needs to support optimal growth and development in infants and toddlers (Beluska-Turkan et al., 2019).

The research results showed that 80% of respondents reported breastfeeding. Among them, 70% of mothers successfully provided exclusive breastfeeding to their toddlers, but 30% did not receive exclusive breastfeeding. Reasons for not exclusively breastfeeding include illness in toddlers, delayed initiation of breastfeeding in the first three days of life, early introduction of complementary feeding (MPASI), and mothers returning to work, resulting in formula milk being given as a substitute for breastfeeding.

Exclusive breastfeeding is considered capable of reducing the risk of stunting because breast milk contains antibodies and highly bioavailable calcium, which optimizes nutrient absorption, particularly in bone formation (Damayanti et al., 2017). Both exclusive breastfeeding and the timing of introducing complementary foods (MP ASI) are factors associated with the incidence of stunting in toddlers (D. Rahayu et al., 2023). Introducing solid foods too early can disrupt exclusive breastfeeding and increase susceptibility to illness due to immature digestive enzymes until the age of 6 months. Poor hygiene during MP ASI feeding can also elevate the risk of diarrhea (Zogara et al., 2014).

Parents with low levels of education, similar to the majority of the population in the Jambi Kecil Health Center's working area—mostly equivalent to middle school and elementary education—affect their childcare practices, which subsequently impact children's development. Research by Hardinata (2023) highlights parental education as a critical factor influencing the incidence of stunting in Indonesia. Higher parental education levels can significantly reduce the risk of childhood stunting (Firrahmawati, 2023).

The economic status of families also influences the incidence of stunting in the Jambi Kecil Community Health Center's working area. In 2024, the district minimum wage (UMK) for Muaro Jambi district is IDR 3,171,413. Family economic status is categorized as either high or low based on this UMK threshold. The majority of toddlers, 60%, come from families with low economic status, while 40% are from families with high economic status. According to UNICEF, low family economic status is associated with increased risks of children being underweight and stunted (UNICEF, 2020). Unfavorable economic conditions can limit access to additional food and impact healthy living habits, potentially leading to malnutrition and stunting among toddlers (Aini et al., 2022). Families with sufficient or higher financial resources can more easily access education and healthcare services, ensuring better nutritional outcomes for their children. This highlights the positive impact of improving economic status on children's health.

CONCLUSION

The primary factors contributing to the incidence of stunting among toddlers in the Jambi Kecil Community Health Center's working area include birth weight, nutritional intake (including exclusive breastfeeding), parental education level, and socio-economic conditions of the toddlers' families. It is hoped

that the findings of this research can support local policymakers, particularly those at the Jambi Kecil Community Health Center, in developing strategies to address stunting cases. These strategies should target the identified main factors and enhance cross-sectoral cooperation to optimize interventions for addressing stunting among toddlers.

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CONFLICT OF INTEREST

There was no conflict of interest in this article.

REFERENCES

- Aini, N., Mulia Hera, A. G., Anindita, A. I., Stelin Maliangkay, K., & Amalia, R. (2022). Hubungan Rendahnya Tingkat Ekonomi Terhadap Risiko Terjadinya Stunting : a Systematic Review. *Jurnal Kesehatan Tambusai*, 3(2), 127–135. <https://doi.org/10.31004/jkt.v3i2.4457>
- Amelia Halim, L., Warouw, S. M., Ch Manoppo, J. I., & Kesehatan Anak Fakultas Kedokteran Universitas Sam Ratulangi, I. (2021). Hubungan Faktor-Faktor Risiko Dengan Stunting Pada Anak Usia 3-5 Tahun Di TK/Paud Kecamatan Tuminting. *Jurnal Medik Dan Rehabilitasi*, 1(2), 1–8. <https://ejournal.unsrat.ac.id/index.php/jmr/article/view/22164>
- Azmy, U., & Mundiastuti, L. (2018). Konsumsi Zat Gizi pada Balita Stunting dan Non- Stunting di Kabupaten Bangkalan Nutrients Consumption of Stunted and Non-Stunted Children in Bangkalan. *Amerta Nutrition*, 292–298. <https://doi.org/10.20473/amnt.v2.i3.2018.292-298>
- Beluska-Turkan, K., Korczak, R., Hartell, B., Moskal, K., Maukonen, J., Alexander, D. E., Salem, N., Harkness, L., Ayad, W., Szaro, J., Zhang, K., & Siriwardhana, N. (2019). Nutritional gaps and supplementation in the first 1000 days. *Nutrients*, 11(12), 1–50. <https://doi.org/10.3390/nu11122891>
- BKKBN. (2023). Senarai BKB HI Unggulan. In Direktorat Bina Keluarga Balita dan Anak BKKBN (Vol. 01).
- Damayanti, R. A., Muniroh, L., & Farapti, F. (2017). Perbedaan Tingkat Kecukupan Zat Gizi Dan Riwayat Pemberian Asi Eksklusif Pada Balita Stunting Dan Non Stunting. *Media Gizi Indonesia*, 11(1), 61. <https://doi.org/10.20473/mgi.v11i1.61-69>
- Dwi Putri, V., & Tiara Levia, A. (2022). Hubungan Berat Badan Lahir Terhadap Kejadian Stunting Pada Balita Usia 2-5 Tahun. *Cendekia Medika: Jurnal Stikes Al-Ma`arif Baturaja*, 7(2), 147–151. <https://doi.org/10.52235/cendekiamedika.v7i2.192>
- Endrinikapoulos, A., Afifah, D. N., Mexitalia, M., Andoyo, R., Hatimah, I., & Nuryanto, N. (2023). Study of the importance of protein needs for catch-up growth in Indonesian stunted children. *SAGE Open Medicine*, 11. <https://doi.org/10.1177/20503121231165562>
- Firrahmawati. (2023). Analisis faktor penyebab yang mempengaruhi kejadian stunting. *Jurnal Kebidanan*, 12(1), 28–38.
- Guerrant, R. L., DeBoer, M. D., Moores, S. R., & Scharf, R. J. (2014). The Improverished gur-a triple burden of diarrhoea, stunting and chronic disease. 10(4), 115–130. <https://doi.org/10.1159/000365373>
- Hardinata, R., Oktaviana, L., Husain, F. F., Putri, S., & Kartiasih, F. (2023). Analysis of Factors Influencing Stunting in Indonesia 2021. *Seminar Nasional Official Statistics 2023*, 2023(1), 817–826. <https://prosiding.stis.ac.id/index.php/smnasoffstat/issue/view/7/11>

- Herawati, N., Rohmah, N., Dewi, R. K., Mahesti, R., Hidayatulloh, M. D., Najla, C. A., Hasanah, U., Nurhaini, D., Aminulloh, M. F., Nasrulloh, N., Tarmizi, & Sunyahni, I. (2022). *PEMBERDAYAAN PSIKOLOGI KELUARGA* - Google Books. In penerbit Adab.
- Peraturan Presiden (Perpres) Nomor 72 Tahun 2021 tentang Percepatan Penurunan Stunting, 1 (2021).
- Jambi, B. P. (2023). Penyelenggaraan Percepatan Penurunan Stunting Tahun 2023. In Provinsi Jambi (Issue June).
- Junita, J., Rusmimpong, R., Triana, W., & Putra, E. S. (2023). Simpatik Education Model for Knowledge and Diversity of Food Intake for Stunting Toddlers in Kerinci Regency. In *Proceeding International Conference Health Polytechnic of Jambi* (Vol. 2, pp. 1-8).
- Junita, J., Rusmimpong, R., Triana, W., & Putra, E. S. (2023b). SIMPATIK website nutrition education on mother's knowledge and diversity of toddler consumption in Jambi City. *AcTion: Aceh Nutrition Journal*, 8(2), 270-277.
- Kemenkes RI. (2023). Menteri Kesehatan Republik Indonesia Hasil Survei Status Gizi Indonesia (SSGI) 2022. 1–7.
- Kemenkes RI. (2020). Buku Saku Pencegahan dan Tata Laksana Gizi Buruk Pada Balita di Layanan Rawat Jalan Bagi Tenaga Kesehatan. In Kemenkes RI: Jakarta.
- Kemenkes RI. (2022). Status Gizi SSGI 2022. BPKP Kemenkes RI, 1–156. https://r.search.yahoo.com/_ylt=Awr1TXopzHJm13UHIgDLQwx.;_ylu=Y29sbwNzZzMEcG9zAzQEEdnRpZAMEc2VjA3Ny/RV=2/RE=1718828202/RO=10/RU=https%3A%2F%2Fpromkes.kemkes.go.id%2Fpub%2Ffiles%2Ffiles52434Buku%2520Saku%2520SSGI%25202022%2520rev%252010123.pdf/RK=2/RS=ua_K
- Lestari, E. D., Hasanah, F., & Nugroho, N. A. (2018). Correlation between non-exclusive breastfeeding and low birth weight to stunting in children. *Paediatrica Indonesiana*, 58(3), 123–127. <https://doi.org/10.14238/pi58.3.2018.123-7>
- Oktavianisya, N., Sumarni, S., & Alifitah, S. (2021). Faktor Yang Mempengaruhi Kejadian Stunting Pada Anak Usia 2-5 Tahun Di Kepulauan Mandangin. *Jurnal Kesehatan*, 14(1), 46. <https://doi.org/10.24252/kesehatan.v14i1.15498>
- Putri, M. P., Dary, D., & Mangalik, G. (2022). Asupan Protein, Zat Besi Dan Status Gizi Pada Remaja Putri. *Journal of Nutrition College*, 11(1), 6–17. <https://doi.org/10.14710/jnc.v11i1.31645>
- Rahayu, A., Yulidasari, F., Putri, A. O., & Rahman, F. (2015). Riwayat Berat Badan Lahir dengan Kejadian Stunting pada Anak Usia Bawah Dua Tahun. *Kesmas: National Public Health Journal*, 10(2), 67. <https://doi.org/10.21109/kesmas.v10i2.882>
- Rahayu, D., Fresty Africia, Zauhani Kusnul H, & Erwin Yektiningsih. (2023). Exclusive Breast Feeding As an Effort To Overcome Stunting in Toddlers With the Family Empowerment Strategy Approach. *Journal for Quality in Women's Health*, 6(2), 120–126. <https://doi.org/10.30994/jqwh.v6i2.226>
- Rahmadhita, K. (2020). Stunting Problems and Prevention. *Juni*, 11(1), 225–229. <https://doi.org/10.35816/jiskh.v10i2.253>
- RI, S. N. (2017). 100 Kabupaten/ Kota Prioritas Untuk Intervensi Anak Kerdil (Stunting). Universitas Nusantara PGRI Kediri, 01, 1–7.
- RI, S. N. (2019). Strategi Nasional Percepatan Pencegahan Anak Kerdil (Stunting).
- Rodríguez, L., Cervantes, E., & Ortiz, R. (2011). Malnutrition and gastrointestinal and respiratory infections in children: a public health problem. *International Journal of Environmental Research and Public*

- Health, 8(4), 1174–1205.
<https://doi.org/10.3390/ijerph8041174>
- Sabilla, M. (2020). Food Recall dan Penggunaan Nutrisurvey. 1–28.
- Siddiq, A., & Nuzul, A. (2018). Penyakit Infeksi Dan Pola Makan Dengan Kejadian Status Gizi Kurang Berdasarkan Bb/U Pada Balita Usia 6-24 Bulan Di Wilayah Kerja Puskesmas Tanah Sepenggal. Kementerian PPN/Bappenas, 7(1), 66.
- Soliman, A., De Sanctis, V., Alaraj, N., Ahmed, S., Alyafei, F., Hamed, N., & Soliman, N. (2021). Early and long-term consequences of nutritional stunting: From childhood to adulthood. *Acta Biomedica*, 92(1), 1–12.
<https://doi.org/10.23750/abm.v92i1.11346>
- Sudirman, J., Saleng, H., Supardi, N., & Eryanti, R. (2023). The relationship of food (protein) intake on stunting incidence in toddlers. 11(April 2023), 34–40. <https://doi.org/10.47794/jkhws>
- Tadi, M. Y., Hinga, I. A. T., & Purnawan, S. (2023). Factors Related to Acute Respiratory Infection (ARI) in Toddlers at Radamata Health Center. 5(1), 1–15.
- Thurstans, S., Sessions, N., Dolan, C., Sadler, K., Cichon, B., Isanaka, S., Roberfroid, D., Stobaugh, H., Webb, P., & Khara, T. (2022). The relationship between wasting and stunting in young children: A systematic review. *Maternal and Child Nutrition*, 18(1).
<https://doi.org/10.1111/mcn.13246>
- TP2S SETWAPRES. (2023). Buletin Tim Percepatan Penurunan Stunting (TP2S) Sekretariat Wakil Presiden RI I. 1–28.
https://drive.google.com/file/d/1BEBD TZNYsdy0NfN5PZ7nvGwnWY5fqm_Y/view
- UNICEF. (2020a). Situasi Anak di Indonesia - Tren, peluang, dan Tantangan dalam Memenuhi Hak-Hak Anak. Unicef Indonesia, 8–38.
- UNICEF. (2020b). the State of Children in Indonesia. The State of Children in Indonesia p Trends, Opportunities and Challenges for Realizing Children's Rights., 65.
<https://www.unicef.org/indonesia/sites/unicef.org.indonesia/files/2020-06/The-State-of-Children-in-Indonesia-2020.pdf>
- Utami, M. T., & Widiyaningsih, E. N. (2023). Status berat badan lahir rendah dengan kejadian stunting pada balita di Desa Sukadadi, Lampung. *Ilmu Gizi Indonesia*, 6(2), 95.
<https://doi.org/10.35842/ilgi.v6i2.352>
- WHO. (2015). Stunting in A Nutshell. *Who News*, November, 2015.
<https://www.who.int/news/item/19-11-2015-stunting-in-a-nutshell>
- WHO. (2022). Stunting Policy Brief. The Art of Revising Poetry: 21 U.S. Poets on Their Drafts, Craft, and Process, 9.
<https://doi.org/10.7591/cornell/9781501758898.003.0006>
- Zogara, A. U., Hadi, H., & Arjuna, T. (2014). Riwayat pemberian ASI eksklusif dan MPASI dini sebagai prediktor terjadinya stunting pada baduta di Kabupaten Timor Tengah Selatan, Nusa Tenggara Timur History of exclusive breastfeeding and early introduction of complementary food as predictors of stunting. *Jurnal Gizi Dan Dietetik Indonesia*, 2(1), 41–50.

STUDY OF HYGIENE SANITATION IN FOOD STALLS AT ALAM BARAJO TERMINAL, JAMBI CITY

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ABSTRACT

Background: Hygiene and sanitation of food stalls is one aspect that has an important role in influencing the quality of food stalls, food stalls must meet good hygiene and sanitation requirements. If it is not fulfilled, it is feared that it can affect the food served. The purpose of this research was to determine the Sanitation Hygiene Overview at the Alam Barajo Terminal Food Stall in Jambi City.

Method: The type study titled "Study of Hygiene Sanitation in Food Stalls at Alam Barajo Terminal, Jambi City" used was Description with an observational approach, the sample and population in this study consist of the entire population of food stalls at the terminal, totaling 18 food stalls with a method a total sampling. Research variables in this study are location and building, sanitation facilities, kitchen facilities, dining areas, food storage areas, and eating utensils using indicator study in the form of a checklist observation sheet.

Result: The study of the food stalls at Alam Barajo Terminal, Jambi City, fall short of health standards in several key areas. The location and buildings are non-compliant, with 56% below required standards due to pollution from vehicle exhaust, dust, and garbage odors. Sanitation facilities are also inadequate, with 36% failing to meet standards. Many stalls lack proper clean water supply and effective wastewater drainage systems, relying instead on soil absorption. Food management practices are deficient, with 44% of facilities not meeting standards. Improvements are needed in kitchen layouts, ventilation, and cleanliness of dining and storage areas to prevent pest issues and ensure proper food safety. Tableware at the stalls is non-compliant in 33% of cases, with poor washing and storage practices contributing to potential disease spread. Consistent maintenance of high cleanliness standards is essential to avoid contamination and ensure food safety.

Conclusion: The conclusion of the study shows that the research variables include environmental and building conditions, sanitation facilities, kitchen facilities, dining areas, and dining ware and tableware according to sanitary hygiene requirements in food stalls have a bad category with a percentage of less than 70%.

Keywords: Hygiene; Sanitation; Food Stalls; Terminal

INTRODUCTION

Hygiene and sanitation of food stalls is still lacking attention and does not meet sanitation requirements. Food stalls must meet good hygiene and sanitation requirements. If not met, it is feared that it can affect the food served. As we know that food is a fundamental need for human life (Kurniasih and D 2015).

Hygiene sanitation according to the Decree of the Minister of Health of the Republic of Indonesia Number 1098 of 2003

is an effort to control food factors, people, places and equipment that can or may cause disease or other health problems. This control is also required to conduct inspection and guidance to food traders, especially in the environment of providing public transportation services such as terminals. Inspection and guidance are less considered by the terminal manager so that there are still many hygiene and sanitation problems found in food stalls that do not meet the requirements.

Alam Barajo Type A Terminal is a Service Unit managed by the Class II Jambi Land Transportation Management Office. This terminal is the largest in Jambi City and one of the few terminals still operational today. Due to the high number of public transportation vehicles, such as buses, frequently operating around Alam Barajo Terminal, Therefore, it is necessary to provide food and beverage facilities at the terminal such as food stalls that sell ready-to-eat food.

Preliminary survey conducted by the author, there are 18 food stalls in Alam Barajo Terminal, Jambi City that still do not meet health requirements. Some things that do not meet the requirements such as floors that are not clean enough to cause nuisance animals. In terms of the location of food stalls that are on the side of the road and around the terminal, there is automatically a lot of dust, pollution that can be associated with food can stick to food. and there are still several food stalls that do not cover food with a lid so that dust or flies can contaminate food, and wash cutlery not using running water. It was also found that food management facilities were less clean and unkempt and inadequate sanitation facilities,

The purpose of this research was to determine the Sanitation Hygiene Overview at the Alam Barajo Terminal Food Stall in Jambi City, with the following objectives:

1. To understand the layout and structure of the food area and building at Terminal Alam Barajo food stalls in Kota Jambi.
2. To assess the sanitation facilities at Terminal Alam Barajo food stalls in Kota Jambi.
3. To gain insight into the kitchen facilities, food area, and food storage warehouse at Terminal Alam Barajo food stalls in Kota Jambi.
4. To examine the food utensils and equipment at Terminal Alam Barajo food stalls in Kota Jambi.

Based on this background, the authors are interested in conducting research on Title “Studi Hygiene Sanitasi di Warung Makan Terminal Alam Barajo Kota Jambi” (Study of Hygiene Sanitation in Food Stalls at Alam Barajo Terminal, Jambi City). sounds appropriate and aligned with your research focus. It clearly reflects the scope and purpose of your study.

METHODS

The title " Study of Hygiene Sanitation in Food Stalls at Alam Barajo Terminal, Jambi City” indeed captures the essence of your research focus on hygiene sanitation in food stalls. It effectively communicates the scope and purpose of your study, which presents the real situation of how hygiene and sanitation requirements are applied to food stalls at the terminal. The type of research used was Descriptive with an observational approach, the sample and population in this study consist of the entire population of food stalls at the terminal, totaling 18 food stalls with a method a total sampling. Research variables in this study are location and building, sanitation facilities, kitchen facilities, dining areas, food storage areas, and eating utensils using indicator study in the form of checklist observation sheet.

RESULTS AND DISCUSSION

- a. The location and buildings at the Alam Barajo Terminal food stalls in Jambi City cannot be considered compliant, with 56% falling below the health standards requirements. Alam Barajo Terminal in Jambi City, including the location and the building of the food stalls, does not meet the required standards. The area around the food stalls in the terminal is still affected by sources of pollution such as vehicle exhaust, dust, and garbage odors. There should be measures in place to ensure that the food stalls are not

directly exposed to these pollutants. The building used for the food stalls is a permanent structure consisting of three integrated permanent buildings connected to residential areas and fifteen standalone permanent buildings. In terms of the physical condition of the buildings, some aspects meet the standards, but many still do not, such as irregular room divisions, damaged roofs and ceilings leading to leaks, and a lack of functional doors due to many stalls being set up as tent-like structures.



Figure 1. Condition of the buildings at the food stalls in Alam Barajo Terminal, Jambi City

- b. The sanitation facilities at the Alam Barajo Terminal food stalls in Jambi City cannot be considered compliant, with 36% falling below the health standards requirements. The sanitation facilities at the food stalls in Alam Barajo Terminal lack adequate clean water supply and only use water tanks for storage. Additionally, 12 stalls do not have proper wastewater drainage systems and rely solely on soil absorption for wastewater disposal. Six stalls located in the terminal kiosks have wastewater drainage systems, but these are not functional due to poor water flow, absence of grease

traps, and lack of coverage. Sanitation facilities at the terminal are primarily intended for visitors/passengers of the terminal, such as toilets and trash bins. These facilities are crucial and should be provided by the food stall owners. The trash bins owned by the food stall owners are only plastic bags, not permanent trash bins. The terminal has a total of 4 toilets, consisting of 2 for men and 2 for women, which are available for terminal passengers.



Figure 2. The physical condition of the trash bins at the food stalls in Alam Barajo Terminal, Jambi City

- c. The food management facilities at the Alam Barajo Terminal food stalls in Jambi City cannot be considered compliant, with 44% falling below the health standards requirements. Food management facilities at the terminal food stalls, including kitchens, dining areas, and food storage, could be improved in several ways. The kitchen layout should be reorganized, and ventilation systems should be installed to remove lingering odors from the kitchen environment. The cleanliness of dining areas should be carefully maintained to avoid attracting pests. Food storage areas should be spacious and well-constructed,

made from durable materials, and fully enclosed with no gaps that could allow pests to enter.



Figure 3. Condition of the kitchen and food storage areas at the food stalls in Alam Barajo Terminal, Jambi City.

- d. The tableware at the Alam Barajo Terminal food stalls in Jambi City cannot be considered compliant, with 33% falling below the health standards requirements. The tableware at the terminal food stalls must be maintained according to proper washing and storage procedures. Poor washing and storage practices can lead to the spread of diseases. One of the factors contributing to foodborne illnesses is contaminated dining equipment. Inadequate cleanliness of food utensils plays a crucial role in the growth and proliferation of germs, the spread of diseases, and incidents of food poisoning outbreaks. Therefore, it is essential to consistently uphold high standards of cleanliness for food equipment to prevent contamination by pathogenic microbes and other contaminants.

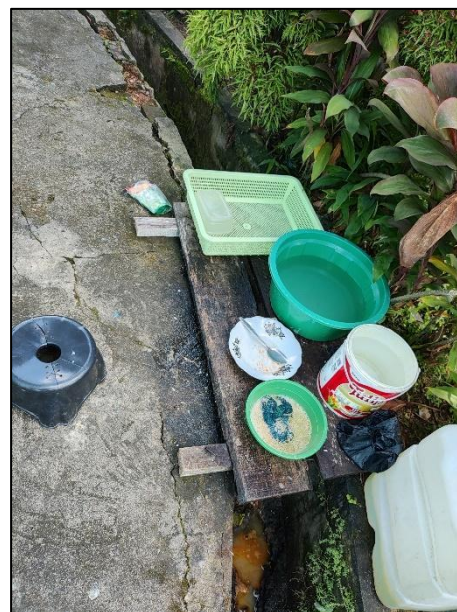


Figure 4. Condition of the dishwashing area at the food stalls in Alam Barajo Terminal, Jambi City

CONCLUSION

Based on the research conducted at Alam Barajo Terminal in 2024, the conclusions drawn are:

1. The location and buildings at food stalls in alam barajo terminal Jambi City are unqualified, indicating the need for significant improvements in physical infrastructure to improve compliance with sanitation standards.
2. Sanitation Facilities at food stalls in alam barajo terminal Jambi City are also unqualified. there is an urgent need to improve sanitation facilities to comply with applicable regulations, which can help reduce health risks for visitors and managers.
3. Kitchen, dining area, and food storage facilities at the Alam Barajo Terminal Food Stall in Jambi City are also unqualified. Improvements in kitchen management, dining areas, and food warehouses need to be prioritized to ensure better food safety for terminal users.

4. Tableware at the Alam Barajo Type A Terminal Food Stall in Jambi City also shows unsatisfactory performance, Evaluation and replacement of tableware that does not meet the standards need to be done regularly to minimize the risk of food contamination.

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CONFLICT OF INTEREST

All authors declared that there was no conflict of interest.

REFERENCES

- Agustina, Titin. 2014. "Kontaminasi Logam Berat Pada Makanan Dan Dampaknya Pada Kesehatan." *Teknoba* 1(1): 53–65.
- Agustina, Tifa. 2021. "Gambaran Hygiene Sanitasi Rumah Makan Di Terminal Kalideres Tahun 2021." *Poltekkes Kemenkes Jakarta II*.
- Amaliyah, Nurul. 2017. *Penyehatan Makanan Dan Minuman-A*. Yogyakarta. <https://books.google.co.id/books?id=Owc3DwAAQBAJ&lpg=PR7&ots=pIZf5xZ8OX&dq=peranan makanan dalam menimbulkan penyakit&hl=id&pg=PA12#v=onepage&q=peranan makanan dalam menimbulkan penyakit&f=false>.
- Hitipeuw, Michelle Regina Christanty, Oksfriani Jufri Sumampouw, and Rahayu H Akili. 2018. "Higiene Dan Sanitasi Rumah Makan Di Kompleks Wanea Plaza Kota Manado." *Kesmas* 7(4): 11–17.
- Irfan Syahroni, Muhammad. 2022. "Prosedur Penelitian Kuantitatif." *eJurnal Al Musthafa* 2(3): 43–56.
- Kementerian Kesehatan. 2023. "Peraturan Menteri Kesehatan Republik Indonesia Nomor 2 Tahun 2023." *Kemenkes Republik Indonesia* 151(2): Hal 10-17.
- "Keputusan Menteri Kesehatan RI Nomor 1098/ Menkes/SK/VII/2003 Tentang Persyaratan Hygiene Sanitasi Rumah Makan Dan Restoran." 2003. 1116/MENKE(4): 1–22. <https://www.jstor.org/stable/409719>
- 65 REFERENCES.
- Kurniasih, Rizqi Putri, and Yusniar Hanani D. 2015. "Kontaminasi Bakteri Escherichia Coli Dalam Makanan Di Warung Makan Sekitar Terminal Borobudur , Magelang." 3: 549–58.
- Malango, Lany. 2012. "Aspek Hygiene Sanitasi Makanan Pada Rumah Makan Di Terminal 42 Andalas Kota Gorontalo 2012." : 65–74.
- Marisdayana, Rara, Putri Sahara Harahap, and Hesty Yosefin. 2017. "Teknik Pencucian Alat Makan, Personal Hygiene Terhadap Kontaminasi Bakteri Pada Alat Makan." *Jurnal Endurance* 2(3): 376.
- Sintia, Amelia. 2021. "Penerapan Hygiene Sanitasi Makanan pada Pedagang Kaki Lima."
- Rahmadhani, Dini, and Sri Sumarmi. 2017. "Gambaran Penerapan Prinsip Higiene Sanitasi Makanan Di PT Aerofood Indonesia, Tangerang, Banten." *Amerta Nutrition* 1(4): 291.
- Rahmayani, Rahmayani. 2018. "Hubungan Pengetahuan, Sikap Dan Tindakan Hygiene Sanitasi Pedagang Makanan Jajanan Di Pinggir Jalan." *Action: Aceh Nutrition Journal* 3(2): 172.
- Tifal, Tifal Dakwani. 2019. "Hygiene and Sanitation of Food Processing Center in Gudang 100 Warehouse at Tanjung Perak Sea Port of Surabaya 2018." *Jurnal Kesehatan Lingkungan* 11(1): 69–74.

Wati Gulo, Aprilina. 2021. "Hygiene Dan Sanitasi Rumah Makan Disekitar Pasar Kabanjahe Tahun 2021." : 67.

DIETARY DIVERSITY IS ASSOCIATED WITH FOOD SECURITY AMONG FARMER'S CHILDHOOD IN LOMBOK TENGAH

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ABSTRACT

Background: Nutrition at children under five-year stage is crucial for growth and development. Dietary choices are common determinants caused by a set of underlying factors such as household food insecurity and dietary diversity. This study aimed to determine the prevalence of food insecurity and dietary diversity among farmer's children from 6 to 59 months.

Method: Cross sectional study was conducted on 359 children aged 6-59 month. A multistage cluster sampling method was used to select the study participants. This study was carried out used data on food security and dietary diversity. A validated structured questionnaire was used to collect data on sociodemographic characteristics, food security and dietary diversity.

Result: The majority (97.4%) of children respondent had good dietary diversity. Subject's who are food secure tend to have good food diversity. Children under five years respondent had mean dietary diversity score of 5.3 food groups. In adjusted analysis, statistical correlation was found between several food groups and food security status, like meat, poultry and this product. The results revealed the household food security determine adequate food intake for children in the community.

Conclusion: Household food insecurity and dietary diversity was unacceptably less and good respectively among farmer's children. The food security that resides in highland and are involved in subsistence most vulnerable to food security and their produce consumed less varied diets as they had lowest dietary diversity score.

Keywords: Food security, Dietary diversity score, Farmer's children

INTRODUCTION

Food security is the state in which all people always have physical and financial access to adequate, wholesome food that meets their dietary requirements and preferences and allows them to lead active, healthy lives (Burchi & Muro, 2016). The three primary pillars of food security are usage, availability, and accessibility. Food can be domestically produced, commercially imported, or acquired through food assistance.

The quantity of foods ingested over time by various groups is known as dietary diversity. Utilization is the allocation of household food among household members according to each person's nutritional needs; it also includes biological usage, which is

connected to an individual's health. the idea that diversifying food types in the diet can aid in consuming more nutrients and advancing health (Singh et al., 2020). It was discovered that having a diverse diet positively correlated with household income, gender, education level, having a home garden, and owning animals (Nengovhela et al., 2022). Dietary diversity scores are becoming more and more popular because they have a positive correlation with children's nutritional status and nutrient intake and because dietary diversity is crucial for both nutrition and overall health (Hooshmand & Udipi, 2013).

However, elements including food production, food taboos, knowledge, attitude, and eating behavior practices all have an impact on dietary diversity. Pregnant women were found to have decreased dietary

diversity and food taboos; about half of the respondents reported this (Angkasa, D., & Iswarawanti, D.N., 2021).

Malnutrition and the effects of a less varied diet have been documented in a number of studies. The effects of malnutrition include delayed physical and motor development, a lower intellectual quotient, increased behavioral issues, a lack of social skills, and an increased risk of illness. Adult chronic disease rates may be greater as a result (Darsene et al., 2017).

Urbanization, rising household incomes, and the expansion of supermarkets have all been linked to changes in dietary diversity and patterns of food consumption (Arifin et al., 2019). The purpose of this study was to investigate the relationship between dietary variety score and household food security.

METHODS

The households of farmers in Lombok Tengah, West Nusa Tenggara, Indonesia, were the subject of this study. A sample of 359 farmer households participated in the study after being randomly selected as study participants. The Health Polytechnic of Mataram's Institutional Ethics Committee gave its clearance for this study (LB.01.03/6/115/2023).

The Home Food Insecurity Access Scale (HFIAS), which allows for monitoring the effects of development food aid programs on the access component of household food insecurity, was used to measure the food security of farmers's children.

The HFIAS is a thorough nine-item scale designed to measure the prevalence of food security, taking into account factors such as inadequate consumption and quality of food, anxiety and uncertainty about the household food supply, and the resulting bodily effects. The questions further assess the number of times the respondent has experienced the situation (0 = never, 1 = rarely, 2 = sometimes, 3 = often). A score of less than

two indicated that the individual had access to food. The population's diet diversity was assessed using the Individual Dietary Diversity Score (IDDS), which counts the number of food groups that a particular target group consumed the day before or the night before. By gathering each respondent's 24-hour recall, the IDDS was conducted.

Twelve food groups—cereals, white tubers and roots, vegetables, fruits, meat, eggs, fish and other seafood, legumes, nuts and seeds, milk and milk products, oils and fats, sweets and spices, condiments, and beverages—were created based on the 24-hour recall. A score of one indicated group consumption, and 0 indicated non-consumption. A score below 8 meant that the person had low dietary diversity.

RESULTS AND DISCUSSION

The codes of answers to the occurrence questions were added together to determine each household's HFIAS score.

Also indicates that households in Kopang (highland) are the most food insecure among districts, with the highest average food insecurity score (6.17). Batu Jangkih households had the lowest levels of food insecurity (3.12). A report indicated that in the mountainous regions, where high food costs and the inability to buy nutritious food overlap, the inability to afford healthy diets is particularly high, notwithstanding the statistical insignificance of the differences across the districts.

Food secure, mildly insecure, moderately insecure, and severely insecure are the categories into which the scores have been divided. A statistical correlation between the categories of flesh meats, fish and shellfish, milk and milk products, and food security status was discovered in an unadjusted analysis.

Table 1. Participants responses to nine items of household food insecurity access scale (HFIAS)

Household Food Insecurity Access Scale (HFIAS) Items	Never	Rarely	Sometimes	Often
	n (%)	n (%)	n (%)	n (%)
1. In the past four weeks, did you worry that your household would not have enough food?	244 (68)	70 (49.1)	38 (27.9)	7 (4.26)
2. In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	52 (21.3)	128 (40.5)	170 (61.2)	9 (2.8)
3. In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	16 (8.7)	62 (27.2)	268 (72.9)	13 (8.1)
4. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	244 (78.9)	37 (38.1)	69 (57.2)	9 (8,2)
5. In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	258 (75.4)	41 (62.1)	56 (36.3)	4 (5.9)
6. In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	270 (79.2)	43 (61.7)	35 (41.8)	11 (13.5)
7. In the past four weeks, was there ever no food to eat of any kind in your household because lack of resources to get food?	281 (83.5)	41 (52.1)	37 (59.0)	0
8. In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	321 (93.4)	38 (100)	0	0
9. In the past four weeks, did you or any household member go a whole day and night without eating because there was not enough food?	359 (100)	0	0	0

While research on food security and dietary diversity among Lombok Tengah's farmer households has been sparse, a similar study among nursing women in Nepal revealed that over half of the moms had inadequate dietary diversity and were food insecure (Singh et al., 2020). In their 24-hour recollection, every respondent categorically stated that they had eaten cereal, with rice being the most popular type. According to other studies, 80% of all grains are still consumed as rice, despite a downward trend in consumption in both coastal and mountain areas (Sabu et al., 2019). In their study,

stressed that dietary diversity is directly correlated with income and reported that low-income groups in Kerala consumed more cereals (Retheesh et al., 2021).

Even though this does not provide sufficient daily nutritional diversity, having a variety of cuisines in the household is a big advantage that may be connected to agricultural production. The relationship between HDDS, HFIAS, and household income is quite robust. A household's food security declines as their monthly income rises.

Table 2. Food groups included in the dietary diversity score and the frequency by household food insecurity status

Food Groups included in dietary diversity score	N	Food Security Status				p-value
		Food secure	Mildly food insecure	Moderate food insecure	Severely food insecure	
Cereals	359 (100)	244 (100)	70 (100)	38 (100)	7 (100)	-
White roots and tubers	73 (39.8)	26 (32.3)	16 (21.5)	29 (35.7)	2 (31.6)	0,681
Vitamin A Rich vegetables and tubers	213 (67.9)	149 (59.4)	36 (48.2)	21 (57.1)	7 (60.4)	0,824
Dark green leafy vegetables	359 (89.6)	250 (73.2)	64 (59.1)	38 (83.9)	7 (100)	0,213
Other vegetables	321 (81.5)	216 (77.8)	70 (80.0)	30 (72.6)	5 (74.1)	0,419
Vitamin A rich fruits	54 (21.9)	32 (17.1)	11 (13.8)	8 (19.3)	3 (8.9)	0,119
Other fruits	139 (65.9)	81 (60.2)	58 (56.4)	0	0	0,415
Organ meat	75 (49.7)	42 (45.2)	29 (36.7)	3 (12.2)	1 (5.4)	0,890
Flesh meat	29 (39.2)	23 (37.2)	6 (29.1)	0	0	0,002**
Eggs	159 (82.5)	113 (79.2)	40 (78.3)	6 (44.7)	0	0,129
Fish and seafood	161 (68.1)	132 (66.9)	21 (67.5)	5 (48.4)	3 (49.3)	0,045**
Legumes, nuts and seeds	288 (69.3)	179 (67.1)	70 (68.9)	32 (59.3)	7 (60.6)	0,392
Milk and milk products	42 (49.2)	37 (48.2)	5 (49.1)	0	0	0,006**
Oils and fats	316 (97.9)	201 (95.4)	70 (100)	38 (100)	7 (27.0)	0,981
Sweets	359 (99.6)	244 (87.9)	70 (98.9)	38 (100)	7 (100)	0,837
Spices, condiments and beverages	359 (100)	245 (100)	69 (100)	38 (100)	7 (100)	0,491
Dietary diversity scores						
Low dietary diversity (≤4 food groups)	57 (15.9)	8 (3.3)	17 (24.3)	25 (65.8)	7 (100)	0,009**
High dietary diversity (>4 food groups)	302 (84.1)	236 (96.7)	53 (75.7)	13 (34.2)	0	

** value is statistically significant at $p < 0.05$

Higher earners tend to have less food insecurity in their households. The findings are consistent with past studies showing a positive relationship between household food security and the food security of female farmworkers.

CONCLUSION

The findings indicate a significant relationship between the dietary diversity score and food security. The HFIAS who

reside in highland locations (Kopang) and practice subsistence women's farming are particularly vulnerable to food insecurity since they have the lowest dietary diversity score. Their produce is therefore consumed in less varied diets.

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CONFLICT OF INTEREST

There was no conflict of interest in this article.

REFERENCES

- Angkasa, D., & Iswarawanti, D.N. (2021). Do Food Taboo and Dietary Diversity Associated With Risk of Chronic Energy Deficiency Among Pregnant Women Living in Rural Setting of Southeast Sulawesi, Indonesia? Proceeding of Nutrition Society. <https://doi.org/10.1017/s0029665121000847>
- Arifin, B., Achsani, N.A., Martianto, D., Sari, L.K & Firdaus, A.H. (2019). The Future of Indonesian Food Consumption. Jurnal Ekonomi Indonesia. <https://doi.org/10.52813/jei.v8il.13>
- Burchi, F., & De Muro, P. (2016). From Food Availability to Nutritional Capability: Advancing Food Security Analysis. Food Policy, 60 (1) 9-10. <https://doi.org/10.1016/j.foodpol.2015.03.008>.
- Darsene, H., Geleto, A., Gebeyehu, A., & Meseret, S. (2017). Magnitude and Predictors of Undernutrition Among Children Aged Six to Fifty Nine Months In Ethiopia : A Cross Sectional Study. Archives of Public Health 75.29. <https://doi.org/10.1186/s13690-017-0198-4>
- Hoosmand, S., Udipi, S. (2013). Dietary Diversity and Nutritional Status of Urban Primary School Children from Iran and India. J Nutrition Disorder Ther S. 12:2161-0509
- Nengovhela, R., Belete, A., & Hlongwane, J.J. (2022). Measuring Rural Household's Food Consumption Pattern Using HDDS. A Case Of Mopani District Municipality, Limpopo Province, South Africa. Journal Of Agribusiness and Rural Development. <https://doi.org/10.17306/j.jard.2022.0>
- Singh, S., Jones, A.D., & Jain, M. (2020). Regional Differences in Agricultural and Socioeconomic Factors Associated with Farmer Household Dietary Diversity in India. Plos One. <https://doi.org/10.1371/journal.pone.0231107>
- Singh DR, Ghimire S, Upadhayay SR, Singh S, Ghimire U. Food insecurity and dietary diversity among lactating mothers in the urban municipality in the mountains of Nepal. PLoS ONE. 2020;15(1): e0227873. <https://doi.org/10.1371/journal.pone.0227873>.
- Sabu S, Kuruvila A, Anirudh KC, Raju R. Dynamics of food consumption pattern in India and Kerala: a comparative analysis. Conference: ascertaining food security through livelihood enriching interventions: challenges and opportunities. Karaikal: Pandit Jawaharlal Nehru College of Agricultural Sciences and Research Institute; 2019.
- Retheesh PK, Santhosh R, Karunakaran N. Diversity in food consumption: evidences from urban Kerala. J Manag Res Anal. 2021;8(3):122–6.

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CONTRIBUTING FACTORS OF CHRONIC ENERGY DEFICIENCY IN ADOLESCENT GIRLS: SCOPING REVIEW

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ABSTRACT

Background: Chronic energy deficiency is a condition that occurs due to the deficiency of energy and protein intake to the needs over a long period of time. Chronic energy deficiency often occurs in adolescence, especially adolescent girls. Chronic energy deficiency can be caused by many factors including lack of energy intake, protein intake and body image. The purpose of study was to examine the relationship energy intake, protein intake, and body image with the prevalence of chronic energy deficiency in adolescent girls.

Methods: The method used was a scoping review approach. Research used as a source for scoping review by collecting research articles from various sources through the google scholar database, Pubmed / Medline, and Scopus. Article selection using PRISMA-Scr. Then then selected using inclusion and exclusion criteria. Keywords used are energy intake, protein intake, chronic energy deficiency, adolescents.

Results: The results of the search obtained 12 articles that fit the criteria. The results of the analysis obtained relationship factors (energy intake, protein intake and body image) that are most correlated with chronic energy deficiency in adolescent girls.

Conclusion: Based on 12 articles, it can be concluded that the causes of chronic energy deficiency in adolescents can be caused by energy intake, protein intake and body image. In addition, it is also found that there are other factors that can cause chronic energy deficiency in adolescent girls such as fat intake, nutritional knowledge, physical activity, pocket money and infectious diseases.

Keywords: Energy Intake, Protein Intake, Chronic Energy Deficiency, Adolescents

INTRODUCTION

Based on the regulation of the Ministry of Health of the Republic of Indonesia Number 25 of 2014, adolescence is classified in the range of 10-18 years (Ministry of Health of the Republic of Indonesia, 2014). Adolescence is a period when a person experiences growth and development both physically, cognitively and psychologically (Widhiyanti et al., 2020). According to Putri, adolescents experience a period of growth spurth which means experiencing rapid development so that the nutrients needed also increase (F. M. Putri et al., 2022).

In process Growth spurt, it is not uncommon for adolescents to experience various nutritional problems such as anemia, undernutrition, obesity and CED (Yuningsih, 2023). Nutritional problems that often occur, especially in adolescent girls, currently and still require special attention, namely chronic energy deficiency (CED) because it can cause problems in the future (Yulianasari et al., 2019).

Chronic Energy Deficiency (CED) is a condition in adolescent girls or women of childbearing age who experience nutrition deficiency especially energy and protein intake and lasts for a long time or years (Fibrila & Ridwan, 2022). Chronic Energy

Deficiency (CED) can occur due to an imbalance in nutrient intake with the nutritional needs required by the body (Retni & Arfianti, 2023). The indicator commonly used to detect someone affected by chronic energy deficiency (CED) is by measuring the upper arm circumference (MUAC). The results of measuring upper arm circumference if <23.5 can be said that someone has chronic energy deficiency (Fakhriyah et al., 2021).

WHO said chronic energy deficiency (CED) is still a global problem because it has increased from 2015 to 777 million and 2018 to 815 million or around 60% (WHO, 2018). Based on RISKESDAS in 2018, the prevalence of chronic energy deficiency in non-pregnant women is highest in the age range of 15-19 years, which is 36.6% (RISKESDAS, 2018).

Chronic energy deficiency (CED) caused by many factors which are divided into two, namely direct and indirect factors. Direct factors include intake (macronutrients and micronutrients) and infectious diseases (Dagne et al., 2021). While indirect factors include body image, money, nutrition knowledge, physical activity, family socioeconomics and so on (F. M. Putri et al., 2022).

Direct factors that are often associated with chronic energy deficiency (CED) are energy intake and protein intake. Low energy intake and protein intake as macronutrients can contribute to low micronutrient intake (Telisa & Eliza, 2020). Energy and protein intake are useful for metabolic processes used to support growth and development (Zaki & Sari, 2019). While indirect factors that are often associated with the incidence of chronic energy deficiency (CED) in adolescents are body image.

Body image data can be divided into two, namely positive and negative body image. A positive body image is someone who can accept their body shape, while a negative body image is someone who cannot accept their body shape (Wahyuni & Auriella, 2021).

Adolescents who have a negative body image are likely to limit food intake and follow certain diets so that they can experience chronic energy deficiency (CED) (Yulia et al., 2024).

The impacts caused when adolescents experience chronic energy deficiency (CED) include anemia, suboptimal development and growth, decreased learning concentration, and can reduce the body's resistance (Retni & Arfianti, 2023). Chronic energy deficiency (CED) in adolescents if it lasts until pregnancy will cause impacts such as low birth weight, prematurity, disability, fetal anemia, and bleeding (Falentina et al., 2023).

Thus, the author wants to examine the relationship between energy intake, protein intake and body image with the incidence of chronic energy deficiency (CED) in adolescent girls through a scoping review approach from various existing studies and sources.

METHODS

The method used for this research is scoping review. Scoping review using the PEOS method (population, exposure, outcome, study design). The population to be studied is adolescent girls, exposure is the factor to be studied, namely energy intake, protein intake and body image, outcome refers to the results, namely there is a relationship between energy intake, protein intake and body image with the incidence of chronic energy deficiency in adolescent girls, and study design refers to the type of research to be used, namely cohort, case control, and cross sectional.

The types of articles selected were articles relevant to the research theme using several electronic databases, namely Google Scholar, PubMed/Medline, and Scopus. The inclusion criteria used to select research articles are articles within the last 5 years (2019-2024), research results that show the relationship, influence or risk factors of chronic energy

deficiency and research samples in adolescent girls. The exclusion criteria used are research articles whose research methods are literature review, systematic review, paid article reports, books, irrelevant research samples (pregnant women and adolescent boys), research results there is no relationship, influence or risk factors of chronic energy deficiency on adolescent girls. Article selection process used in the scoping review using flowchart Figure 1.

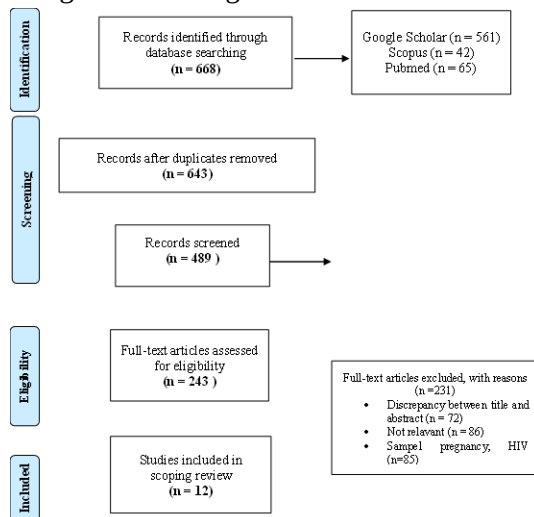


Figure 1. PRISMA Flowchart

RESULTS AND DISCUSSION

Table 1 shows 7 articles on energy intake and protein intake with chronic energy deficiency. Table 2 shows 5 articles about body image with chronic energy deficiency.

Energy Intake and Protein Intake with the Incidence of Chronic Energy Deficiency

Table 1 consists of articles that show the relationship between energy and protein intake and the incidence of chronic energy deficiency. The results of research conducted by (Swari et al., 2023) that adolescent girls who experience chronic energy deficiency are caused by a lack of frequency of eating, namely only 1-2x a day as seen from the results of SQ-FFQ. Apart from frequency, it is also caused by food portions and variations that are not meet the daily needs in a day

according to the AKG that has been determined according to age. This results in a person experiencing an energy deficit and experiencing chronic energy deficiency.

This research is supported by research (Widhiyanti et al., 2020) that the cause of energy deficits in adolescent girls who only consume 1-2x meals a day due to the busy activities at school or in dormitories as students. This resulted in female students choosing to rest and skip meals. In addition, to replace meals they only eat simple snacks and do not pay attention to the amount. In addition, adolescents often replace it with high consumption of fast food, high consumption of processed sugar, skipping breakfast and low consumption of vegetables and fruits (Nuryani, 2019).

Energy intake in a day is very important to fulfill because it is used for the body's metabolic processes, growth and development. Adolescence requires sufficient energy because during this period they experience growth spurt, which means they experience rapid growth and development. Many adolescents do not pay attention to the amount of intake in a day so that their energy are deficit. If the energy intake needs are inadequate, the fat reserves in the body will be broken down and used to meet the energy deficiency. If it continues for a long time, the reserves will be depleted and experience nutritional problems, one of which is chronic energy deficiency (CED) (N. A. Putri et al., 2023).

Research conducted by (N. A. Putri et al., 2023) is in line with research (Telisa & Eliza, 2020) that energy reserves can be stored in the form of fat reserves under the skin. In addition, the results showed that someone experiencing less energy intake was 4.9 times more likely to experience chronic energy deficiency (CED) than someone who did not experience less energy intake. The results of research (Suarjana et al., 2020) also found that high school / vocational high school adolescents who experience less energy intake will be 2 times more likely than high school / vocational high school adolescents whose energy intake is sufficient.

Table 1. Energy Intake and Protein Intake with the Incidence of Chronic Energy Deficiency

Title and Author	Methods	Results
Correlation Level of Energy Consumption Level of Protein and Body Image Prevalency CED in Shafta High School Surabaya (Swari et al., 2023)	Design: cross sectional observational Subjects: 51 female students in class X and XI aged 13-18. Data collection: SQ-FFQ questionnaire, BSQ-34 questionnaire and MUAC measurement. Data analysis: Spearman test	The results showed that female students who experienced energy deficits were (52.9%) and protein deficits were 41.2%. Based on bivariate analysis, it was found that there was a significant relationship between energy intake and protein intake with the incidence of chronic energy deficiency at Shafta High School in Surabaya with a p value of (0.001) and (0.001).
Path Analysis on the Fad Diets and other Factors Affecting the Risk of Chronic Energy Deficiency among Adolescent Females at the Boarding School (Widhiyanti et al., 2020)	Design: Observational, cross-sectional Subjects: 200 adolescent girls Data collection: MUAC tape, digital weight scale, microtoise, and questionnaire Data analysis: cross tabulation and path analysis	Based on bivariate analysis, relevant results were obtained that there was a relationship between energy intake ($p = <0.001$) and protein intake ($p = 0.021$) with CED. while the results of path analysis obtained the results of energy intake (0.005) and protein intake (0.020).
The Relationship Between Macronutrient And Micronutrient Intake On CED In Adolescent Girls In Man 1 Aceh Barat (Aulia et al., 2024)	Design: Cross sectional Subjects: 261 female students Data collection: LILA Tape, and SQ-FFQ questionnaire. Data analysis: Chi Square Test and Logistic Regression.	The results of bivariate analysis of protein intake with the results of $p=0.000$ which means that there is a significant relationship between protein intake and the incidence of chronic energy deficiency in female students. While the multivariate results obtained $p=0.008$ and OR value 6.486
Analysis of Determinants of Chronic Energy Deficiency (CED) among Adolescents in Pekon Pasir Ukir Pagelaran District, Pringsewu Regency (N. A. Putri et al., 2023)	Design: Cross sectional Subjects: 30 adolescents aged 13-18 years Data collection: LILA measurement, 1x24 hour food recall questionnaire Data analysis: Frequency analysis	Based on the research, the results showed that out of 30 adolescents there are 10 children (33%) experiencing CED, the level of nutritional knowledge is not good (46%), the average energy intake (1,387 kcal) and protein (49 g), and the level of energy adequacy (70%) and protein (63%). So it can be concluded that the determinants of SEZ are energy intake, protein and level of nutritional knowledge.
Macronutrient Intake, Iron Intake, Haemoglobin Level and Risk of Chronic Energy Deficiency in Adolescent Girls (Telisa & Eliza, 2020)	Design: Case control Subjects: 72 female students Data collection: using the Semi Quantitative Food Frequency Questionnaire (SQ-FFQ), Haemoglobin using the quick check method, and measurement (MUAC). Data analysis: chi-square test	The results showed that there was a significant relationship between energy intake ($p = 0.004$), fat ($p = 0.031$), protein ($p = 0.004$) and iron $p = 0.000$ with the incidence of chronic energy deficiency (CHD) in high school students.
Chronic Energy Deficiency (CED) of Adolescent Girls of SMU/SMK Students In Karangasem Regency, Bali Province (Suarjana et al., 2020)	Design: Observational, cross sectional Subjects: 298 female students Data collection: using questionnaire and MUAC measurement Data analysis: chi square Mantel Haentzel	The results of the research conducted obtained 8 of the 15 variables studied, namely there is a significant relationship in energy consumption ($p = 0.008$, OR = 2.1), protein consumption ($p = 0.000$, OR = 2.5), nutritional perceptions ($p = 0.007$ OR = 1.9), physical activity ($p = 0.018$, OR = 1.8) and body image perceptions ($p = 0.014$, OR = 1.86) with the incidence of chronic energy deficiency in female students.
Analysis of Factors Associated with The Incidence of Chronic Energy Deficiency in Adolescent Girls (Munawara et al., 2023)	Design: quantitative cross sectional Subjects: 118 female students of class X and XI Data collection: MUAC measurement, knowledge questionnaire interview, physical activity (GPAQ), 24-hour recall form and food frequency. Data analysis: chi-square test	There is a significant relationship between energy intake ($p=0.028$), carbohydrate intake ($p=0.032$), fat intake ($p=0.018$) and there is no relationship between protein intake ($p=0.272$), physical activity ($p=0.411$), and socioeconomics (0.429) with the incidence of chronic energy deficiency in female students of SMK Negeri 1 Pinrang.

Another factor that causes chronic energy deficiency is lack of protein intake. Based on research (Widhiyanti et al., 2020) it was found that there was a significant relationship between lack of protein intake and the incidence of chronic energy deficiency (CHD). The study explained that the smaller the protein intake, the greater the chance of experiencing KEK and vice versa. The intake of protein consumed depends on the diet. If someone in a day often consumes animal

protein rather than vegetable protein, the protein needs will be fulfilled because animal protein has better bioavailability than plant source protein.

Research conducted (Aulia et al., 2024) is in line with the theory that lack of protein intake can cause chronic energy deficiency with the results of $p = 0.000$. Someone with less protein intake has a 4.7 times greater chance of experiencing KEK than someone with sufficient protein intake. Adolescents

who consume more protein than needed will have a protective effect having a 0.4 times lower risk of suffering from chronic energy deficiency (CED) than those whose intake is less (Suarjana et al., 2020).

Protein is a macronutrient that is useful as a source of energy and body building substances, especially muscles. If protein intake is sufficient, muscle mass will be formed and nutritional status will be good including LILA size. Conversely, if the intake is insufficient, muscle depletion will occur

and cause the upper arm circumference to shrink and experience chronic energy deficiency (CED (Telisa & Eliza, 2020).

Body Image with Chronic Energy Deficiency

Table 2 contains several research articles on body image and chronic energy deficiency. Body image is divided into two, namely positive body image and negative body image.

Tabel 2. Body Image with Chronic Energy Deficiency

Title and Author	Methods	Results
Reflections of well-being: navigating body image, chronic energy deficiency, and nutritional intake among urban and rural adolescents (Yulia et al., 2024)	Design: cross sectional observational Subjects: 387 adolescents aged 13-15 years Data collection : FRS (Figure Rating Scale) questionnaire, 2x24 hour recall questionnaire and LILA measurement. Data analysis: chi square	The results showed that 54% of adolescents in urban areas and 61.7% were at risk of developing chronic energy deficiency and there was a significant relationship between body image and the incidence of chronic energy deficiency with a value of $p=0.007$.
Relationship between Nutrition Knowledge Level and Body Image with Chronic Energy Deficiency of Adolescent Girls at SMAN 2 Pringsewu (B. P. Sari et al., 2024)	Design: Cross sectional Subjects: 153 adolescent girls aged 15-19 years Data collection: questionnaire and MUAC measurement Data analysis: chi-square	The results showed that there was a significant relationship between body image and the incidence of chronic energy deficiency in adolescent girls at SMAN 2 Pringsewu ($p=0.008$).
The Role of Body Image, Socioeconomic Factors, Food Consumption Quality and Its Relationship with the Incidence of Kek in Women of Fertile Age in Menes District, Pandeglang Regency (Fauziah & Ashari, 2024)	Design: Cross sectional Subjects: 261 female students Data collection: MUAC Tape, and SQ-FFQ questionnaire. Data analysis: Chi Square Test and Logistic Regression.	The results of bivariate analysis of protein intake with the results of $p=0.000$ which means that there is a significant relationship between protein intake and the incidence of chronic energy deficiency in female students. While the multivariate results obtained $p=0.008$ and OR value 6.486
The Relationship between Body Image and Nutritional Status in Students of SMKN Sukasari (N. Sari et al., 2023)	Design: Cross sectional Subjects: 105 class X,XI and XII Data collection: MUAC measurement and questionnaire Data analysis: Pearson Chi Square	The results showed that there was a significant relationship between body image variables and chronic energy deficiency (CED) nutritional status with a p value = 0.001.
The Correlation Between Body Image and Diet with Chronic Energy Deficiency (CED) on Female Adolescents in SMAN in West Java (Wardhani et al., 2020)	Design: Cross sectional Subjects: 189 Data collection: MUAC measurement and questionnaire Data analysis: Chi Square	The results of the study was a relationship between body image (appearance evaluation $p = 0.000$, appearance orientation $p = 0.006$, body satisfaction $p = 0.015$, overweight preoccupation $p = 0.003$, self-classified weight $p = 0.000$) and eating patterns (eating frequency $p = 0.000$ and type of diet $p = 0.000$) with chronic energy deficiency (KEK)

Research conducted by (B. P. Sari et al., 2024) found that most respondents had a negative body image. At the age of adolescence where it has begun to pay attention to its body shape. The impact of someone having a negative body image can result in limiting food intake because to maintain their body shape. Many ways will be done to have an ideal body shape or

following their idols, including dieting, limiting intake or even skipping breakfast so that the body shape is maintained. If this happens on a daily basis, it will result in adolescents experiencing chronic energy deficiency (CED).

This is in line with research (Yulia et al., 2024) that negative body image is one of the causes of adolescents experiencing chronic

energy deficiency (CED). Teenagers who are in villages and cities mostly have a negative body image of their body shape. In addition, negative body image can also arise because someone has an idol or culture circulating in Indonesia.

Negative body image is very influential on nutritional status because someone cannot accept the shape of the body that is owned. so that it will make efforts so that the body shape matches the desired goals considering the ideal weight (Fauziah & Ashari, 2024). If a teenager has an idol or public figure, the teenager will try to follow his habits and behaviour so that it can create a negative body image on themselves.

Negative body image can also arise due to the influence of the environment, namely peers, at the age of adolescence will be more easily influenced by their peers. In addition, adolescents will compare their body shape with the body shape of their friends if they are not satisfied with their body shape, then a negative body image appears.

The research conducted by (N. Sari et al., 2023) also supports the previous results, namely that there is a significant relationship between body image and the incidence of chronic energy deficiency, especially in students of SMKN Sukasari. These results show that many experience a negative body image so that the number who experience chronic energy deficiency is also high. Efforts must be made to reduce having a negative body image, namely building self-confidence, the importance of healthy living and optimistic thinking. This can be done to reduce the number of chronic energy deficiency in adolescents.

CONCLUSION

This study concluded that the factors causing chronic lack of energy in adolescent girls from 12 articles showed that there was a significant relationship between energy intake, protein intake and body image with the incidence of chronic lack of energy, apart

from that it could also be caused by fat intake, nutritional knowledge, physical activity, pocket money and infectious diseases.

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CONFLICT OF INTEREST

There is no conflict of interest in the preparation of this article.

REFERENCES

- Aulia, P. R., Putri, E., Mulyani, I., & Ayunda, H. M. (2024). The Relationship Between Macronutrient and Micronutrient Intake on Ced in Adolescent Girls in Man 1 Aceh Barat. *Medical Research, Nursing, Health and Midwife Participation*.
- Dagne, S., Menber, Y., Wassihun, Y., Dires, G., Abera, A., Adane, S., Linger, M., & Haile, Z. T. (2021). Chronic Energy Deficiency and Its Determinant Factors among Adults Aged 18-59 Years in Ethiopia: A Cross-Sectional Study. *Journal of Nutrition and Metabolism*, 2021. <https://doi.org/10.1155/2021/8850241>
- Fakhriyah, Noor, M. S., Setiawan, M. I., Putri, A. O., Lasari, H. H., Qadrinnisa, R., Ilham, M., Nur, S. Y. L. S., Zaliha, Lestari, D., & Abdurrahman, M. H. (2021). *Textbook on chronic energy deficiency (CED)* (eds.); Vol. 57). CV Mine.
- Falentina, I. A., Rahmawati, E. S., & Fauziah, L. F. (2023). Relationship between Macronutrient Intake and Nutritional Status Based on LILA in Adolescent Girls in High School. *Insologi : Jurnal Sain Dan Teknologi*, 2(6), 1155–1165.

- <https://doi.org/10.55123/insologi.v2i6.2972>
- Fauziah, F. I., & Ashari, C. R. (2024). The Role of Body Image, Socioeconomic Factors, Quality of Food Consumption and its Relationship with the Incidence of CED among Women of Childbearing Age in Menes Sub-district, Pandeglang Regency.. *Jurnal Gizi Dan Pangan Soedirman*, 8(1), 110–130.
<https://doi.org/10.20884/1.jgipas.2024.8.1.11653>
- Fibrila, F., & Ridwan, M. (2022). Anemia and Chronic Energy Deficiency Case Screening and Knowledge of Adolescent Girls. *AMMA: Jurnal Pengabdian ...*, 1(08), 979–985.
<https://journal.mediapublikasi.id/index.php/amma/article/view/859>
- Kemenkes RI. (2014). *Regulation of the Minister of Health of the Republic of Indonesia Number 25 Year 2014*.
- Munawara, M., Umar, F., Anggraeny, R., & Majid, M. (2023). Analysis of Factors Associated with The Incidence of Chronic Energy Deficiency. *Jurnal Gizi Kerja Dan Produktivitas*, 4(2), 98–108.
- Nuryani. (2019). Overview of Knowledge, Attitude, Behavior and Nutritional Status of Adolescents in the Regency. *Jurnal Dunia Gizi*, 2(2), 63–70.
- Putri, F. M., Idrus, J., Sitoayu, L., Melani, V., & Palupu, K. C. (2022). T Level of Education, Incidence of Diarrhea and Risk of Chronic Energy Deficiency in Women of Childbearing Age in Island Provinces of Indonesia (Analisis Data RISKESDAS 2018). *Journal Of Nutrition College*, 11(2), 98–104.
<https://doi.org/10.1177/23742895211037027>
- Putri, N. A., Miranda, D., Abdullah, & Dewi, A. P. (2023). A nalysis of Determinants of Chronic Energy Deficiency (CED) among Adolescents in Pekon Pasir Ukir, Pagelaran Sub-district, Pringsewu Regency. *Jurnal Gizi Aisyah*, 6(1), 8.
- Retni, & Arfianti, M. (2023). Food Consumption Diversity and Nutritional Status of Adolescent Girls. *Jurnal Ilmu Kesehatan Dan Gizi(JIG)*, 1(3), 108–121.
- RISKESDAS. (2018). *National RISKESDAS Report 2018*.
- Sari, B. P., Khairani, M. D., Abdullah, & Muharramah, A. (2024). Relationship between Nutrition Knowledge Level and Body Image with Chronic Energy Deficiency of Adolescent Girls at SMAN 2 Pringsewu. *Jurnal Of Social Science Research*, 4, 6700–6708.
- Sari, N., Kelana, D., & Sopiah, P. (2023). Relationship between body image and nutritional status. *Jurnal Kesehatan Tambusai*, 4(2), 954–959.
- Suarjana, I. made, Nursanyoto, H., & Dewi, N. N. A. (2020). Kurang Energi Kronik (KEK) Remaja Putri Pelajar SMU/SMK di Kabupaten Karangasem Propinsi Bali. *Jurnal Sehat Mandiri*, 15(1), 41–51.
<https://doi.org/10.33761/jsm.v15i1.106>
- Swari, A. P., Nur Hatijah, Pengge, N. M., & Buanasita, A. (2023). Correlation Level of Energy Consumption Level of Protein and Body Image Prevalency CED in Shafta High School Surabaya. *Journal of Nutrition Explorations*, 1(3), 127–137.
<https://doi.org/10.36568/jone.v1i3.252>
- Telisa, I., & Eliza. (2020). Intake of macro nutrition , iron intake , haemoglobin levels and chronic energy deficiency risk in female adolescents . *Jurnal AcTion : Aceh Nutrition Journal*, 5(1), 80–86.
- Wahyuni, N. S., & Auriella, A. (2021). The Relationship of Body Image with Self Esteem in Kpop Fan Teenage Girls in A.R.M.Y Community Medan. *Journal of Education, Humaniora and Social Sciences (JEHSS)*, 3(3), 1365–1371.
<https://doi.org/10.34007/jehss.v3i3.566>
- WHO. (2018). *Data and Statistics*. WHO.
<https://www.who.int/hiv/data/en/>

- Widhiyanti, F., Dewi, Y. L. R., & Qadrijati, I. (2020). Path Analysis on the Fad Diets and other Factors Affecting the Risk of Chronic Energy Deficiency among Adolescent Females at the Boarding School. *Journal of Maternal and Child Health*, 5(3), 251–264. <https://doi.org/10.26911/thejmch.2020.05.03.04>
- Yulia, C., Rosdiana, D. S., Muktiarni, M., & Sari, D. R. (2024). Reflections of well-being: navigating body image, chronic energy deficiency, and nutritional intake among urban and rural adolescents. *Frontiers in Nutrition*, 11(May), 1–7. <https://doi.org/10.3389/fnut.2024.1346929>
- Yulianasari, P., Nugraheni, S. A., & Kartini, A. (2019). The Effect of Nutrition Education with Booklet Media on Changes in Adolescent Behavior Related to the Prevention of Chronic Energy Deficiency (Study on Adolescent Girls of Senior High School Class Xi in Senior High School 14 and Senior High School 15 Semarang City.). *Jurnal Kesehatan Masyarakat (e-Journal)*, 7(4), 420–428.
- Yuningsih, D. Ek. (2023). *Nutrition Problems in Adolescents*. Kemenkes : Direktorat Jenderal Pelayanan Kesehatan.
- Zaki, I., & Sari, H. P. (2019). Social media-based nutrition education improves knowledge and energy-protein intake of adolescent girls with chronic energy deficiency (CED). *Gizi Indonesia*, 42(2), 111. <https://doi.org/10.36457/gizindo.v42i2.469>

APPLICATION BASED ON NURSING CARE: CASE STUDY

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ABSTRACT

Background: Bleeding is a common complication in post-Percutaneous Coronary Intervention (PCI) patients from the femoral route due to the use of strong anticoagulant and antiplatelet therapy. To prevent post-PCI bleeding in the ICCU, mechanical pressure was applied using a 1.5 kg sand pillow for 6 hours. This study aims to describe the application of mechanical pressure using a 2.3 kg sand pillow for 2 hours in post-PCI patients.

Method: This study is a summary of case presentations and interventions in two post-PCI patients through a nursing care approach.

Results: After 1 day of implementing the intervention in both patients, there were no incidents of bleeding and hematoma incidents in patients who used 2.3 kg sand pillow pressure for 2 hours. However, there was a difference in the level of comfort, the legs did not feel numb and sore, while patients using 1.5 kg sand pillow pressure for 6 hours, the legs felt numb, sore and painful in the groin.

Conclusion: It was concluded that the application of 2.3 kg sand pillow pressure for 2 hours in post PCI patients can prevent complications and increase patient comfort.

Keywords: CHD, PCI, therapy

INTRODUCTION

The American Heart Association identifies that there are 17.3 million deaths each year caused by heart disease and this death rate is expected to continue to increase until 2030 (Lara, 2022). In the United States, cardiovascular disease is the leading cause of death, namely 836,456 deaths and 43.8% of which are caused by coronary heart disease (Lara, 2022).

Percutaneous Coronary intervention (PCI) is a non-surgical intervention or procedure to open or widen narrowed coronary arteries so that blood flow can return to the heart muscle and is usually performed through the radial, brachial and femoral arteries (Reviansyah et al., 2022).

Bleeding is one of the complications associated with percutaneous coronary intervention from the femoral route due to the use of strong anticoagulation and antiplatelet

therapy including adenosine diphosphate receptor inhibitors and glycoprotein IIB/IIIA inhibitors. Complications include hematoma, retroperitoneal bleeding, pseudoaneurysm, arteriovenous fistula, arterial occlusion, femoral neuropathy and infection. The vascular incidence during diagnostic coronary angiography is 0.44-1.8% and can affect up to 4% of percutaneous coronary intervention (PCI) procedures.

To prevent bleeding and hematoma in PCI access, sand pillow pressure is performed after the sheath is removed. The standard operating procedure (SOP) for post-cardiac catheterization patients at Dr. Kariadi General Hospital, Semarang is that after the femoral sheath is removed, manual pressure is applied for approximately 15 minutes followed by mechanical pressure with a 1.5 kg-2.5 kg sand pillow for 6 hours and the patient is asked to immobilize by not bending the right leg. Although various studies on the use of sand pillows have shown an ineffective results for

post-cardiac catheterization wound pressure, Dr. Kariadi General Hospital, Semarang still uses it because there is no substitute. The weaknesses of sand pillows from the observation results include, the amount of pressure caused by the sand pillow is not measurable, not constant and the position of the sand pillow cannot be stable (Rifqi & Pillow, 2013).

It was found in the ICCU room of Raden Mattaher Hospital, the pressure of the sand pillow used was a sand pillow weighing 1.5 kg with a time of 6 hours so that patients complained of discomfort such as numb legs and sore thighs. Yilmaz et al. (2007) in their study, that using a 4.5 kg sand pillow for 30 minutes and 2.3 kg for 2 hours and concluded that there was no significant difference in the incidence of bleeding and hematoma between the two groups, but there was a significant difference in the level of comfort experienced by patients between the two groups.

Exploring how "Implementation of 2.3 kg Sand Pillow Pressure for 2 Hours in Post PCI Patients in the ICCU Room Based on Nursing Care in 2024.

METHOD

This study is a case study with a nursing care approach. The cases are two post-PCI patients in the ICCU of a hospital in January 2024. The inclusion criteria are CHD patients after cardiac catheterization, male gender, aged <70 years, femoral PCI access, normal blood clotting factors (DDimer, PT/APTT, CT/BT), and no psychosis. While the exclusion criteria are patients with abnormal blood clotting factors D-Dimer, PT/APTT, CT/BT, patients with complications with CHF niha 4, patients with psychosis. When post-PCI patients are treated in the ICCU, researchers select patients who meet the inclusion and exclusion criteria of the study. In addition, Title of the article. researchers inform patients about the study. When the patient agrees, researchers explain

the procedure and begin the research intervention.

RESULTS AND DISCUSSION

Case history before intervention The two patients, aged 51 and 69 years, underwent bleeding prevention intervention and cardiac care intervention. Each patient involved in this study gave written voluntary consent and agreed to publication. The purpose of nursing intervention with nursing problems in this case is referred to the Indonesian nursing output standards. It is expected that there will be no bleeding with the outcome criteria, namely normal hemoglobin, normal hematocrit.

Interventions carried out to prevent bleeding Interventions were carried out by identifying patients based on the research inclusion and exclusion criteria. After obtaining the patient's consent, continue by explaining to the patient about the action plan to be carried out, asking about the patient's complaints, observing the patient's hemodynamics (BP, RR, Pulse, Oxygen Saturation, ECG image), opening the gauze covering the puncture area and carefully removing the sheath, applying pressure to the area 1-2 cm above the puncture for 15 minutes, If there is no active bleeding in the puncture area, cover the wound with gauze and hypafik, bandage the femoral area using an elastic bandage, place a 2.3 kg sand pillow on the bandaged puncture area for 2 hours and the patient is immobilized while the sand pillow is attached, observe bleeding on the bandage for the first 15 minutes, observe bleeding on the bandage for the second 15 minutes, observe bleeding on the bandage for the third 15 minutes, observe bleeding on the bandage for the fourth 15 minutes, observe bleeding on the bandage for the first 30 minutes, observe bleeding on the bandage for the 30 minutes Second, remove the sand cushion from the puncture area.

Patient condition after intervention An overview of the patient's condition. Evaluation An evaluation was conducted on patient 1, no internal or external bleeding was found, no hematoma in the cardiac catheterization access, hemoglobin level 13.5 g/dl. An evaluation was conducted on patient 2, no internal or external bleeding was found, no hematoma in the cardiac catheterization access, hemoglobin level 11.6 g/dl.

The respondents in this study were male, the age of respondents who underwent cardiac catheterization was 51 years and 69 years for the intervention group, this age is lower compared to the study conducted by Janno Sinaga, et al. which concluded that the majority of CAD/MI patients were male and the average age of patients who underwent coronary angiography and PCI/PTCA was in the age range of 55-70 years.

Kern, (2023) said that myocardial infarction more often attacks older adults because older adults have greater risk factors such as a history of smoking, high total and LDL cholesterol levels, hypertension, DM, and age factors themselves. Another study by Wagner (2027), as many as 58% of respondents were male, while Wijpkema, et al. (2025), 57.4% of respondents were male. Thus it can be concluded that men are more often subjected to coronary angiography and PCI/PTCA. Based on the pathophysiology and risk factors for CAD, Prince and Wilson (2026); Woods, et al. (2025), which states that men have risk factors for suffering from CAD related to patterns / lifestyles such as smoking and diet habits, as well as irregular activity / rest.

The use of catheter diameter in this study was 6 Fr. This is in accordance with Kern's research (2023) the use of large or small catheter diameter sizes in cardiac catheterization procedures depends on the type or purpose of the procedure performed, the diameter of the blood vessels. If coronary angiography procedures generally use catheters of 6 Fr or smaller.

This study found that there were no bleeding incidents and no hematoma incidents, this shows that there were no incidents of blood vessel complications between clients who used a 2.3 kg sand pillow for 2 hours and a 1.5 kg sand pillow for 6 hours. But the results of the study showed that there was a significant difference in the level of comfort. Patients who used a 1.5 kg sand pillow for 6 hours experienced discomfort such as numb legs, soreness, and pain in the groin, unlike the pressure of a 2.3 kg sand pillow for 2 hours, patients felt more comfortable such as their legs did not feel numb and sore because the time required for mobilization was shorter, only 2 hours. This study is in line with research conducted by Sinaga, et al. with the results of using a 2.3 kg sand pillow for 2 hours did not increase the incidence of blood vessel complications, but increased patient comfort, and allowed clients to mobilize earlier.

CONCLUSION

Can prevent complications such as bleeding and hematoma and increase patient comfort. It is expected that hospital institutions can improve the quality of nursing care services, especially in coronary heart disease patients undergoing cardiac catheterization in terms of nursing care.

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CONFLICT OF INTEREST

The researcher declares that he has no affiliation or involvement in an organization or entity with any financial interest (such as honoraria, educational grants, participation in speakers, membership, employment, consultancies, or other equity interests and expert testimony or patent-licensing arrangements), or non-financial interests such as personal or professional relationships, affiliations, knowledge of beliefs in the subject matter or materials discussed in this manuscript.

REFERENCES

- Atang Setiawan. (2012). Konsep Percutaneous Coronary Intervention. Universitas Muhamadiyah Jakarta, 32.
- Barua, R. S., & Ambrose, J. A. (2013). Mechanisms of coronary thrombosis in cigarette smoke exposure. *Arteriosclerosis, Thrombosis, and Vascular Biology*, 33(7), 1460–1467. <https://doi.org/10.1161/ATVBAHA.112.300154>
- Cheng, G., Chang, F. J., Wang, Y., You, P. H., Chen, H. C., Han, W. Q., Wang, J. W., Zhong, N. E., & Min, Z. Q. (2019). Factors influencing stent restenosis after percutaneous coronary intervention in patients with coronary heart disease: A clinical trial based on 1-year follow-up. *Medical Science. Monitor*, 25, 240–247. <https://doi.org/10.12659/MSM.908692>
- Christian Lallo, Ir. R. J. Poluan, Msi, Dr. Judy O. Waani, ST., M. (2009). Penyakit Jantung Koroner. Universitas Muhamadiyah Ponorogo, 2(5), 255. ???
- Fahmi, I., Nurachmah, E., Yona, S., & Herawati, T. (2022). Physical Activity and Associated Factors in Indonesian Patients with Acute Myocardial Infarction. *Evidence Based Care Journal*, 12(4), 27–35. <https://doi.org/10.22038/EBCJ.2022.6149.2734>
- Garcia-Garcia, D. (2022). Health Promotion and Hydration: A Systematic Review About Hydration Care. *Florence Nightingale Journal of Nursing*, 30(3), 310–321. <https://doi.org/10.5152/FNJN.2022.21313>
- Holroyd, E. W., Mustafa, A. H. S., Khoo, C. W., Butler, R., Fraser, D. G., Nolan, J., & Mamas, M. A. (2015). Major bleeding and adverse outcome following percutaneous coronary intervention. *Interventional Cardiology: Reviews, Research, Resources*, 10(1), 22–25. <https://doi.org/10.15420/icr.2015.10.1.22>
- Kimura, K., Kimura, T., Ishihara, M., Nakagawa, Y., Nakao, K., Miyauchi, K., Sakamoto, T., Tsujita, K., Hagiwara, N., Miyazaki, S., Ako, J., Arai, H., Ishii, H., Origuchi, H., Shimizu, W., Takemura, H., Tahara, Y., Morino, Y., Iino, K., Yamazaki, T. (2019). JCS 2018 guideline on diagnosis and treatment of acute coronary syndrome. *Circulation Journal*, 83(5), 1085–1196. <https://doi.org/10.1253/circj.CJ-19-0133>
- Lara. (2022). ASUHAN KEPERAWATAN PERAWATAN JANTUNG PADA PASIEN ACUTE CORONARY SYNDROME (ACS) DENGAN GANGGUAN PENURUNAN CURAH JANTUNG DI RUANG ICCU RSUD Dr. M. YUNUS BENGKULU TAHUN 2022. KARYA ILMIAH AKHIR NER, 8.5.2017, 2003–2005. www.agingus.com
- Maulani, W. (2020). Asuhan Gizi Pada Pasien CAD Disertai CHF, dan Bronkopneumonia. *Poltekkes Kemenkes Riau*, 53(9), 1689–1699. [http://repository.pkr.ac.id/817/7/BAB II TINJAUAN PUSTAKA.pdf](http://repository.pkr.ac.id/817/7/BAB%20II%20TINJAUAN%20PUSTAKA.pdf) percutaneouscoronary-intervention-pci. (n.d.).

- Plutzer, M. B. B. and E. (2021). "ASUHAN KEPERAWATAN PADA TN.A POST PERCUTANEOUS CORONARY INTERVENTION (PCI) DENGAN DIAGNOSA MEDIS ANGINA PECTORIS STABIL CCS II DAN CORONARY ARTERY DISEASE (CAD) 3VD". 6.
- Redfors, B., G  n  reux, P., Witzenbichler, B., Kirtane, A. J., McAndrew, T., Weisz, G., Stuckey, T. D., Henry, T. D., Maehara, A., Mehran, R., & Stone, G. W. (2018). Bleeding severity after percutaneous coronary intervention. *Circulation: Cardiovascular Interventions*, 11(3), 1–10. <https://doi.org/10.1161/CIRCINTERVENTIO> NS.117.005542
- Reviansyah, M., Rosyid, F. N., & Sugimin. (2022). Hemodinamik Pada Pasien Post PCI (Percutaneous Coronary Intervention) Di Ruang ICCU. *Prosiding Seminar Nasional*. 1, 63–70. <https://proceedings.ums.ac.id/index.php/semnaskep/article/view/923%0Ahttps://proceedings.ums.ac.id/index.php/semnaskep/article/download/923/900>
- Rifqi, S., & Pillow, S. (2013). Perbandingan Efektivitas antara Bantal Pasir dan Arfband sebagai Penekanan Luka Paska Angiografi Koroner. 2(1), 50–53.
- Riskesdas Kementerian Kesehatan RI. (2018). Laporan Riskesdas 2018 Nasional.pdf. In Lembaga Penerbit Balitbangkes.
- Sawada, H., Ando, H., Takashima, H., Waseda, K., Shimoda, M., Ohashi, H., Suzuki, A., Sakurai, S., Nakano, Y., & Amano, T. (2020). Epidemiological features and clinical presentations of acute coronary syndrome in young patients. *Internal Medicine*, 59(9), 1125–1131. <https://doi.org/10.2169/internalmedicine.4138-19>.
- Seyedhosseini-Davarani, S., Asle-Soleimani, H., Hossein-Nejed, H., & Jafarbaghdadi, R. (2017). Do Patients with Chest Pain Benefit from Installing Triage System in Emergency Department? *Advanced Journal of Emergency Medicine*, 2(1), 0–0. <https://doi.org/10.22114/ajem.v0i0.33>
- Sinaga, J., & Ui, F. (2009). Manuscrip a Comparasson Effectivness Sandbag Compression Beetwen Two, Four and Six Hours To Reduced Complications in Patients Having Cardiac Catheterization; a Randomized Controlled Trial. *Postgraduate Program Medical Surgical Nursing Faculty of Nursing University of Indonesia Depok* 2009.
- Tuslamia, F. I. (2022). Analisis Asuhan Keperawatan pada Pasien Coronary Artery Disease (CAD) Post Coronary Artery Bypass Graft (CABG) dengan Ansietas menggunakan Intervensi Green Color Breathing Therapy. 150. <http://repositori.uinalauddin.ac.id/21407/1/FATIHAMIZZA> TUSLAMIA 70900121005.pdf
- Valle, J. A., Shetterly, S., Maddox, T. M., Ho, P. M., Bradley, S. M., Sandhu, A., Magid, D., & Tsai, T. T. (2016). Postdischarge bleeding after percutaneous coronary intervention and subsequent mortality and myocardial infarction: Insights from the HMO research network-stent registry. *Circulation: Cardiovascular Interventions*, 9(6), 1–9. <https://doi.org/10.1161/CIRCINTERVENTIO> NS.115.003519
- Viera Valencia, L. F., & Garcia Giraldo, D. (2019). Coronary Artery Disease (CAD). *Angewandte Chemie International Edition*, 6(11), 951–952., 2, 7–52.
- Widianingsih, H., & Sahrudi, S. (2022). Efektivitas Tindakan Primary Percutaneous Coronary Intervention Pada Pasien Stemi Onset Kurang Dari 6 Jam. *Malahayati Nursing Journal*, 4(3), 733–745. <https://doi.org/10.33024/mnj.v4i3.6086>
- Xu, R. Y., Zhu, X. F., Yang, Y., & Ye, P. (2013). High-sensitive cardiac troponin T. *Journal of Geriatric Cardiology*, 10(1), 102–109.

<https://doi.org/10.3969/j.issn.1671-5411.2013.01.015>

Zurriyani, R. (2021). Faktor Risiko Kejadian Penyakit Jantung Koroner Di Poliklinik Rsud Sekarwangi Sukabumi Periode Tahun 2021. Jurnal Sains Riset |, 11(November), 777.
<http://journal.unigha.ac.id/index.php/JSR>. <https://bjcardio.co.uk/2016/11/risk-factors-forfemoral-arterial-complications-andmanagement/>

EDUCATION USING BOOKLET MEDIA IN INCREASING KNOWLEDGE OF ADOLESCENTS ABOUT ANEMIA AT THE GARUDA PUTIH JAMBI HEALTH SCIENCES COLLEGE

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ABSTRACT

Background: Anemia in teenagers is a condition where the number of red blood cells or hemoglobin levels in a teenager's body is lower than normal limits, adolescents it can be said to be anemia if Hb < 12 gr/dl. Anemia is a health problem that has symptoms of tiredness, tiredness and lethargy so it will have an impact on creativity and productivity. . In Southeast Asia, the highest prevalence of anemia was found in school-aged children, around 60%. The aim of this research is to increase the knowledge of young women about anemia.

Method: The method used was pre-experimental with one group pre and post-test. The sampling technique used simple random sampling with a total of 36 people. Statistical tests with univariate and bivariate analysis using the t-test.

Results: The results of this research prove that there has been an increase in knowledge. The results of the analysis showed that the results of the t test with p value = 0.000 < 0.05

Conclusion: that there was an influence of implementing education using booklet media in increasing young women's knowledge about anemia

Keywords: adolescents, anemia, booklet

INTRODUCTION

Adolescence is a developmental stage between childhood and adulthood which is characterized by general physical changes as well as cognitive and social development that takes place between the ages of 12-19 years. Adolescent groups generally have better nutritional conditions than toddlers and school children, because this age group is easily reached by various nutritional improvement efforts carried out by the government and private groups. However, there are still various nutritional conditions in adolescents that occur, such as underweight, excess weight or obesity and anemia (Aras et al., 2021).

Anemia is a health problem that has symptoms of tiredness, tiredness and lethargy so it will have an impact on creativity and productivity. Not only that, anemia also

increases disease susceptibility in adulthood and impacts generations with nutritional problems (Ministry of Health of Indonesia, 2021). Globally, anemia is the most common nutritional problem in the world's population of around 2 billion, which has an impact on social and economic development. In Southeast Asia, the highest prevalence of anemia was found in school-aged children, around 60% (Subratha, 2020). The incidence of anemia in Indonesia is still quite high. Based on 2018 Riskesdas data, the prevalence of anemia in teenagers is 32%, meaning that 3-4 out of 10 teenagers suffer from anemia. This is influenced by suboptimal nutritional intake habits and lack of physical activity. (Ministry of Health Indonesia, 2021).

Iron deficiency anemia is an anemia that is often a problem in teenagers because of the high need for iron for growth. Adolescent girls are vulnerable to anemia because they

experience a menstrual cycle. Young women are very concerned about their body shape, so most of them follow an incorrect diet and have many food restrictions (Kalsum & Halim, 2016). Anemia is a micronutrient problem that needs attention because it can cause various complications in groups as well as in newborns and women. Anemia that occurs in teenagers will have an impact on decreased concentration in learning, impaired growth and decreased physical fitness, resulting in abnormal height and weight according to their age (Herwandar & Soviyati, 2020).

Adolescents' knowledge influences their behavior in consuming Fe tablets. A person's knowledge is influenced by the environment, intelligence, emotions and a person's perspective. However, it could also be due to low awareness so that the ability of young women to acquire knowledge about anemia in adolescents is low (Lestari et al., 2016). According to Nikmah (2021), providing nutrition education using E-Booklet media has an effect on the knowledge and attitudes of young women about anemia at SMPN 1 Gemuh, Kendal Regency.

The results of the study show that nutrition education using booklet media can increase knowledge and attitudes about anemia in young women. According to the research results of Nurul (2006), there was a difference in knowledge before and after providing counseling via booklet media regarding knowledge about overweight 35 in teenagers.

Based on the background above, researchers are interested in conducting research on the application of education using booklet media in increasing the knowledge of young women about anemia at the Garuda Putih Jambi College of Health Sciences in 2024.

METHOD

This research is pre-experimental research with a one group pre and post-test design. The aim of this research is to determine the application of education using booklet media in increasing the knowledge of young women about anemia at the Garuda Putih Jambi College of Health Sciences in 2024. The population in this study were all female students of the Garuda Putih Jambi College of Health Sciences. The sampling technique uses Simple Random Sampling. The sample in this study was the result of simple random sampling of all female students who would be used as respondents. This research was carried out on June 19-20 2024. Data collection was carried out by filling out questionnaires using questionnaires for young women. Data analysis used univariate and bivariate analysis with the t test.

RESULTS AND DISCUSSION

Overview of adolescent knowledge before and after interventions using booklet

Table 1. Descriptive knowledge

Knowledge before Education	n	%
Good	5	13.9
Enough	14	38.9
Less	17	47.2
Total	36	100,0
Knowledge after education	n	%
Good	24	66.7
Enough	11	30.6
Less	1	2.8
Total	36	100.0

Based on table 1, it is known that the knowledge of adolescent girls about anemia before the implementation of education with booklet media as much as 47.2% is still lacking, as many as 38.9% have sufficient knowledge and as many as 13.9% have good knowledge. After implementation with booklet showed can be seen that the knowledge of adolescent girls about anemia after the implementation of education with booklet media as much as 66.7% is well knowledgeable.

The effect of the implementation of education with booklet media in increasing the knowledge of adolescent girls about anemia

Table 2 shows that the results of the t test with $p \text{ value} = 0.000 < 0.05$ means that there is an influence of implementing education using booklet media in increasing the knowledge of young women about anemia at the Garuda Putih Jambi Health Sciences College in 2024. Based on the results of the analysis it is found that the test results t test with $p \text{ value} = 0.000 < 0.05$ means that there is an influence of implementing education using booklet media in increasing young women's knowledge about anemia at the Garuda Putih Jambi Health Sciences College in 2024.

Table 2. Bivariate analysis

Variabel	N	Mean	Min	Max	SD	P
Knowledge Before Education	36	11,56	3	18	3,573	0,000
Knowledge After Education	36	16,11	1	20	2,447	

These results show that there was an increase in knowledge after education was carried out using booklet media. This is in accordance with research Wijayanti & Mulyadi, (2019) that health education using booklets is effective in increasing understanding of anemia patients. Apart from booklets, health education can also be delivered through videos, routine education, poster placement, and by including health messages during classroom learning. Generally, the health education resources available in schools are very limited. Students receive more health information from their teachers and the internet. Booklet media is an alternative health education substitute for textbooks that can be taken anywhere (Kusuma & Pertiwi, 2019; Nasiatin et al., 2021; Pertiwi & Annissa, 2019).

Choosing the right educational media can also influence student learning motivation. Interesting and effective educational media will make students more interested in learning and actively participating in learning activities. Apart from booklets, other

educational media that can be used are video, audio, posters or educational games (Dewi Haris, 2018). However, choosing the right educational media must be adjusted to the learning objectives and characteristics of students. By selecting appropriate and effective educational media, it is hoped that health education activities can run more effectively and have a positive impact on increasing students' health knowledge and awareness (Wijayanti & Mulyadi, 2019).

In this study, booklets were used as a medium for Health Education. The booklet contains information related to the concept of adolescent anemia (definition, etiology, risk factors, signs, symptoms, impacts), as well as efforts to prevent and treat anemia in adolescent girls. By providing booklets, young women can read repeatedly and understand the content of the material in the booklet so that they can indirectly increase knowledge and understanding related to anemia. The booklet media used in this research was developed by the researchers themselves and has been reviewed by several teams of experts from the nursing and pediatric departments who were appointed to review this booklet. The material presented in this booklet consists of the definition of anemia, the causes of anemia, clinical manifestations, the impact of anemia, efforts to prevent and treat anemia. The information presented in the booklet is also accompanied by attractive images that support the information provided, making it easier for young women to understand the information provided through writing and images.

The increase in the average knowledge score of female students from 11.56 to 16.11 was obtained through increasing the understanding obtained through booklet media so that female students were able to understand the problem of anemia in adolescents and were expected to be able to make efforts to prevent and treat anemia. Apart from knowledge, the incidence of anemia in adolescent girls is also influenced

by other factors, namely family support, family income, nutritional status and menstruation (Harahap, 2018; Rahayu et al., 2022).

For this reason, one way to increase a person's knowledge is by providing education through counseling using booklets. This is supported by research conducted by Nurul (2006) on "the influence of nutrition education with lectures and booklets on increasing the knowledge of overweight adolescents" with the research results of the group that was given education through booklets experiencing an increase in pre-test knowledge scores which at the start of the research had a good category of as much as 3 subjects (21.4%), the sufficient category was 11 subjects (78.6%) increasing to 8 subjects (57.2%) in the good category and 6 subjects (42.9%) in the sufficient category at the post-test. This shows that there is a difference in knowledge before and after providing counseling via booklet media regarding knowledge about overweight 35 in adolescents. This increase occurred in connection with the advantages of the booklet, namely that the material contained in the booklet is more complete, more detailed, clear and educative and the preparation of the booklet material is made in such a way as to attract the attention of teenagers, according to the needs and conditions of teenagers. Apart from that, the booklet can also be taken home, so that the subject can read or study it.

Research was also conducted by Minokta Lendra (2018) regarding "the influence of using booklet media on increasing knowledge about energy adequacy of teenagers at SMA Negeri 1 Pontianak". The results of the research show that students' knowledge has increased, this is proven by looking at the mean value of students' knowledge level at 58.5% or an increase of 22.7% to 81.2%. These results can be concluded that there was an increase in the average knowledge score of class students before and after the intervention using booklet media.

This shows that there is a difference in knowledge before and after providing counseling via booklet media regarding knowledge about energy adequacy by teenagers. It is also supported by Suiroaka's research that there is a significant effect of better nutritional knowledge on respondents who were given nutrition education using media compared to respondents who were not given nutrition education without using media.

This is in accordance with Zulaekah who stated that with the Communication, Information and Education (KIE) Program print media is quite effective in conveying nutrition information and education. In the IEC program, print media is more effective in conveying nutritional information and education, because print media is a static medium, prioritizes visual messages, and generally consists of a number of words, pictures or photos in color, namely in the form of posters, leaflets, brochures, magazines, modules and pocket books. Of the several print media that can be used in IEC programs for children, they include pocket books or booklets and leaflets.

It can be concluded that counseling is a process of planned behavior change in individuals, groups and communities from not knowing about health values to knowing, and from not knowing how to overcome their own health problems to becoming independent. The change in knowledge scores after being given media about anemia to female students was very significant. This change occurred due to factors including: 1). Providing media booklets about anemia, given one by one so that the reception of information is clearer, 2). The counseling intervention uses booklet media about anemia where the media clarifies the ideas or messages conveyed, apart from that it can also recall what was read because this booklet media is not only in the form of pictures but there is writing that explains the images in the media, 3.) Material contained in the booklet media are exactly the same as the

pre-test and post-test questionnaire questions, so that young women can immediately understand and answer the post-test questions correctly, 4.) The information provided is in accordance with the students' needs, so that during the intervention the booklet media is given. Students enthusiastically read the information contained in the booklet media.

CONCLUSION

Based on the results of this research, it was concluded that there was an increase in knowledge. Meant that there was an influence of implementing education using booklet media in increasing young women's knowledge about anemia at the Garuda Putih Jambi Health Sciences College in 2024

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CONFLICT OF INTEREST

There was no conflict of interest in this article.

REFERENCES

- Arikunto, S. 2010. *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta: Rineka Cipta.
- Ashar, T. (2016). Potensi Pendidikan Gizi Dalam Meningkatkan Asupan Gizi Pada Remaja Putri Yang Anemia Di Kota Medan. *Kesehatan Masyarakat*, 11(2)
- Budiman & Riyanto A. 2013. *Kapita Selekta Kuisisioner Pengetahuan Dan Sikap Dalam Penelitian Kesehatan*. Jakarta : Salemba Medika pp 66-69.
- Chaparro C, Oot L, Sethuraman K. 2014. *Overview of the Nutrition Situation in Seven Countries in Southeast Asia*. Washington, DC: FHI 360/FANTA.
- Devinia. 2020. Hubungan pola makan dan status sosial ekonomi dengan kejadian anemia, systematic review.
- Firdaus, Rahmi and Rahmat, Mamat and Asep, Asep Iwan Purnawan and Fred, Agung S (2021) *Pengaruh Edukasi Gizi Menggunakan Media E-Booklet Anemia Terhadap Pengetahuan Anemia dan Perilaku Konsumsi Makanan Sumber Zat Besi Pada Remaja Putri Di SMA Negeri 1 Cisarua Bogor*. Diploma thesis, Politeknik Kesehatan Kemenkes Bandung.
- Herwandar, F. R. and Soviyati, E. (2020) 'Perbandingan Kadar Hemoglobin Pada Remaja Premenarche Dan Postmenarche Di Desa Ragawacana Kecamatan Kramatmulya Kabupaten Kuningan Tahun 2018', *Jurnal Ilmu Kesehatan Bhakti Husada: Health Sciences Journal*, 11(1), pp. 71–82. doi: 10.34305/jikbh.v11i1.154
- Imran, N, Indriasari, R. and Najamuddin, U. (2015) 'Pengetahuan dan Sikap Tentang Anemia dengan Status Hemoglobin Remaja Putri di SMA N 10 Makasa
- Izzani, R. (2018). Hubungan Tingkat Pengetahuan Dengan Perilaku Konsumsi Tablet FE Saat Menstruasi Pada Mahasiswi FKM UNAIR Surabaya. Vol 7, No 1.
- Kalsum, U, dan Halim, R. 2016. Kebiasaan Sarapan Pagi Berhubungan Dengan Kejadian Anemia Pada Remaja Di SMA NEGERI 8 Muaro Jambi. *Jurnal penelitian Universitas Jambi Seri Sains*. 18(1), 09-19
- Kartasapoetra, Marsetyo, Med. Ilmu Gizi. Jakarta: Rineka Cipta; 2010.
- Kementerian Kesehatan Republik Indonesia. 2018. *Riset kesehatan dasar (riskesdas) 2018*. Badan penelitian dan pengembangan kesehatan Kementerian kesehatan Republik Indonesia. Jakarta

- Kemenkes RI. 2016. Program Pencegahan Penanggulangan Anemia pada Remaja. Putri dan WUS. Jakarta: Kementerian Kesehatan Republik Indonesia; 2016.
- Kemenkes RI. 2021. Program Pencegahan dan Penanggulangan Anemia pada Remaja. Putri dan WUS. Jakarta: Kementerian Kesehatan Republik Indonesia.
- Kemenkes RI. 2015. Pedoman Penatalaksanaan Pemberian Tablet Tambah Darah. Jakarta: Kemenkes RI
- Lindung Purbadewi, dkk. 2013. Hubungan Tingkat Pengetahuan tentang Anemia dengan Kejadian Anemia pada Ibu Hamil. Universitas Muhammadiyah Semarang.
- Madanijah .S. (2014). Pola Konsumsi Pangan Dalam Sistem Pangan Dan Gizi. ed. Dwiariani Y, Baliwati., A, Khomsan., CM. Jakarta: Penebar Swadaya.
- Nursalam. 2013. Metodologi Penelitian Ilmu Keperawatan: Pendekatan Praktis : Jakarta : Salemba Medika
- Notoatmodjo, 2010 Pendidikan dan Perilaku Kesehatan. Jakarta : Rineka Cipta.
- Notoatmodjo, S. 2012. Metode Penelitian Kesehatan. Jakarta: PT Rineka Cipta
- Nurul R.D. 2016. Pengaruh Edukasi Gizi dengan Ceramah dan Booklet terhadap Peningkatan Pengetahuan dan Sikap Gizi Remaja Overweight. Artikel Penelitian. Semarang: Universitas Diponegoro
- Nikmah (2021) dengan judul Pengaruh Pemberian Edukasi Gizi Dengan Media E-Booklet Terhadap Pengetahuan Dan Sikap Mengenai Anemia Pada Remaja Putri Di Smp N 1 Gemuh Kabupaten Kendal.
- Parwiyati, S., W. Sumekar dan D. Mardingsih. 2014. Pengaruh Penggunaan Media Booklet Pada Peningkatan Pengetahuan Peternak Kambing Tentang Penyakit Scabies Di KTT Ngupoyo Sato Desa Wonosari Kecamatan Patebon Animal Agriculture Journal 3(4):581-585, Desember 2014 Online at : <http://ejournals1.undip.ac.id/index.php/aaaj>
- Proverawati, 2018. Anemia dan anemia kehamilan. Penerbit Buku Nuha Medika. Yogyakarta
- Prihananto, 2004. Fortifikasi Pangan sebagai Upaya Penanggulangan Anemia Gizi Besi, IPB: Bogor
- Rahayu, dkk (2020). Buku Ajar Dasar-Dasar Gizi. Yogyakarta. Penerbit CV Mine
- Reeder, S.J., Martin, L.L. & Koniak-Griffin, D. (2014). Keperawatan Maternitas: Kesehatan Wanita, Bayi, & Keluarga, Volume 2, Edisi 18. Jakarta: EGC
- Rukiyah A. 2015. Asuhan kebidana III Nifas. 2nd ed. Jakarta: cv. Trans Info. Media;
- Sandra, dkk. (2017). Gizi anak dan remaja. Ed. 1. Cet. 1. Depok : Rajawali Pers
- Saryono. (2017). Metodologi Penelitian Kesehatan. Yogyakarta: Mitra Cendekia Press
- Utami, A. dkk. (2021) Anemia Pada Remaja Putri. Semarang: Fakultas Kedokteran. Universitas Diponegoro
- Wawan dan Dewi, 2010, Teori dan Pengukuran Pengetahuan, Sikap dan Perilaku Manusia, Yogyakarta : Nuha Medika
- World Health Organization, 2019. Global health observatory data repository/world health statistics. Prevalence of anemia among pregnant women. The world bank

DIFFERENCES IN THE EFFECTS OF PURSED LIPS BREATHING AND CHEST PHYSIOTHERAPY ON OXYGEN SATURATION IN TODDLERS SUFFERING FROM PNEUMONIA

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ABSTRACT

Background: Pneumonia is an acute respiratory infection that attacks the lungs or alveoli and often occurs in toddlers, especially infants. Pneumonia is caused by viruses, bacteria, fungi, exposure to chemicals or damage to lung physiology. Pneumonia causes high mortality rates in children under five because it results in disruption of oxygenation status in the form of a decrease in oxygen saturation caused by accumulation of secretions. This condition raises the nursing problem of impaired gas exchange and ineffective airway clearance. Non-pharmacological measures to increase oxygen saturation are pursed lips breathing and chest physiotherapy. The aim of the research was to determine the difference in the effect of pursed lips breathing and chest physiotherapy on oxygen saturation in toddlers with pneumonia in the Purbaratu Tasikmalaya Health Center working area.

Method: This study used a quasi-experimental design with two intervention groups, pretest and posttest without a control group, with a sample size of 22 respondents who were divided into 2 intervention groups with sampling using a purposive sampling technique. Data analysis was univariate and bivariate in the form of paired tests and independent t-tests.

Results: The results of the study showed that there was a difference in the effect of pursed lips breathing and chest physiotherapy on oxygen saturation in toddlers with pneumonia with a p value of 0.002 ($p < 0.05$).

Conclusion: This study shows that pursed lips breathing and chest physiotherapy can increase oxygen saturation in toddlers with pneumonia. The implication of this research could be an intervention that applies the principles of atraumatic care in providing pure lips breathing and chest physiotherapy to overcome the nursing problems of gas exchange disorders and ineffective airway clearance in increasing oxygen saturation values.

Keywords: Toddlers; Chest Physiotherapy; Pneumonia; Pursed Lips Breathing

INTRODUCTION

The toddler years are the most important period of growth and development. Children are particularly vulnerable to infectious diseases such as malaria, AIDS, diarrhea and pneumonia (Akbar et al., 2021). Based on data from World Health Organization (2021), pneumonia accounts for 14% of under-five deaths in the world and resulted in 740,180 under-fives dying in 2019.

According to, UNICEF (2019) Pneumonia in children is the cause of up to 800,000 deaths worldwide. Most deaths due to pneumonia occur in children under 2 years of age and 153,000 deaths occur in children aged 1 month. The prevalence of childhood

pneumonia in 2018 in Indonesia was 4.8% with pneumonia cases in children <1 year old at 3.8% and aged 1-4 years at 5.0%. West Java is ranked 10th with coverage of 31.2%. Child mortality due to pneumonia in babies is twice as high as in children aged 1-4 years (Kementerian Kesehatan RI, 2020). There are 1,367 children under five with 3 deaths due to pneumonia in Tasikmalaya City in 2022. Tasikmalaya City consists of 23 Community Health Centers, Purbarat U Health Center is one of the community health centers with high pneumonia coverage, namely 79.57% with 167 children under five suffering from pneumonia. (Dinas Kesehatan Kota Tasikmalaya, 2022).

Risk factors for pneumonia in children include premature birth, inadequate breastfeeding, incomplete immunization, especially measles immunization, anemia, climate change, poor parenting patterns, malnutrition, low economic status, overcrowding, lack of kitchen ventilation, house pollution, and passive smoking (Nurhaeni et al., 2018). Meanwhile, the most common causes of pneumonia in children are viruses and bacteria (Rueda et al., 2022). The signs and symptoms of pneumonia namely coughing, dyspnea and cyanosis as well as decreased oxygen saturation (Indonesian Ministry of Health, 2022).

Efforts that can be made to minimize the number of pneumonias is with pharmacological and non-pharmacological therapy. Pharmacological therapy that can be given to toddlers suffering from pneumonia is oxygen and antibiotics. Meanwhile, non-pharmacological therapy includes pursed lips breathing and chest physiotherapy. Pursed lips breathing is a process of increasing the alveolar level in each lung lobe and can increase air flow during expiration (Dev K & Naveen, 2022). The mechanism of pursed lips breathing is to increase air flow during expiration and activate the cilia on the respiratory tract mucosa so that it can clean secretions from the respiratory tract and optimize gas exchange resulting in increased oxygen saturation (Muliasari & Indrawati, 2018). Chest physiotherapy is a therapy used to treat most respiratory diseases in children with neuromuscular diseases or chronic respiratory diseases (Sangadah & Kartawidjaja, 2020). Chest physiotherapy aims to clear tracheobronchial secretions, so that it can help reduce airway resistance, help make breathing easier, clear inflammatory exudates and increase gas output resulting in increased oxygen saturation in children (Chaves et al., 2019).

Research related to the act of pursed lips breathing which uses a balloon blowing game and chest physiotherapy (clapping, vibrating,

postural drainage and effective coughing) has never been carried out in the Purbaratu Tasikmalaya Health Center working area. So the formulation of the problem in this research is how different the influence of the pursed lips breathing method is with chest physiotherapy on oxygen saturation in toddler pneumonia in the Purbaratu Tasikmalaya Health Center working area. The specific objectives of this research are to analyze oxygen saturation before and after giving pursed lips breathing, analyzing oxygen saturation before and after giving chest physiotherapy, analyzing changes in oxygen saturation after giving pursed lips breathing and chest physiotherapy for toddlers with pneumonia.

METHODS

This research is quantitative research with a quasi-experimental research design with a two-group pretest and posttest without control group design. The population in this study was 167 children diagnosed with pneumonia in the Purbaratu Community Health Center working area, with a total sample of 22 respondents consisting of 11 people in the pursed lips breathing group and 11 people in the chest physiotherapy group using a purposive sampling technique based on the inclusion criteria, namely: 1) pneumonia patients aged 1-5 years, patients with a decrease in oxygen saturation between 93%-95%, 3) pneumonia patients whose parents allow and are willing to be respondents, 4) pneumonia patients who are able or willing to play a role in providing pursed lips breathing therapy and chest physiotherapy. The exclusion criteria are: 1) pneumonia patients whose condition worsens, 2) pneumonia patients with coughing for more than 2 weeks, 3) pneumonia patients who change domicile.

The independent variable is the effect of pursed lips breathing and chest physiotherapy, while the dependent variable is oxygen saturation. The research instrument

used an observation sheet in the form of a child's oxygen saturation record to measure oxygen saturation before and after being given pursed lips breathing and chest physiotherapy. As well as calibrated oximetry, balloon blowing games. Data analysis used univariate analysis in the form of frequency distribution and bivariate in the form of paired t test and independent t-test. This research has undergone an ethical test at the Tasikmalaya Health Polytechnic Ethics Committee and received a certificate of ethical suitability, Description of Ethical Approval "Ethical Approval" with Ethics Number DP.04.03/F.XXVI.20/128/2023.

RESULTS AND DISCUSSION

RESULTS

Table 1. Characteristics of respondents

Characteristics	n	Percentage (%)
Age		
<3 years	10	45.5
>3 years	12	54.5
Gender		
Man	13	59.1
Woman	9	40.9
Parental education		
elementary school	1	4.5
JUNIOR HIGH SCHOOL	6	27.3
SENIOR HIGH SCHOOL	13	59.1
S1	2	9.1
Parents' job		
Civil servants	3	13.6
Work alone	7	31.8
IRT	12	54.5
Parental Income		
<Rp. 1,000,000	8	36.4
IDR 1,000,000-2,500,000	11	50.0
>Rp 2,500,000	3	13.6
Total	22	100.0

Table 1 shows that of the 22 respondents, the majority of children were >3 years old, 12 respondents (54.5%), the majority of children were male, namely 13 respondents (59.1%), 13 respondents had a high school education level (59.1%). %, parents' occupation as housewives was 12 respondents (54.5%) and parents' monthly income was Rp. 1,000,000-2,500,000 as many as 11 respondents (50.0%).

Table 2. Oxygen Saturation Analysis before and after Pursed Lips Breathing

Variable	n	Mean	Elementary school	p
SPO2 Pre PLB	11	93.4	0.82	0,000
SPO2 Post PLB	11	96.2	0.98	

Table 2 shows that of the 22 respondents, the average oxygen saturation value before being given pursed lips breathing was 93.4% with a standard deviation value of 0.82 and after being given pursed lips breathing was 96.2% with a standard deviation value of 0.982. and a P value of 0.000 which shows that there is an effect of giving Pursed lips breathing on increasing oxygen saturation.

Table 3. Oxygen Saturation Analysis before and after Chest Physiotherapy

Variable	n	Mean	Elementary school	p
SPO2 Pre Chest Physiotherapy	11	93.9	1.04	0,000
SPO2 Post Chest Physiotherapy	11	97.7	1.10	

Table 3 shows that of the 22 respondents, the average oxygen saturation value before being given chest physiotherapy was 93.9% with a standard deviation of 1.04 and after being given chest physiotherapy was 97.7% with a standard deviation value of 1.10, and The P-value is 0.000, which indicates that there is an effect of chest physiotherapy on increasing oxygen saturation.

Table 4. Oxygen Saturation Analysis after being given Pursed Lips Breathing and Chest Physiotherapy

Variable	n	Mean	Elementary school	p
SPO2 Post PLB	11	96.18	0.98	0.002
SPO2 Post Chest Physiotherapy	11	97.73	1.10	

Table 4 shows the results of the independent sample t-test, the significance value is P value = 0.002 ($p < 0.05$) so that the null hypothesis (H_0) is rejected and H_a is accepted so it can be concluded that there is a difference in changes in oxygen saturation after being given pursed lips breathing and chest physiotherapy. in toddlers suffering from pneumonia in the Purbaratu Tasikmalaya Health Center working area.

DISCUSSION

Respondent Characteristics

Children under five years of age are very susceptible to infectious diseases, especially children who experience malnutrition or inadequate growth and development. This condition can increase morbidity and mortality rates as well as result in children experiencing poor nutrition which causes the body's immune system to weaken so that children are susceptible to infectious diseases (Akbar et al., 2021).

Most of the respondents' parents' education was high school. The level of parental education is one factor that can indirectly influence the incidence of pneumonia in children. The higher the parents' education, the easier it is for parents to receive health messages and the more they understand about preventing pneumonia in children (Syani & Raharjo, 2015). Educated parents have sufficient knowledge about infant and child health services (Chandra, 2017).

Working parents can have better and broader information in caring for their children. In this study the majority of parents were housewives (54.5%). This is in line with research Utari et al. (2014), that mothers who do not work and spend 24 hours more time caring for children than mothers who work. The work status of housewives can affect children's health, because mothers who do not work have more time to care for their children.

The majority of parents of pneumonia sufferers have an income of Rp. 1,000,000-2,500,000 as many as 11 people (50.0%). People who have higher incomes will have higher levels of health service utilization. The incidence of pneumonia is twice as high in families with incomes below the minimum wage. This makes it difficult for parents to provide good housing, health services and adequate nutrition for their children. Poor food quality can cause reduced immunity and

children are susceptible to infectious diseases (Morales et al., 2023).

Analysis of oxygen saturation before and after giving Pursed Lips Breathing

The average oxygen saturation before giving pursed lips breathing was 93.4%, meaning that the oxygen saturation condition was still in the abnormal category. This theory also explains that pneumonia in toddlers is caused by increased secretions which affect the entry of oxygen into the lungs and result in inflammation and will affect oxygen levels in the blood so that it impacts gas exchange which results in decreased oxygen saturation in the child's body. (Sulisnawati et al., 2015).

Based on the results of the paired sample t-test, it was obtained that the total data was 11 respondents and the p value $< \alpha$ ($0.000 < 0.05$), it can be concluded that there is an influence on changes in oxygen saturation. before and after giving pursed lips breathing to toddlers suffering from pneumonia in the Purbaratu Tasikmalaya Health Center working area. This is because when respondents do pursed lips breathing with a modified toy balloon, inspiration and expiration will take longer and can increase diffusion time and oxygen balance in the pulmonary blood capillaries and alveoli. This condition can increase oxygen saturation and help expel air trapped in the lungs, thereby allowing clean air to enter the lungs (Suprayitno, 2017). Other research results also show that giving pursed lips breathing can reduce symptoms of dyspnea (Vtwani, 2019).

Pursed lips breathing therapy is very easy and can be done independently at home because this action does not require a lot of energy, is simple, easy to do, and safe. Pursed lips breathing therapy is modified with balloon toys as an approach to the principles of atraumatic care so that children want to do therapy. Research shows that one way of implementing atraumatic care is that it is able to meet children's psychological needs, thereby reducing anxiety during

hospitalization and reducing the length of care for children (Seniwati et al., 2023) . In this therapy, more oxygen is inhaled than normal breathing and the therapy is appropriate to the child's age where the child's fine motor skills have developed (Khoerunisa, 2021).

The results of this study are also in line with research Muliasari & Indrawati (2018), that by administering pursed lips breathing therapy there is an increase in air flow during expiration and activates the cilia on the respiratory tract mucosa, thereby clearing secretions from the respiratory tract and optimizing gas exchange. resulting in an increase in oxygen saturation.

Analysis of oxygen saturation before and after giving chest physiotherapy

The average oxygen saturation before chest physiotherapy was given was 93.91%, meaning that the oxygen saturation condition was still in the abnormal category. The condition of toddlers suffering from pneumonia experiences respiratory problems due to inflammation of the alveoli which can cause an increase in secretions retained in the child's lungs, thus affecting gas exchange in the child's body which causes the child's oxygen saturation to decrease (Sari et al., 2022).

After being given chest physiotherapy, the average child's oxygen saturation increased to 97.73%, meaning there was an increase in oxygen saturation. It is known that providing chest physiotherapy procedures with a combination of postural drainage, percussion, vibration and strong coughing will help remove secretions, maximize ventilation and increase oxygen use resulting in increased oxygen saturation in the body. (Wardiyah et al., 2022).

Based on the results of the Paired Sample T-test, the total number of research data obtained was 11 respondents and the p value $< \alpha$ ($0.000 < 0.05$), it can be concluded that there is an influence on changes in oxygen saturation before and after being given chest physiotherapy to toddlers suffering from

pneumonia in the work area. Purbaratu Tasikmalaya Community Health Center. Chest physiotherapy can clear the airway with a combination of postural drainage, clapping and vibration techniques. When providing chest physiotherapy by patting the child's chest repeatedly to help move secretions in the small airways towards the trachea and accompanied by coughing in the child which can increase oxygen use resulting in an increase in the child's oxygen saturation levels (Sari, 2020). Other research also shows that providing conventional chest physiotherapy shows a greater increase in peripheral oxygen saturation levels (Chaves et al., 2019) .

Chest physiotherapy is one of the most effective treatments for patients with acute and chronic respiratory problems. Even though this chest physiotherapy method does not seem special, it is very effective in removing secretions and increasing ventilation in patients with impaired lung function. The benefits of chest physiotherapy for the body are that it can increase respiratory efficiency and expand the lungs, strengthen respiratory muscles, facilitate secretions to overcome airway clearance problems and patients can breathe freely and the body gets enough oxygen so that there are no problems with gas exchange disorders. (Smeltzer & Bare, 2015).

The application of chest physiotherapy is one intervention for the nursing problem of ineffective airway clearance. Airway clearance is a way to clear secretions or blockages in the respiratory tract so that the airway remains effective (Suhanda & Rusmana, 2014). Physiologically, airway clearance is ineffective because airway hypersecretion occurs and secretions are retained due to an increase in the number of cells and an increase in the size of gland cells, causing hypersecretion in the airways. In this situation, airway clearance can be caused by passive smoking, active smoking, and exposure to pollution. Thick, sticky mucus and reduced mucociliary clearance cause

airway clearance problems (Tim Pokja SPO DPP PPNI, 2021).

The results of this study are in line with research. The results of the study Desak (2020), show that there is a big influence on the clinical improvement of toddlers by providing chest physiotherapy with the result that the Respiratory Rate returns to normal, the Heart Rate returns to normal, there is an increase in oxygen saturation and the ability to expel phlegm so that the airway becomes normal.

Oxygen Saturation Analysis After Pursed Lips Breathing and Chest Physiotherapy

Based on the results of the independent t test analysis, it was obtained $p \text{ value} < \alpha$ ($0.002 < 0.05$) it can be concluded that H_a is accepted and H_o is rejected with the conclusion that there is a difference in changes in oxygen saturation after being given pursed lips breathing and physiotherapy chest pneumonia in toddlers in the Purbaratu Tasikmalaya Health Center working area. When measuring oxygen saturation, it is influenced by the movement of the hand attached to the oximeter. Researchers must wait for the respondent to calm down so that the oxygen saturation results are valid. The respondents in this study were toddlers, so collaboration with parents is needed so that a pulse oximeter can be installed to measure before and after the intervention.

Based on theory and research results, it is known that pursed lips breathing and chest physiotherapy are equally effective in changing oxygen saturation in children with pneumonia, but judging from the average increase in oxygen saturation, namely the average oxygen saturation results in the pursed lips breathing group, there is a difference in the increase in oxygen saturation of 2.73%, while in the chest physiotherapy group it was 3.82%. These results indicate that chest physiotherapy is more effective because respondents in this research group had more nursing problems with ineffective airway clearance so that increasing oxygen

saturation had more of an effect in the chest physiotherapy group compared to the pursed lips breathing group.

CONCLUSION

The results of the study showed that there was an increase in oxygen saturation in both groups with a p value of 0.000, which shows that providing PLB and chest physiotherapy was able to increase oxygen saturation in toddlers with pneumonia. And research shows that there are differences in the effect of changes in oxygen saturation after being given pursed lip breathing and chest physiotherapy in toddlers with pneumonia, which shows that chest physiotherapy is more effective in increasing oxygen saturation.

The limitations of this research are the research method which does not use a control group, as well as the short frequency of administration of measures. Future research is expected to use a research design that uses a control group and extends the frequency of actions given.

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CONFLICT OF INTEREST

The implementation of this research process went well and there were no conflicts of interest.

REFERENCES

- Anwar, A., & Dhamayanti, I. (2014). Pneumonia in children under five in

- Indonesia. *National Journal of Public Health* , 8 (8), 359-360.
- Chandra. (2017). *The Relationship between Mother's Education and Employment and Efforts to Prevent ISPA in Toddlers by Mothers Visiting the Kelayan Timur Community Health Center, Banjarmasin City* . 11-15.
- Chaves, GSS, Freitas, DA, Santino, TA, Nogueira, PAMS, Fregonezi, GAF, & Mendonça, KMPP (2019). Chest physiotherapy for pneumonia in children. *Cochrane Database of Systematic Reviews* , 2019 (1). <https://doi.org/10.1002/14651858.CD010277.pub3>
- Dev K, & Naveen. (2022). *Effect of modified pursed lip breathing in pneumonic children* . 10 (11), f50–f60. www.ijcrt.org.
- Hannah, C., Klerk, N., Richmond, P., & Lehmann, D. (2010). Retrospective Population-Based Cohort Study Identifies Target Areas for Prevention of Acute Lower Respiratory Tract Infections in Children. *BMC Public Health* , 757.
- Hanifah Khoerunisa Lin. (2021). *The Effect of Pursed Lip Breathing Therapy (Blowing Balloons/Toys) on the Oxygenation Status of Children Suffering from Pneumonia* .
- Indonesian Health Ministry. (2020). *Indonesia Health Profile 2020* . <https://www.kemkes.go.id/downloads/resources/download/pusdatin/profil-kesehatan-indonesia/Profil-Kesehatan-Indonesia- Tahun-2020.pdf>
- Indonesian Ministry of Health. (2022). *Integrated Management Chart Book for Sick Toddlers* . Ministry of Health of the Republic of Indonesia.
- Morales, F., Montserrat-de la Paz, S., Leon, M. J., & Rivero-Pino, F. (2023). Effects of Malnutrition on the Immune System and Infection and the Role of Nutritional Strategies Regarding Improvements in Children's Health Status: A Literature Review. *Nutrients* , 16 (1), 1–16.
- <https://doi.org/10.3390/nu16010001>
- Muliasari, Y., & Indrawati, I. (2018). Effectiveness of Pursed Lips Breathing Therapy on the Oxygenation Status of Children Suffering from Pneumonia. In *International Journal of Nursing and Health Services (IJNHS)* (Vol. 1, Issue 2).
- Nurhaeni, N., Rustina, Y., Agustini, N., & Enis Rosuliana, N. (2018). The Impact of the Family Empowerment Model on Satisfaction and Length of Child Care in Hospital. *Enfermeria Clinic* , 28 , 36-40. [https://doi.org/10.1016/S1130-8621\(18\)30033-0](https://doi.org/10.1016/S1130-8621(18)30033-0)
- PPNI DPP SPO Working Team. (2021). *Guide to Standard Operating Procedures for Nursing* (1st ed.). PPNI Central Management.
- Rueda, Z.V., Aguilar, Y., Maya, M.A., López, L., Restrepo, A., Garcés, C., Morales, O., Royo-Pabón, C., Trujillo, M., Arango, C., Copete, Á. R., Vera, C., Giraldo, M.R., Herrera, M., & Vélez, L.A. (2022). Etiology and the challenges of diagnostic testing of community-acquired pneumonia in children and adolescents. *BMC Pediatrics* , 22 (1), 1–14. <https://doi.org/10.1186/s12887-022-03235-z>
- Sangadah, K., & Kartawidjaja, J. (2020). The effect of chest physiotherapy on clinical improvement in children with pneumonia. *Orphanet Journal of Rare Diseases* , 21 (1), 1–9.
- Sari, DP, Pardosi, S., & Annisa, R. (2022). The Effect of Chest Physiotherapy on Respiratory Frequency and O2 Saturation in Children with Pneumonia at RSUP Dr. M. Yunus Bengkulu. *Journal of Applied Health Research* , 9 (1), 28-36.
- Sari W. (2020). *Analysis of Nursing Clinical Practices Providing Chest Physiotherapy on the Effectiveness of Airway Clearance* .
- Seniwati, T., Rustina, Y., Nurhaeni, N., & Wanda, D. (2023). Patient and family-centered care for children: A concept

- analysis. *Belitung Nursing Journal* , 9 (1), 17–24.
<https://doi.org/10.33546/bnj.2350>
- Smeltzer, S. C., & Bare, B. G. (2015). *Handbook of Medical-Surgical Nursing* .
- Somantri, I. (2012). *Nursing Care for Clients with Respiratory System Disorders* . Salemba Medika.
- Suhanda, P., & Rusmana, M. (2014). Effectiveness of Post Nebulization Chest and Baruk Physiotherapy on Airway Clearance in Pulmonary TB Patients at Tangerang District Hospital. *Journal of Medicine* , 1 (2).
- Sulisnawati, NL, Labir, IK, & Ribek, IN (2015). Blowing Toy Playing Activities on the Oxygenation Status of Toddlers Suffering from Pneumonia. *Echo Nursing Journal* .
- Suprayitno, E. (2017). Effect of Pursed Lip Breathing on Peak Expiratory Flow Rate in Chronic Lung Disease Patients. *Wiraja Medika Health Journal* , 56-60.
- Syani, FE, & Raharjo, M. (2015). The Relationship between Environmental Risk Factors and the Incidence of Pneumonia in Toddlers Using a Spatial Analysis Approach in North Semarang Regency. *Journal of Public Health* , 3 .
- Tasikmalaya City Health Service. (2022). *Tasikmalaya City Health Profile in 2022* .
- UNICEF (2019, November). *One Child Dies of Pneumonia Every 39 Seconds, Agency Warns*.
<https://www.unicef.org/indonesia/press-releases/one-child-dies-pneumonia-every-39-seconds-agencies-warn>
- Urge. (2020). The Effect of Chest Physiotherapy on Clinical Improvement in Children Suffering from Pneumonia . 5 (10).
<https://doi.org/10.36418/syntax-literate.v5i10.1667>
- Utari, W., Arneliawati, & Novayelinda, R. (2014). *Effectiveness of Health Education in Increasing Family Knowledge about Upper Respiratory Tract Infections (ARI)*
- Vatwani, A. (2019). Pursed Lip Breathing Exercise to Reduce Shortness of Breath. *Archives of Physical Medicine and Rehabilitation* , 100 (1), 189–190.
<https://doi.org/https://doi.org/10.1016/j.apmr.2018.05.005>
- Wardiyah, AW, Wandini, RW, & Rahmawati, RP (2022). Implementation of Chest Physiotherapy for Patients with Airway Clearance Problems in Mulyojati Village, Metro City. *Journal of Community Service Creativity (PKM)* , 5 (8), 2348-2362.
<https://doi.org/10.33024/jkpm.v5i8.7084>
- World Health Organization . (2021, November 11). *Pneumonia* .
<https://www.who.int/news-room/fact-sheets/detail/pneumonia>
- Wulandari, D., & Erawati, M. (2016). *Handbook of Pediatric Nursing* . Student Library.

HISTORY OF DIARRHEA AND AGE ARE DETERMINANT FACTORS OF STUNTING INCIDENCE : ANALYSIS OF SSGI DATA 2022, EAST TANJUNG JABUNG DISTRICT, JAMBI PROVINCE

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ABSTRACT

Background: Stunting is a serious condition characterized by a child's height being below the normal limit for his age. Recurring infectious diseases, especially in the first two years of a toddler's life, can worsen stunting because they further disrupt nutritional absorption and growth. This study aimed to determine the relationship between acute respiratory infections (ARI) and diarrhea on the incidence of stunting in toddlers aged 0-59 month.

Method: This research is a cross-sectional study that applies two-stage stratified sampling using secondary data obtained from the 2022 Indonesian Nutrition Status Survey in East Tanjung Jabung Regency, Jambi Province. A total of 552 toddlers were included the sample analysis. Data were analyzed univariately, bivariately and multivariately using logistic regression.

Results: The results of the multivariate analysis showed that there was a relationship between a history of diarrhea ($p=0.002$), age 12-23 months ($p=0.034$) and age 24-59 months ($p=0.041$) with the incidence of stunting while there was no association between a history of ARI and the incidence of stunting in toddlers. ($p=0.836$).

Conclusion: The incidence of stunting in children aged 0-59 months is related to a history of diarrheal disease and the age of the toddler. There is no relationship between ARI and stunting. There is a need for further coordination in implementing sensitive interventions to reduce the incidence of stunting among children under five through the provision of clean water and proper sanitation

Keywords: ARI, diarrhea, Infectious diseases, stunting

INTRODUCTION

Stunting refers to a condition where a child's height is shorter than normal for his age. Stunting can affect a child's growth and development from the beginning of conception to the third or fourth year of life, where maternal and child nutrition is an important determinant of growth (Soliman et al., 2021; Junita et al., 2023). Apart from being caused by nutritional deficiencies, repeated attacks of infectious diseases during the first 1000 days of a child's life can worsen the condition.

The incidence of stunting in developing countries is still a large health problem that

requires a comprehensive solution. According to estimates of UNICEF, more than one in five children under five in the world, or the equivalent of 148.1 million people, will experience stunting in 2022. Meanwhile, Asia has the highest number of children under the age of five that are stunted, namely 76.6 million people, followed by Africa with 63.1 million people, or equivalent to 30% of total global stunting cases (UNICEF et al., 2023).

Based on the result of the 2022 Indonesian Nutrition Status Survey (SSGI), the prevalence of stunting in Indonesia is 21.6%. East Tanjung Jabung Regency is one of the areas with a fairly large prevalence of stunting. Based on 2023 Indonesian Health

Survey (SKI) data, the prevalence of stunting in East Tanjung Jabung

Regency is 23.7%. This figure has decreased significantly compared to 2018, with the prevalence of stunting at that time amounting to 40.9% (Risksdas, 2018).

Diarrhea and Acute Respiratory Infections (ARI) are diseases that often attack children under five. Diarrhea ranks as the second leading cause of mortality among children under the age of five in Indonesia. Based on the 2021 Indonesian Health Profile, around 8 out of 100 Indonesians experienced diarrhea in 2020 with a prevalence of 8.68%. Meanwhile, ISPA cases rank first in the cause of infant mortality with a prevalence of ISPA in children under five of 22.8%. According to data from East Tanjung Jabung District Health Service, 2019, the prevalence of diarrhea cases in the area was 7.82% or there were 3,266 cases or 19.0 per 1000 population and the prevalence of ISPA cases was 4.44%.

One of the risk factors for stunting is infection disease. The study's findings indicate a correlation between the prevalence of stunting and an infectious disease history. The likelihood of stunting in toddlers with a history of infectious disease is 12 times higher (Pibriyanti et al., 2019). Recurrent infectious diseases in children disrupt and reduce the body's ability to absorb important nutrients from food (Fatimah & Wirjatmadi, 2018).

ARI illness leads to a decline in the nutritional status of children, which is associated with stunting. Research shows that children who have had an ARI in the past are three times more likely than children who have never had an ARI to have stunted growth (Himawati & Fitria, 2020). In addition to a previous occurrence of acute respiratory infection (ARI), diarrheal disease is also strongly associated with stunting in young children. It is one of the contributing factors to infectious diseases that result in infant mortality worldwide (Ilma et al., 2019). Both ARI and diarrhea will cause metabolic disorders in the body and require more energy

and nutrients due to the inflammation that occurs (DeBoer et al., 2017).

Based on these problems, researchers want to conduct research which aims to determine the relationship between acute respiratory tract infections (ARI) and diarrhea on the incidence of stunting in toddlers aged 0-59 months in East Tanjung Jabung Regency, Jambi Province.

METHOD

This study used secondary data obtained from the 2022 Indonesian Nutrition Status Survey conducted in East Tanjung Jabung Regency, Jambi Province, with a cross-sectional design. The population in this study was all households with toddlers based on census blocks consisting of 56 census blocks (BS). The samples were toddlers aged 0-59 months in East Tanjung Jabung Regency, Jambi Province.

The sample selection framework is based on the Master Frame from the block list of regular population census results (SP 2020), which is then updated the list of households in each selected census block by the Community Health Center's Nutrition Implementing Staff. The sampling design used was stratified two-stage sampling (Indonesian Ministry of Health, 2022a). In the first stage, block samples were systematically selected with an implicit process of stratification based on urban and rural areas. The second stage, selecting 10 households under five in each census block was selected using systematic random sampling.

In this study the instruments used were the Household Questionnaire (SSGI-2022-RT) and the Toddler Individual Questionnaire (SSGI-2022-IND_BLT) (Indonesian Ministry of Health, 2022b). The use of questionnaires is adjusted to the research variables. The secondary data that has been obtained is then checked and checked for completeness of the data, including the presence of missing or lost data. Based on the

results of checking the data, the number of samples processed was 552 toddlers. The data is continued with the data processing stage for further analysis.

The statistical package SPSS was utilized to perform the analysis of the data, which included univariate, bivariate, and multivariate analyses. The general distribution of the variables used is determined through univariate analysis. Bivariate analysis was applied to examine the correlation between the variables of gender, age, history of ARI, and history of diarrhea with the incidence of stunting. Meanwhile, multivariate analysis was conducted using a multivariable logistic regression test to determine the most dominant variables related to the occurrence of stunting. This research has received ethical approval from the Health Research Ethics Committee of RSUD Dr. Moewardi Surakarta Number: 428/II/HREC/2024 dated 19 February 2024.

RESULTS AND DISCUSSION

This research utilized a sample size of 552 children under the age of five from the 2022 SSGI data. The outcomes of the univariate analysis are displayed in the subsequent table:

Table 1. Sample Characteristics

Variable	N	%
Stunting		
Yes	124	22.5
No	428	77.5
ISPA history		
Yes	183	33.2
No	369	66.8
History of Diarrhea		
Yes	68	12.3
No	484	87.7
Gender		
Man	287	52
Woman	265	48
Age		
0-5 months	53	9.6
6-11 months	49	8.9
12-23 months	101	18.3
24-59 months	349	63.2

Table 1 shows the distribution of stunting incidence, history of ARI and diarrhea, gender and age. Most of the toddlers in the sample were male as many as 287 people

(52%) and were in the age range of 25-59 months, namely 349 people (63.2%). Meanwhile, from the frequency distribution of history of ARI, and history of diarrhea, and stunting, more than half of toddlers have never experienced ARI and diarrhea, respectively 369 people (66.8%) and 484 people (87.7%). There were 428 (77.5%) toddlers who were not stunted and 124 (22.5%) other toddlers who were stunted.

Table 2. Results of Bivariate Analysis of Stunting Risk Factors

Variable	Stunting				p	OR
	Yes n	Yes %	No n	No %		
ISPA history						
-Yes						
-No	46	25.1	137	74.9	0.341	1.25
	78	21.1	291	78.9		(0.83-1.90)
History of Diarrhea						
-Yes	25	36.8	43	63.2	0.004*	2.26
-No	99	20.5	385	79.5		(1.32-3.88)
Gender						
-Man	66	23.0	221	77.0	0.834	1.066
-Woman	58	21.9	207	78.1		(0.71-1.59)
Age						
-0-5 months	6	11.3	47	88.7		Ref
-6-11 months						1.53
-12-23 months	8	16.3	41	83.7	0.467	(0.49-4.78)
-24-59 months	26	25.7	75	74.3	0.041*	2.72
						(1.04-7.09)
						2.48
	84	24.1	265	75.9	0.044*	(1.03-6.01)

A bivariate test was carried out in order to collect information regarding the factors that are associated with the prevalence of stunting (Table 2). According to the findings of the bivariate analysis conducted with the chi square test, the variables that were shown to be associated with stunting ($p < 0.05$) were the age of the toddlers and the history of diarrhea. The findings of the chi-square analysis indicate that there is a significant association between the history of diarrhea in toddlers and the incidence of stunting, with the value of $p = 0.004$ ($p < 0.05$). Meanwhile for the age variable, the results of bivariate analysis showed that there was a relationship between age 12-23 months ($p = 0.041$) and age 24-59 months ($p = 0.044$) with the incidence of stunting. Toddlers aged 12-23 months are at 2.72 times the risk of experiencing stunting compared to toddlers aged 0-5 months. Stunting is 2.48 times more likely to occur in

toddlers aged 24-59 months than in those aged 0–5 months. Regarding the relationship between history of ARI and stunting, the value of $p=0.341$ was obtained, which means that there is no relationship between history of ARI in toddlers and the incidence of stunting ($p>0.05$). The gender variable is also not related to the incidence of stunting ($p=0.834$).

The findings of the bivariate analysis conducted on toddlers in East Tanjung Jabung Regency revealed no correlation between the incidence of stunting and a child's history of ARI, with $p\text{-value}=0.341$ ($p\text{-value}>0.005$). Different from research results Yoselin & Pambudi (2020) which states that children with a history of respiratory tract disorders are at risk of experiencing stunting. The relationship between stunting and respiratory tract infections (ARI) in children is a complex and reciprocal relationship, meaning that each condition can influence each other.

The results of this study are consistent with prior research conducted by Efendi et al. (2015), which found that there is no association between stunting and the frequency of acute respiratory infections (correlation coefficient $0.411>\alpha=0.05$) in children aged 12-48 months in the working area of the Gilingan Surakarta Health Center. Furthermore, Halim et al. (2021) found no significant relationship between risk factors of ARI and the incidence of stunting in children aged 3-5 years in TK/PAUD Tuminting District. Generally, ARI attacks children in the form of mild symptoms such as fever accompanied by a cough and cold, in some cases it can also heal by itself in a short time. Research conducted in Uganda found that children under 24 months were at higher risk of experiencing ARI and pneumonia. In addition, children whose mothers have lower secondary education have a higher chance of contracting ARI compared to children whose mothers have higher education (Terfa et al., 2022).

Table 3. Results of Multivariate Analysis of Stunting Risk Factors

Variable	Sig.	OR	CI(95%)
History of Diarrhea	0.002	2.33	1.35 – 4.01
Toddler age			
- 0-5 months	0.106		
- 6-11 months	0.474	1.52	0.43 – 4.79
-12-23 months	0.034	2.85	1.08 – 7.50
-24-59 months	0.041	2.53	1.04 – 6.18

The variables linked to the incidence of stunting were a history of diarrhea ($p=0.002$), age 12-23 months compared to age 0–5 months ($p\text{-value}=0.034$), and age 24-59 months compared to age 0–5 months ($p=0.041$), according to the results of multivariate analysis using logistic regression. Age is the main factor influencing the prevalence of stunting. Toddlers aged 12-23 months have a 2.85 times risk of experiencing stunting compared to those aged 0-5 months after controlling for diarrhea variables ($OR=2.85$ 95% CI 1.08-7.50). Multivariate analysis was carried out by conducting a logistic regression test on four variables on the incidence of stunting. The final result of the multivariate analysis was obtained after removing the variables history of ARI and gender because the results in the full model were $p>0.05$. Based on the results of the cross tabulation between diarrhea and age, it is known that those who experienced a history of diarrhea were mostly in the toddler age range of 24-59 months and then those aged 12-23 months.

Stunting is a common form of malnutrition in children and is associated with adverse health problems (Makasi & Humphrey, 2020). A number of infectious illnesses, including diarrhea, are responsible for morbidity and mortality in children, particularly in countries with low and intermediate incomes (George et al., 2021). The research result in Table 3 shows that there is a relationship between a history of diarrhea in toddlers and the incidence of stunting with a value of $p=0.002$. Stunting is 2.3 times more likely to occur in toddlers who have had diarrhea in the past than in those who have not. This research aligns with earlier studies

that found a correlation between the incidence of diarrhea and the incidence of stunting ($p=0.007$) in toddlers in the Pecangaan Jepara Health Center working area (Lestari & Siwiendrayanti, 2021). Additional research found a link between the prevalence of diarrhea and stunting in infants in Sambas Regency, in addition to postnatal variables such as early delivery, low birth weight, and full coverage of basic immunization (Sartika et al., 2021). This research contradicts the findings of Purwanti and Ratnasari (2020), who determined that there is association between the incidence of diarrhea and stunting in young children in Kluwut Village, Bulakamba District, Brebes Regency. Similarly, Angraini et al. (2021) also found no correlation between the incidence of diarrhea and stunting, with $p = 0.237$ ($p\text{-value} > 0.05$) in the Mumpo Regulation Community Health Center Working Area, Central Bengkulu Regency.

Children living in families with inadequate sanitation and hygiene facilities, and inadequate potable water source are more susceptible to diarrhea (Terfa et al., 2022). According to Mulyaningsih et al. (2021), children residing in communities lacking access to sanitation, water, and hygiene are at an increased risk of stunting. Terfa et al. (2022) adding that stunting in children is more may occur in children from homes where there are inadequate drinking water sources. Children living in homes with poor flooring have a higher prevalence of diarrhea than in homes with better flooring materials (Kundu et al., 2022).

Sanitation and clean water are vital in reducing stunting rates. The quality and quantity of safe drinking water and available sanitation facilities correlates with the burden of diarrhea and gastrointestinal infections, and in turn with stunted growth in children (Das & Bhutta, 2016). Clean water is still a serious problem in East Tanjung Jabung Regency. Based on data of BPS Jambi Province in 2022 coverage of households with

clean water or households that have access to proper sanitation has only reached 69.75%. The source of drinking water consumption in the community is mostly rainwater in addition to refill water.

Infectious diseases, both diarrhea and ARI, both of which can cause loss of appetite in children, resulting in stunted growth (Arini et al., 2020). Toddlers with infectious disorders may experience both malabsorption and loss of nutrients if they are not treated right away and given a balanced diet (Fadilah et al., 2020). Nevertheless, this study concluded that there was no correlation observed between ARI and the prevalence of stunting in toddlers.

Children under the age of two, particularly those between 12 and 23 months old, have a notably higher occurrence of acute respiratory infections and diarrhea (Kundu et al., 2022). Consistent with the findings of this study, toddlers who suffer from diarrhea are susceptible to stunting. In addition, toddlers between the ages of 12 and 23 months face a 2.8 times higher risk of stunting than toddlers aged 0 to 5 months. These findings are consistent with the findings of Mengesh et al. (2021), who found that children in the age group between 0-6 months and 11 months have a decreased probability of having stunting compared to those aged over 24 months.

The chances of stunting in children vary greatly and are influenced by many factors, not only related to characteristics at the child level but also characteristics at the family and society level (Junita et al., 2023). Children who are raised in households that do not have access to water, sanitation, and hygiene are at a greater risk of stunting (Mulyaningsih et al., 2021). Lack of access to adequate sanitation can increase the risk of spreading infectious diseases and malnutrition.

CONCLUSION

Based on the research results, it can be concluded that there is a significant relationship between the history of diarrhea and age in toddlers and stunting in East Tanjung Jabung Regency, while the history of ARI and stunting is not significantly related. Further research needs to be done by taking into account the history of diseases that have not been included in this study as other factors that can affect the incidence of stunting in toddlers.

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CONFLICT OF INTEREST

There was no conflict of interest in this article.

REFERENCES

- Angraini, W., Amin, M., Bintang Agustina, P., Febriawati, H., & Yanuart, R. (2021). Maternal Knowledge, Access to Clean Water, and Diarrhea with Stunting at the Aturon Mumpo Health Center, Central Bengkulu. *Equator Public Health Journal*, 8(2), 92–102.
- Arini, D., Nursalam, N., Mahmudah, M., & Faradilah, I. (2020). The incidence of stunting, the frequency/duration of diarrhea and Acute Respiratory Infection in toddlers. *Journal of Public Health Research*, 9(2), 1816. <https://doi.org/10.4081/jphr.2020.1816>
- Jambi Central Statistics Agency (2022). Ownership of Access to Adequate Sanitation Report (Percent), 2020-2022. BPS Jambi Province.
- Das, J. K., & Bhutta, Z. A. (2016). Global challenges in acute diarrhea. *Current*

Opinion in Gastroenterology, 32(1), 18–23.

<https://doi.org/10.1097/MOG.0000000000000236>

- DeBoer, M.D., Scharf, R.J., Leite, A.M., Ferrer, A., Havt, A., Pinkerton, R., Lima, A.A., & Guerrant, R.L. (2017). Systemic inflammation, growth factors, and linear growth in the setting of infection and malnutrition. *Nutrition (Burbank, Los Angeles County, Calif.)*, 33, 248–253. <https://doi.org/10.1016/j.nut.2016.06.013>

East Tanjung Jabung District Health Service. (2019). Health Profile of East Tanjung Jabung Regency 2019.

- Efendi, A., Mutalazimah, & Mustikaningrum, F. (2015). Correlation between the incidence of stunting and the frequency of acute respiratory infections and diarrhea in toddlers aged 12-48 months in the working area of the Gilingan Surakarta Community Health Center. Muhammadiyah Surakarta university. Available at: <https://eprints.ums.ac.id/38307/>.

- Fatimah, NSH, & Wirjatmadi, B. (2018). Adequacy Levels of Vitamin A, Zinc and Iron and Frequency of Infections in Stunting and Non-Stunting Toddlers. *Indonesian Nutrition Media*, 13(2), 168. <https://doi.org/10.20473/mgi.v13i2.168-175>

- George, CM, Monira, S., Zohura, F., Thomas, ED, Hasan, MT, Parvin, T., Hasan, K., Rashid, M.-U., Papri, N., Islam, A., Rahman, Z., Rafique, R., Islam Bhuyian, MS, Saxton, R., Labrique, A., Alland, K., Barman, I., Jubyda, FT, Afroze, F., ... Alam, M. (2021). Effects of a Water, Sanitation, and Hygiene Mobile Health Program on Diarrhea and Child Growth in Bangladesh: A Cluster-randomized Controlled Trial of the Cholera Hospital-based Intervention for 7 Days (CHoBI7) Mobile Health Program. *Clinical Infectious Diseases : An Official Publication of the Infectious*

- Diseases Society of America, 73(9), e2560–e2568.
<https://doi.org/10.1093/cid/ciaa754>
- Halim, L.A., Warouw, S.M., Ch Manoppo, J.I., & Child Health, Faculty of Medicine, Sam Ratulangi University, I. (2021). The Relationship between Risk Factors and Stunting in Children Aged 3-5 Years in Kindergarten/Paud, Tuminting District. *Journal of Medicine and Rehabilitation*, 1(2), 1–8.
- Himawati, E.H., & Fitria, L. (2020). Relationship between Upper Respiratory Tract Infections and Stunting in Children Under 5 Years in Sampang. *Indonesian Journal of Public Health*, 15(1), 1. <https://doi.org/10.26714/jkmi.15.1.2020.1-5>
- Ilma, N.N., Salimo, H., & Pamungkasari, E.P. (2019). Prevalence and Path Analysis on the Effects of Diarrhea and Life Course Determinants on Stunting in Children Under Two Years of Age in Kupang, East Nusa Tenggara. *Journal of Maternal and Child Health*, 4(4), 230–241.
<https://doi.org/10.26911/thejmch.2019.04.04.02>
- Indonesian Ministry of Health. (2022a). Indonesian Nutritional Status Survey (SSGI) 2022. Indonesian Ministry of Health, 1–14.
<https://www.litbang.kemkes.go.id/buku-saku-hasil-studi-status-gizi-indonesia-ssgi-tahun-2021/>
- Indonesian Ministry of Health. (2022a). Indonesian Ministry of Health. Available from: <https://jasadata.kemkes.go.id/katalog-data/ssgi/ketersediaan-data/ssgi-2022>[Accessed 21st September 2023]
- Junita, J., Rusmimpong, R., Triana, W., & Putra, E. S. (2023). Simpatik Education Model for Knowledge and Diversity of Food Intake for Stunting Toddlers in Kerinci Regency. In *Proceeding International Conference Health Polytechnic of Jambi* (Vol. 2, pp. 1-8).
- Junita, J., Rusmimpong, R., Triana, W., & Putra, E. S. (2023b). SIMPATIK website nutrition education on mother's knowledge and diversity of toddler consumption in Jambi City. *Action: Aceh Nutrition Journal*, 8(2), 270-277.
- Kundu, S., Kundu, S., Banna, M.H. Al, Ahinkorah, B.O., Seidu, A.-A., & Okyere, J. (2022). Prevalence of and factors associated with childhood diarrheal disease and acute respiratory infection in Bangladesh: an analysis of a nationwide cross-sectional survey. *BMJ Open*, 12(4), e051744.
<https://doi.org/10.1136/bmjopen-2021-051744>
- Lestari, M.E.P., & Siwiendrayanti, A. (2021). Contribution of Physical Conditions of the Home Environment to Diarrhea Incidents and Their Relationship to Stunting Incidents Article Info. *Indonesian Journal of Public Health and Nutrition*, 1(3), 355–361.
- Makasi, R.R., & Humphrey, J.H. (2020). Summarizing the Child Growth and Diarrhea Findings of the Water, Sanitation, and Hygiene Benefits and Sanitation Hygiene Infant Nutrition Efficacy Trials. *Nestle Nutrition Institute Workshop Series*, 93, 153–166.
<https://doi.org/10.1159/000503350>
- Mengesha, A., Hailu, S., Birhane, M., & Belay, M. M. (2021). The prevalence of stunting and associated factors among children under five years of age in southern Ethiopia: Community based cross-sectional study. *Annals of Global Health*, 87(1), 1–14.
<https://doi.org/10.5334/aogh.3432>
- Mulyaningsih, T., Mohanty, I., Widyaningsih, V., Gebremedhin, T.A., Miranti, R., & Wiyono, V.H. (2021). Beyond personal factors: Multilevel determinants of childhood stunting in Indonesia. *PloS One*, 16(11), e0260265.
<https://doi.org/10.1371/journal.pone.0260265>
- Pibriyanti, K., Suryono, S., & Luthfi, C. (2019). Factors associated with the incidence of stunting in toddlers in the

- working area of the Slogohimo Health Center, Wonogiri Regency. *Darussalam Nutrition Journal*, 3(2), 1. <https://doi.org/10.21111/dnj.v3i2.3398>
- Purwanti, DY, & Ratnasari, D. (2020). The Relationship Between Diarrhea, Exclusive Breastfeeding, and Stunting in Toddlers. *Scientific Journal of Health Nutrition*, 1(02), 15–23.
- Risikesdas. (2018). Results of Basic Health Research 2018. In Ministry of Health of the Republic of Indonesia (Vol. 53, Issue 9).
- Sartika, AN, Khoirunnisa, M., Meiyetrian, E., Ermayani, E., Pramesthi, IL, & Nur Ananda, AJ (2021). Prenatal and postnatal determinants of stunting at age 0-11 months: A cross-sectional study in Indonesia. *PloS One*, 16(7), e0254662. <https://doi.org/10.1371/journal.pone.0254662>
- Soliman, A., De Sanctis, V., Alaaraj, N., Ahmed, S., Alyafei, F., Hamed, N., & Soliman, N. (2021). Early and long-term consequences of nutritional stunting: From childhood to adulthood. *Acta Biomedica*, 92(1), 1–12. <https://doi.org/10.23750/abm.v92i1.11346>
- Terfa, Z.G., Ahmed, S., Khan, J., Niessen, L.W., & Consortium, OBOTI (2022). Household Microenvironment and Under-Fives Health Outcomes in Uganda: Focusing on Multidimensional Energy Poverty and Women Empowerment Indices. *International Journal of Environmental Research and Public Health*, 19(11). <https://doi.org/10.3390/ijerph19116684>
- UNICEF / WHO / World Bank Group. (2023). Levels and trends in child malnutrition Joint Child Malnutrition Estimates.
- UNICEF, WHO, & WORLD BANK. (2023). Levels and trends in child malnutrition. World Health Organization, 4. <https://www.who.int/publications/i/item/9789240073791>
- Yoselin, M., & Pambudi, W. (2020). The relationship between airway disorders and stunting. *Tarumanagara Medical Journal*, 2(2), 366–371.

RELATIONSHIP BETWEEN PATIENT KNOWLEDGE LEVEL AND COMPLIANCE WITH TAKING ANTI-HYPERTENSION MEDICATION

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ABSTRACT

Background: The World Health Organization (WHO) in 2021 stated that around 23.2% of adults worldwide suffer from hypertension. The prevalence of hypertension worldwide is expected to continue to increase to **36.9%** in 2030. Non-compliance with taking hypertension medication can lead to a 3.5-fold risk of uncontrolled blood pressure, thereby increasing the risk of serious health complications.

Method: This research was conducted using a quantitative descriptive cross-sectional method using a knowledge questionnaire and an adherence level questionnaire using the MMAS-8 (Morisky Medication Adherence Scale). The number of respondents involved was 71 people who were selected using purposive sampling. Data analysis includes univariate and bivariate analysis with the chi-square test.

Result: Based on the univariate test, it was found that the higher the knowledge, the higher the compliance, and the lower the knowledge, the lower the compliance.

Conclusion: The results of which means there is a relationship between the level of patient knowledge and compliance with taking anti-hypertensive medication at the Sungai Bungkal Community Health Center.

Keywords: hypertension, knowledge, compliance

INTRODUCTION

The results of Basic Health Research (RISKESDAS) in 2018 stated that the estimated number of hypertension cases in Indonesia was 63,309,620 people, while the death rate in Indonesia due to hypertension was 427,218 deaths (6% of hypertension cases). The prevalence of hypertension based on measurement results in the population aged ≥ 18 years is 34.1%. From the prevalence of hypertension of 34.1%, it is known that 8.8% were diagnosed with hypertension. And of the number of hypertension diagnoses, there were 13.3% of people who did not take medication, and 32.3% of people who did not regularly take medication. This shows that the majority of sufferers do not know that they have hypertension so they do not receive treatment. According to the World Health Organization (WHO), in 2021, around 29.2%

of adults worldwide suffer from hypertension. The prevalence of hypertension worldwide is expected to continue to increase to 36.9% in 2030 (WHO, 2017).

Based on data obtained from the Sungai Penuh Health Service in 2023, the most cases of hypertension were found in the Sungai sungau Community Health Center. According to morbidity data for the elderly at the Sungai Bungkal Community Health Center in 2023, hypertension is the disease with the highest number of cases. Based on observations of medical records at the Sungai Bungkal Community Health Center, it was found that 80% of hypertensive patients had abnormal blood pressure. From the results of interviews with 10 patients, it was discovered that 7 patients did not take their medication regularly and often forgot. Non-compliance with taking medication is related to the side effects of hypertension medication which

must be taken for life. This causes patients to be afraid of long-term adverse effects or other complications. After further observation, it turned out that as many as 60% of patients lacked knowledge about hypertension.

Non-compliance of hypertensive patients in taking anti-hypertensive drugs is the cause of the still high blood pressure of patients at the Sungai Bungkal Community Health Center. Non-compliance with taking hypertension medication can lead to a 3.5-fold risk of uncontrolled blood pressure, thereby increasing the risk of serious health complications such as heart disease, stroke, heart failure and kidney disease (Zhou & Carrillo-Larco, 2021). Patients feel uncomfortable or even experience unpleasant side effects from anti-hypertensive drugs. Common side effects of anti-hypertensive drugs are dizziness, fatigue and nausea (Arsyad Muhammad Iqbal; Syed F. Jamal, 2023). Patients feel that hypertension is a harmless disease. Hypertension often occurs without complaints, so sufferers do not know that they have hypertension but then find that they have a disease or complications from hypertension. This can happen because hypertension usually does not cause obvious symptoms. As a result, patients may not consider it important to take medication.

The aim of this study was to analyze the relationship between knowledge about hypertension and adherence to taking anti-hypertensive medication at the Sungai Bungkal Community Health Center.

METHODS

This research is a quantitative descriptive type with a cross sectional method. The data collection technique was a survey using a questionnaire to determine the level of patient knowledge regarding compliance with taking anti-hypertensive medication at the Sungai Bungkal Community Health Center, Sungai Penuh City.

The questionnaire was prepared based on MMAS-8. To find the relationship, the chi square test was used in SPSS 20. The research was conducted in May 2024. Based on preliminary studies, the number of hypertensive patients in the elderly polyclinic was 192 people, and in the general polyclinic there were 58 people. So, the total population of this study was 250 people. The minimum sample size is calculated using the Slovin formula as follows:

$$\begin{aligned} n &= \frac{N}{1 + Ne^2} \\ &= \frac{250}{1 + (250 \times 0,1)^2} \\ &= \frac{250}{1 + (250 \times 0,001)} \\ &= 71,42 \\ &\Rightarrow 71 \end{aligned}$$

Information :

n = Sample Size

N = Population Size

e = Percent allowance for inaccuracy due to sampling error that is still tolerable or desirable, 10%

The sample results obtained were 71 respondents with the following inclusion criteria: (1) Hypertensive patients registered at the Sungai Bungkal Community Health Center, Sungai Penuh City, (2) Patients who were willing to fill out a questionnaire, (3) Speak Indonesian and can communicate well

The research instruments used were a 10-item hypertension knowledge questionnaire to measure the level of knowledge and an 8-item Morisky Medication Adherence Scale (MMAS-8) questionnaire to measure the level of adherence. Both questionnaires have gone through respondent validity and reliability tests with the same inclusion criteria as the sample.

The knowledge and compliance scores obtained were analyzed to see the relationship between the two, namely the chi-square test.

RESULTS AND DISCUSSION

The level of knowledge of respondents regarding hypertension was obtained as follows:

Table 1. Knowledge Level of Hypertension Patients

Knowledge	F	%
Not Enough	28	39,4%
Enough	26	36,6%
Good	17	23,9%

The frequency results of the knowledge level of hypertensive patients show that many patients have a low level of knowledge, this could be a serious concern in disease management. Low levels of knowledge can result in a lack of understanding about the disease and how to manage it, which can ultimately lead to more serious complications and increased health risks.

The level of respondent compliance can be seen from table 2 as follows:

Table 2. Compliance Level of Hypertension Patients

Obedience	F	%
Low	31	43,7%
Currently	30	42,3%
High	10	14,1%

It was found that the majority had a low level of compliance, 43.7% of respondents, then a moderate level of compliance, 42.3% of respondents, and a high level of compliance, 14.1% of respondents. The distribution of knowledge results based on compliance is as follows:

Table 3. Distribution of Knowledge Based on Compliance

Knowledge	Obedience			Total
	Low	Currently	High	
Good	5 (7,0%)	7 (9,9%)	5 (7,0%)	17 (23,9%)
Enough	8 (11,3%)	15 (21,1%)	3 (4,2%)	26 (36,6%)
Not Enough	18 (25,4%)	8 (11,3%)	2 (2,8%)	28 (39,4%)
Total	31 (43,7%)	30 (42,3%)	10 (14,1%)	71 (100%)

From the results of the chi-square analysis between the level of knowledge and compliance, it was found that there was a relationship between the level of knowledge and the respondent's compliance.

Table 4. Relationship between Knowledge Level and Compliance

Chi-Square Tests				
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	11.133 ^a	4	.025	.023
Likelihood Ratio	10.549	4	.032	.046
Fisher's Exact Test	10.186			.032
N of Valid Cases	71			

Based on the analysis test using chi-square on the expected count value, it was found that there were 3 columns with values less than 5. So that the p-value according to Fisher's Exact Test was 0.032 (<0.05), so a decision could be taken to reject H_0 and accept H_1 or it can be concluded that there is a relationship between the level of knowledge and compliance with taking anti-hypertensive medication at the Sungai Bungkal Community Health Center. This research is in line with research conducted by Ayuningtyas, (2022) with the title "The Relationship between the Level of Knowledge of Hypertension Patients and Compliance with Taking Antihypertensive Medicine at Mulyasari Hospital, North Jakarta" for 83 respondents, the result was a p-value of 0.023.

CONCLUSION

Relationship between the level of patient knowledge and compliance with taking anti-hypertensive medication.

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CONFLICT OF INTEREST

There was no conflict of interest in this article.

REFERENCES

- American Diabetes Association. (2014). *Diagnosis and Classification of Diabetes Mellitus*. Diabetes Care.
- Arikunto, S. (2016). *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta : Rineka Cipta.
- Arsyad Muhammad Iqbal; Syed F. Jamal. (2023). *Hipertensi Esensial*. National Library of Medicine.
- Ayuningtyas, D., Farmasi, F., Studi, P., & Ilmu, S. (2022). Hubungan Tingkat Pengetahuan Pasien Hipertensi terhadap Kepatuhan Minum Obat Antihipertensi di Rumah Sakit Mulyasari Jakarta Utara. *Skripsi Fakultas Farmasi Program Studi Sarjana Ilmu Farmasi Universitas 17 Agustus 1945 Jakarta*.
- Bisnu, M., Kepel, B., & Mulyadi, N. (2017). Hubungan Dukungan Keluarga dengan Derajat Hipertensi pada Pasien Hipertensi di Puskesmas Ranomuut Kota Manado. *Jurnal Keperawatan UNSRAT*, 5(1), 108807.
- Candrayani, D., S. (2020). Hubungan Tingkat Pengetahuan Tentang Hipertensi Dengan Kepatuhan Minum Obat Pada Penderita Hipertensi. *Universitas Muhamadiyah Surakarta*.
- JNC-8. (2014). *The Eight Report of the Joint National Committee. Hypertension Guidelines : In-Depth Guide*. Am J Manag Care.
- Kemenkes RI. (2019). *Fakta dan Angka Hipertensi*. Penyakit Tidak Menular Indonesia.
- Kementerian Kesehatan RI. (2021). Keputusan Menteri Kesehatan Republik Indonesia Nomor HK.01.07/Menkes/4613/2021 Tentang Pedoman Nasional Pelayanan Kedokteran Tata Laksana Hipertensi Pada Anak. https://Yankes.Kemkes.Go.Id/Unduhan/Fileunduhan_1660185729_318602.Pdf, 155.
- Maulida, A. R. (2019). *Tantangan Dalam Mengelola Hipertensi pada Lansia yang Rapuh/Frail dengan Multipel Komorbiditas*.
- Nurroh, S. (2017). *Studi Kasus: Telaah Buku Filsafat Ilmu (Sebuah Pengantar Populer) oleh Jujun S. Suriasumantri. In Assignment Paper of Philosophy of Geography Science*. Yogyakarta: Graduate of School UGM. Yogyakarta: Graduate of School UGM.
- RISKESDAS. (2018). *Hasil Utama RISKESDAS 2018*. Direktorat Jenderal Kesehatan Masyarakat.
- Wardani, N. P. (2022). *Faktor-faktor yang Mempengaruhi Literasi Kesehatan pada Pasien di Puskesmas Kota Jambi*.
- WHO. (2017). *Fakta dan Angka Hipertensi*. Penyakit Tidak Menular Indonesia.
- Zhou, B., & Carrillo-Larco, D. (2021). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. *The Lancet*, 398(10304), 957–980. [https://doi.org/10.1016/S0140-6736\(21\)01330-1](https://doi.org/10.1016/S0140-6736(21)01330-1)

THE RELATIONSHIP OF PARENTING WITH BULLYING BEHAVIOR AMONG ADOLESCENTS IN JAMBI CITY

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ABSTRACT

Background: The prevalence of bullying is estimated at 8 to 50% in some Asian, American and European countries. Research conducted by the National Association of School Psychologists shows that more than 160,000 teenagers in the United States skip school every day for fear of bullying. KPAI disfigured 369 complaints related to bullying in schools. Bullying can occur when a person experiences a form of abuse and humiliation that is systematic and convincing over a long period of time (9-16 days in one month), does not rule out the possibility of occurrence at home due to improper parenting. This study aims to determine the relationship of parenting with bullying behavior at school.

Method: The method used cross-sectional study with subject 100 people proportional random sampling techniques. Data analysed used chi-square with software

Results: The results showed that there was a significant relationship between parenting and bullying behavior (p value <0.05).

Conclusion: Authoritarian and permissive parenting tend to have a greater tendency to bullying children.

Keywords: authoritarian, bullying, democratic, parenting

INTRODUCTION

Bullying is a huge phenomenon all over the world. The prevalence of bullying is estimated at 8 to 50% in some Asian, American and European countries (Murtiarni, 2013). Research conducted by the National Association of School Psychologists shows that more than 160,000 teenagers in the United States skip school every day for fear of bullying. The non-governmental organization (NGO) Plan International and International Center for Research on Women (ICRW), found that seven out of 10 children in Indonesia are exposed to violence at school, according to the results of a study by the National Consortium for character development in 2014, almost every school in Indonesia occurs bullying in the form of verbal and psychological/ mental. Based on the exposure of complex bullying cases, Indonesia has entered the category of

emergency bullying in schools (Annisa, 2014).

Indonesian Child Protection Commission (KPAI), bullying cases in schools occupy the top level of public complaints to the KPAI in the education sector, from 2011 to August 2014 KPAI disfigured 369 complaints related to the problem. The number is about 25% of the total complaints in the field of education as many as 1,480 cases (Setyawan, 2015). Throughout 2018, there were recorded cases of violence against children with the highest record of 336 cases in Jambi province with details of Kerinci regency totaling 30 cases, Merangin 39 cases, Sarolangun 18 cases, Batanghari 27 cases, Muaro Jambi 75 cases, Tanjabtim 12 cases, Tanjabbar 31 cases, Tebo 6 cases, Muaro Bungo 8 cases, Full River 24 cases and Jambi city 96 cases (DP3AP2 Jambi Province, 2018).

The bullying behaviour cannot be separated from the factors that cause it, such as internal factors, namely; self-esteem and

personality. Septrina, Liow, Sulistiyawati & Andrian (2009) said in their research that the higher the self-esteem, the lower the bullying behavior bullying. Tumon (2014) also added that there are 3 external factors that can influence the occurrence of bullying, namely Family, School and peers. Family is the most influential factor in the incidence of bullying (Ahmed & Britewate, 2014). The most decisive family factor is parenting.

Parenting is the way parents play their role, especially in educating their children, starting from making rules, teaching values/norms, and affection. One of the influences on parenting is the environment in which tempat lives. The difference between a family living in a big city and a family living in the countryside is different parenting styles. Families who live in big cities have big worries when their children leave the house, preferably families who live in villages do not have big worries with children who leave the House. In each culture parenting is applied differently, for example, when in a culture are allowed to argue about the rules set by parents, but it does not apply to all cultures. Families with different socioeconomic status yang berbeda juga will also meapply different parentingstyles.

According to Rigby (2008) which explains that bullying category is (intermediate) directly or not, consciously or unconsciously occur at home during the child in the care of parents can be in the form of abuse and humiliation that systematically and convincingly over a long period of time (9-16 days in one month) can make a traumatic experience for the child and become the basis for the emergence of bullying behavior.

In the school the actions include cruel taunts, continued exclusion and some subtle physical threats and attacks, for example pushing, tackling, pulling on clothes. Some things that can be an early indication that a child may be experiencing bullying at school include: difficulty sleeping, wetting the bed, complaining of headaches or stomach, taches,

no appetite or vomiting, acute going to school, crying before or after school, often going to school, are not interested in social activities involving other students, often complain of pain before going to school, often complain of pain to their teachers, and want parents to pick them up immediately, low self-esteem, drastic changes in attitude, behavior, dress, or habits.

Bullying behavior can have a negative influence on psychological status, both in jangka the short and long term on the victim (Fekkes et al., 2006; Milsom & Gallo, 2006; Roberts, 2005 dalam Santrock, 2011). In the short term, they can become depressed, lose interest in schoolwork or not want to go to school. While long-term children can experience anxiety, depression, to suicide. Adolescents who are victims of bullying are more at risk of experiencing various health problems, both physically and mentally. As for the problems that are more likely to be suffered by children who are victims of bullying, they include the appearance of various mental problems such as depression, anxiety and sleep problems that may carry over into adulthood, physical health complaints, such as headaches, abdominal pain and muscle tension, insecurity when in the school environment, and decreased morale learning and academic achievement.

General Objective: This study aims to get an overview of the relationship of parenting with bullying behavior in SMP N 19 Jambi city.

METHOD

This study is a cross-sectional quantitative study. Sampling technique is proportional random sampling. The study was conducted to analyze the relationship of parenting with bullying behavior. The sample was 100 people. An instrument in the form of a questionnaire used to measure bullying behavior and parenting. Data analysed such as coding, processing dan cleaning. Statistical analysis yang used is bivariate with Chi

Square test. Research ethical used
Maleficence, Justice, Anonymous,
Beneficence and Informed consent.

RESULTS AND DISCUSSION

Overview of adolescent knowledge before and after interventions using booklet

Table 1. Descriptive knowledge

Knowledge before Education	n	%
Good	5	13.9
Enough	14	38.9
Less	17	47.2
Total	36	100,0
Knowledge after education	n	%
Good	24	66.7
Enough	11	30.6
Less	1	2.8
Total	36	100.0

Based on table 1, it is known that the knowledge of adolescent girls about anemia before the implementation of education with booklet media as much as 47.2% is still lacking, as many as 38.9% have sufficient knowledge and as many as 13.9% have good knowledge. After implementation with booklet showed can be seen that the knowledge of adolescent girls about anemia after the implementation of education with booklet media as much as 66.7% is well knowledgeable.

The effect of the implementation of education with booklet media in increasing the knowledge of adolescent girls about anemia

Table 2 shows that the results of the t test with p value = $0.000 < 0.05$ means that there is an influence of implementing education using booklet media in increasing the knowledge of young women about anemia at the Garuda Putih Jambi Health Sciences College in 2024. Based on the results of the analysis it is found that the test results t test with p value = $0.000 < 0.05$ means that there is an influence of implementing education using booklet media in increasing young women's knowledge about anemia at the Garuda Putih Jambi Health Sciences College in 2024.

Table 2. Bivariate analysis

Variable	N	Mean	Min	Max	SD	P
Knowledge Before Education	36	11,56	3	18	3,573	0,000
Knowledge After Education	36	16,11	1	20	2,447	

These results show that there was an increase in knowledge after education was carried out using booklet media. This is in accordance with research by Wijayanti & Mulyadi, (2019) that health education using booklets is effective in increasing understanding of anemia patients. Apart from booklets, health education can also be delivered through videos, routine education, poster placement, and by including health messages during classroom learning. Generally, the health education resources available in schools are very limited. Students receive more health information from their teachers and the internet. Booklet media is an alternative health education substitute for textbooks that can be taken anywhere (Kusuma & Pertiwi, 2019; Nasiatin et al., 2021; Pertiwi & Annissa, 2019).

Choosing the right educational media can also influence student learning motivation. Interesting and effective educational media will make students more interested in learning and actively participating in learning activities. Apart from booklets, other educational media that can be used are video, audio, posters or educational games (Dewi Haris, 2018). However, choosing the right educational media must be adjusted to the learning objectives and characteristics of students. By selecting appropriate and effective educational media, it is hoped that health education activities can run more effectively and have a positive impact on increasing students' health knowledge and awareness (Wijayanti & Mulyadi, 2019).

In this study, booklets were used as a medium for Health Education. The booklet contains information related to the concept of adolescent anemia (definition, etiology, risk factors, signs, symptoms, impacts), as well as efforts to prevent and treat anemia in adolescent girls. By providing booklets,

young women can read repeatedly and understand the content of the material in the booklet so that they can indirectly increase knowledge and understanding related to anemia. The booklet media used in this research was developed by the researchers themselves and has been reviewed by several teams of experts from the nursing and pediatric departments who were appointed to review this booklet. The material presented in this booklet consists of the definition of anemia, the causes of anemia, clinical manifestations, the impact of anemia, efforts to prevent and treat anemia. The information presented in the booklet is also accompanied by attractive images that support the information provided, making it easier for young women to understand the information provided through writing and images.

The increase in the average knowledge score of female students from 11.56 to 16.11 was obtained through increasing the understanding obtained through booklet media so that female students were able to understand the problem of anemia in adolescents and were expected to be able to make efforts to prevent and treat anemia. Apart from knowledge, the incidence of anemia in adolescent girls is also influenced by other factors, namely family support, family income, nutritional status and menstruation (Harahap, 2018; Rahayu et al., 2022).

For this reason, one way to increase a person's knowledge is by providing education through counseling using booklets. This is supported by research conducted by Nurul (2006) on "the influence of nutrition education with lectures and booklets on increasing the knowledge of overweight adolescents" with the research results of the group that was given education through booklets experiencing an increase in pre-test knowledge scores which at the start of the research had a good category of as much as 3 subjects (21.4%), the sufficient category was 11 subjects (78.6%) increasing to 8 subjects

(57.2%) in the good category and 6 subjects (42.9%) in the sufficient category at the post-test. This shows that there is a difference in knowledge before and after providing counseling via booklet media regarding knowledge about overweight 35 in adolescents. This increase occurred in connection with the advantages of the booklet, namely that the material contained in the booklet is more complete, more detailed, clear and educative and the preparation of the booklet material is made in such a way as to attract the attention of teenagers, according to the needs and conditions of teenagers. Apart from that, the booklet can also be taken home, so that the subject can read or study it.

Research was also conducted by Minokta Lendra (2018) regarding "the influence of using booklet media on increasing knowledge about energy adequacy of teenagers at SMA Negeri 1 Pontianak". The results of the research show that students' knowledge has increased, this is proven by looking at the mean value of students' knowledge level at 58.5% or an increase of 22.7% to 81.2%. These results can be concluded that there was an increase in the average knowledge score of class students before and after the intervention using booklet media.

This shows that there is a difference in knowledge before and after providing counseling via booklet media regarding knowledge about energy adequacy by teenagers. It is also supported by Suiroaka's research that there is a significant effect of better nutritional knowledge on respondents who were given nutrition education using media compared to respondents who were not given nutrition education without using media.

This is in accordance with Zulaekah who stated that with the Communication, Information and Education (KIE) Program print media is quite effective in conveying nutrition information and education. In the IEC program, print media is more effective in conveying nutritional information and

education, because print media is a static medium, prioritizes visual messages, and generally consists of a number of words, pictures or photos in color, namely in the form of posters, leaflets, brochures, magazines, modules and pocket books. Of the several print media that can be used in IEC programs for children, they include pocket books or booklets and leaflets.

It can be concluded that counseling is a process of planned behavior change in individuals, groups and communities from not knowing about health values to knowing, and from not knowing how to overcome their own health problems to becoming independent. The change in knowledge scores after being given media about anemia to female students was very significant. This change occurred due to factors including: 1). Providing media booklets about anemia, given one by one so that the reception of information is clearer, 2). The counseling intervention uses booklet media about anemia where the media clarifies the ideas or messages conveyed, apart from that it can also recall what was read because this booklet media is not only in the form of pictures but there is writing that explains the images in the media, 3.) Material contained in the booklet media are exactly the same as the pre-test and post-test questionnaire questions, so that young women can immediately understand and answer the post-test questions correctly, 4.) The information provided is in accordance with the students' needs, so that during the intervention the booklet media is given. Students enthusiastically read the information contained in the booklet media.

CONCLUSION

Based on the results of this research, it was concluded that there was an increase in knowledge. Meant that there was an influence of implementing education using booklet media in increasing young women's knowledge about anemia at the Garuda Putih Jambi Health Sciences College in 2024.

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CONFLICT OF INTEREST

There was no conflict of interest in this article.

REFERENCES

- Arikunto, S. 2010. *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta: Rineka Cipta.
- Ashar, T. (2016). *Potensi Pendidikan Gizi Dalam Meningkatkan Asupan Gizi Pada Remaja Putri Yang Anemia Di Kota Medan*. *Kesehatan Masyarakat*, 11(2)
- Budiman & Riyanto A. 2013. *Kapita Selekta Kuisisioner Pengetahuan Dan Sikap Dalam Penelitian Kesehatan*. Jakarta : Salemba Medika pp 66-69.
- Chaparro C, Oot L, Sethuraman K. 2014. *Overview of the Nutrition Situation in Seven Countries in Southeast Asia*. Washington, DC: FHI 360/FANTA.
- Devinia. 2020. *Hubungan pola makan dan status sosial ekonomi dengan kejadian anemia, systematic review*.
- Firdaus, Rahmi and Rahmat, Mamat and Asep, Asep Iwan Purnawan and Fred, Agung S (2021) *Pengaruh Edukasi Gizi Menggunakan Media E-Booklet Anemia Terhadap Pengetahuan Anemia dan Perilaku Konsumsi Makanan Sumber Zat Besi Pada Remaja Putri Di SMA Negeri 1 Cisarua Bogor*. Diploma thesis, Politeknik Kesehatan Kemenkes Bandung.
- Herwandar, F. R. and Soviyati, E. (2020) *'Perbandingan Kadar Hemoglobin Pada Remaja Premenarche Dan Postmenarche Di Desa Ragawacana*

- Kecamatan Kramatmulya Kabupaten Kuningan Tahun 2018', *Jurnal Ilmu Kesehatan Bhakti Husada: Health Sciences Journal*, 11(1), pp. 71–82. doi: 10.34305/jikbh.v11i1.154
- Imran, N, Indriasari, R. and Najamuddin, U. (2015) 'Pengetahuan dan Sikap Tentang Anemia dengan Status Hemoglobin Remaja Putri di SMA N 10 Makasa
- Izzani, R. (2018). Hubungan Tingkat Pengetahuan Dengan Perilaku Konsumsi Tablet FE Saat Menstruasi Pada Mahasiswi FKM UNAIR Surabaya. Vol 7, No 1.
- Kalsum, U, dan Halim, R. 2016. Kebiasaan Sarapan Pagi Berhubungan Dengan Kejadian Anemia Pada Remaja Di SMA NEGERI 8 Muaro Jambi. *Jurnal penelitian Universitas Jambi Seri Sains*. 18(1), 09-19
- Kartasapoetra, Marsetyo, Med. Ilmu Gizi. Jakarta: Rineka Cipta; 2010.
- Kementerian Kesehatan Republik Indonesia. 2018. Riset kesehatan dasar (riskesdas) 2018. Badan penelitian dan pengembangan kesehatan Kementerian kesehatan Republik Indonesia. Jakarta
- Kemenkes RI. 2016. Program Pencegahan Penanggulangan Anemia pada Remaja. Putri dan WUS. Jakarta: Kementrian Kesehatan Republik Indonesia; 2016.
- Kemenkes RI. 2021. Program Pencegahan dan Penanggulangan Anemia pada Remaja. Putri dan WUS. Jakarta: Kementrian Kesehatan Republik Indonesia.
- Kemenkes RI. 2015. Pedoman Penatalaksanaan Pemberian Tablet Tambah Darah. Jakarta Kemenkes RI
- Lindung Purbadewi, dkk. 2013. Hubungan Tingkat Pengetahuan tentang Anemia dengan Kejadian Anemia pada Ibu Hamil. Universitas Muhammadiyah Semarang.
- Madanijah .S. (2014). Pola Konsumsi Pangan Dalam Sistem Pangan Dan Gizi. ed. Dwiariani Y, Baliwati., A, Khomsan., CM. Jakarta: Penebar Swadaya.
- Nursalam. 2013. Metodologi Penelitian Ilmu Keperawatan: Pendekatan Praktis : Jakarta : Salemba Medika
- Notoatmodjo, 2010 Pendidikan dan Perilaku Kesehatan. Jakarta : Rineka Cipta.
- Notoatmodjo, S. 2012. Metode Penelitian Kesehatan. Jakarta: PT Rineka Cipta
- Nurul R.D. 2016. Pengaruh Edukasi Gizi dengan Ceramah dan Booklet terhadap Peningkatan Pengetahuan dan Sikap Gizi Remaja Overweight. Artikel Penelitian. Semarang: Universitas Diponegoro
- Nikmah (2021) dengan judul Pengaruh Pemberian Edukasi Gizi Dengan Media E-Booklet Terhadap Pengetahuan Dan Sikap Mengenai Anemia Pada Remaja Putri Di Smp N 1 Gemuh Kabupaten Kendal.
- Parwiyati, S., W. Sumekar dan D. Mardingsih. 2014. Pengaruh Penggunaan Media Booklet Pada Peningkatan Pengetahuan Peternak Kambing Tentang Penyakit Scabies Di KTT Ngupoyo Sato Desa Wonosari Kecamatan Patebon Animal Agriculture Journal 3(4):581-585, Desember 2014 Online at : <http://ejournals1.undip.ac.id/index.php/aaaj>
- Proverawati, 2018. Anemia dan anemia kehamilan. Penerbit Buku Nuha Medika. Yogyakarta
- Prihananto, 2004. Fortifikasi Pangan sebagai Upaya Penanggulangan Anemia Gizi Besi, IPB: Bogor
- Rahayu, dkk (2020). Buku Ajar Dasar-Dasar Gizi. Yogyakarta. Penerbit CV Mine
- Reeder, S.J., Martin, L.L. & Koniak-Griffin, D. (2014). Keperawatan Maternitas: Kesehatan Wanita, Bayi, & Keluarga, Volume 2, Edisi 18. Jakarta: EGC
- Rukiyah A. 2015. Asuhan kebidana III Nifas. 2nd ed. Jakarta: cv. Trans Info. Media;
- Sandra, dkk. (2017). Gizi anak dan remaja. Ed. 1. Cet. 1. Depok : Rajawali Pers
- Saryono. (2017). Metodologi Penelitian

Kesehatan. Yogyakarta: Mitra
Cendekia Press

Utami, A. dkk. (2021) Anemia Pada Remaja
Putri. Semarang: Fakultas Kedokteran.
Universitas Diponegoro

Wawan dan Dewi, 2010, Teori dan
Pengukuran Pengetahuan, Sikap dan
Perilaku Manusia, Yogyakarta : Nuha
Medika

World Health Organization, 2019. Global
health observatory data
repository/world health statistics.
Prevalence of anemia among pregnant
women. The world bank

UTILIZATION OF SNAKEHEAD FISH MEAL (*CHANNA STRIATA*) AND PUMPKIN FLOUR (*CUCURBITA MOSCHATA*) AS A FORMULA FOR ENTERAL DIABETES MELITUS

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ABSTRACT

Background: Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting accompanied by carbohydrate, protein and fat metabolism disorders from defects in insulin secretion, insulin action, or both. High protein in snakehead fish and pectin in pumpkin are claimed to function as antioxidants, anti-diabetic and can control glycemic level. The purpose development enteral formula for patients diabetes mellitus from snakehead fish flour and pumpkin flour.

Method: This was an experimental study with a completely randomized design of the factors that formulation (formula 1, 2 and 3). Characteristics analyzed are energy, protein, carbohydrates, fat, dietary fiber, colour, viscosity, pH and total plate count. Statistical analysis was done by using friedman test.

Result: The Friedman test is conducted to determine whether one formula is significantly more preferred than the other formulas based on the rank scores provided by the respondents. Friedman test showed that formula F1 is the most preferred formula with the mean rank is 2.13. In 100 grams formula F1 contains total energy 134.09 kcal, 9.47% protein, fat 3.05%, carbohydrates 24.44%, dietary fiber 5.90%. Physical and microbiological characteristics formula F1 are colour test L (56.3), a (5.1) b (12.4), pH 5.95, viscosity 47.9 mPa.s and total plate count after incubation 2x24 hours that is 3.5×10^6 coloni/ml. **Conclusion:** The most preferred formula is Formula F1, with a mean rank of 2.13 according to the Friedman test. The enteral Formula F1 contains 5.90% dietary fiber. Based on microbiological testing, the total plate count after 2x24 hours of incubation is 3.5×10^6 CFU/ml.

Keywords: Diabetes mellitus; Enteral formula; Snakehead fish flour; Pumpkin flour

INTRODUCTION

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia accompanied by impaired carbohydrate, protein and fat metabolism due to impaired insulin secretion, insulin action or both. According to the World Health Organization (WHO), Indonesia has the fourth highest number of DM patients in the world after India, China and the United States, and it is estimated that by 2030 there will be an increase in the number of DM patients in Indonesia by 21.3 million (WHO, 2016).

Report on Result of National Basic Health Research (Riskesdas) 2018 shows that the prevalence of DM according to doctor's diagnosis at the age of over 15 years in Indonesia is 2%. While the prevalence of DM based on blood tests at the age of over 15 years is 8.5% (Ministry of Health RI, 2018). Based on data from the Central Bureau of Statistics of South Sumatra Province in 2019, Diabetes Mellitus is included in the 10 highest diseases suffered by the population of South Sumatra with a total of 71,031 cases. According to Tjekyan in his research, in 2010 the incidence of type II Diabetes Mellitus sufferers in 78 RTs of Palembang

Municipality was 401 (3.2%) sufferers out of 12,01 total population (Tjekyan, 2014).

Diabetics often have other disorders, such as hyperglycemia and hypoglycemia. In fact, there are often cases of patients with DM with gangrene disorders or diabetic ulcers. Hyperglycemia is a medical condition where there is an increase in blood glucose levels beyond normal limits, namely blood glucose levels > 300 mg/dl. One way to control blood glucose levels is to adjust the diet by eating foods that have a low Glycemic Index (GI) and are high in fiber (Soelistijo *et al.*, 2015). Management of DM can be done by pharmacological and nonpharmacological management. Pharmacological management is in the form of intervention with antidiabetic drugs both orally and injections. While non-pharmacological management is the application of a healthy lifestyle, by carrying out medical nutrition diet therapy and physical activity (Marinda *et al.*, 2016).

Providing nutritional diet therapy for patients with DM can be done by providing enteral formula. Enteral formula therapy aims to maintain blood glucose levels close to normal and avoid acute complications. In addition, the administration of enteral formula should be considered when it is unsafe for DM patients to consume food orally or when oral intake is insufficient to meet nutritional needs. Enteral formula for diabetes mellitus in Indonesia is generally still widely available in the form of commercial enteral formula with a relatively expensive price, causing DM patients to incur large costs in treatment. In addition, there are still few hospitals enteral formulas that utilize local food ingredients that have potential as antidiabetics and antihyperglycemia. So, to solve these problems, innovation is needed in the development of local food-based diabetes mellitus enteral formulas.

The utilization of snakehead fish and pumpkin processed in the form of flour is still relatively unvaried, limited to making cookies, donuts, noodles and puddings. The

development of enteral formulas made from snakehead fish flour is still relatively rare, previous research conducted by (Eny *et al.*, 2018) snakehead fish was used as an extract for people with diabetes mellitus who have gangrene disorders, and the results showed that an increase in albumin and can accelerate healing in gangrene wounds (Eny *et al.*, 2018). The results of previous research, enteral formulas made from pumpkin have a significant effect on blood glucose levels (Hawa & Murbawani, 2015). Based on previous studies, there is no enteral formula that combines the two ingredients into one formula intended for people with diabetes mellitus, so researchers are interested in conducting research with the title "Utilization of snakehead Fish Flour (*Channa Striata*) and Yellow Pumpkin Flour (*Cucurbita Moschata*) as a Diabetes Mellitus Enteral Formula". This study aims to determine the fomulation, physical characteristics, microbiological chemistry and acceptability test as well as the utilization of snakehead fish and pumpkin flour as enteral formula for diabetes mellitus.

METHODS

This type of research is a laboratory experimental research, with a non-factorial completely randomized design (CRD) experimental design.

Table 1. Diabetes Mellitus Enteral Formula Formulation

Material (g)	F1	F2	F3
Skim Milk Powder	140	140	140
Snakehead Fish Flour	55	60	57
Pumpkin Flour	60	55	58
Coconut Oil	20	20	20
Stevia	20	20	20
Maltodextrin	20	20	20
Total weight	315	315	315

Procedure for Making Snakehead Fish Meal

The making of snakehead fish flour was carried out using the modified method of (Hana, 2017) which is as follows, during the day, wash the fish and fish fillets, then soak the fish in lemon juice solution for 10 minutes.

Steam the fish for 30 minutes, after steaming, the fish is drained by leaving it in the open air. The fish is dried using an oven at 55° for 20 hours. The dried meat pulp is immediately pulverized and sieved to obtain fine fishmeal.

Procedure for Making Pumpkin Flour

Preparation of flour from pumpkin fruit was carried out using a modified method (Hendrasty, 2003) which is as follows, peel the pumpkin and wash it thoroughly. Thinly slice the pumpkin with a thickness of 22 mm, width of 3 mm, length of 50 mm. Next, drying was carried out at a temperature of 75° C for 7 hours. After that, pulverization is carried out using a blender and filtered using an 80 mesh sieve.

Procedure for Making Enteral Formula

Mix snakehead fish flour, pumpkin flour, skim milk powder, stevia leaves, and maltodextrin. Then stir until well combined using a mixer. Gradually add coconut oil while continuing to stir. After mixing, sift the powder mixture. The enteral formula is now ready to be brewed and tested for viscosity.

Data Collection, Processing, and Analysis

The formulation determination, enteral DM formula preparation, acceptance test, and pH and viscosity tests will be conducted at the Food Science and Technology Laboratory (THP) of the Department of Nutrition, Poltekkes Kemenkes Palembang. The proximate analysis test will be conducted at the Saraswanti Genetech Laboratory in Bogor, and the microbiological test will be conducted at the Agricultural KHP Laboratory of Sriwijaya University. The panelists used are semi-trained panelists, consisting of 25 students from the Department of Nutrition at Poltekkes Kemenkes Palembang. The panelists are given an evaluation form, which includes four criteria: color, taste, aroma, and texture/consistency. The evaluation uses a hedonic scale with the following ratings: very much like (4), like (3), dislike (2), and very much dislike (1).

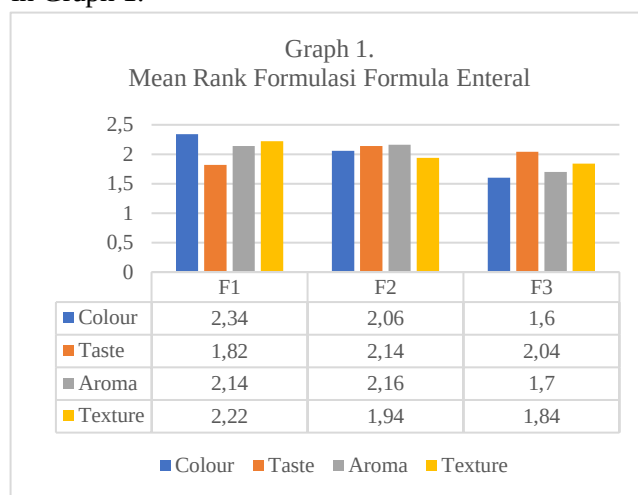
The acceptance test results of the selected formulation are then analyzed for nutritional content using proximate analysis (energy, protein, fat, carbohydrates, and dietary fiber) in the laboratory. Additionally, the selected formulation undergoes physical tests, including color analysis, pH, and viscosity. The acceptance test data are input and processed using statistical software with univariate analysis and the Friedman test. The acceptance data, nutritional values, and physical properties are presented in tabular form and graph.

RESULTS AND DISCUSSION

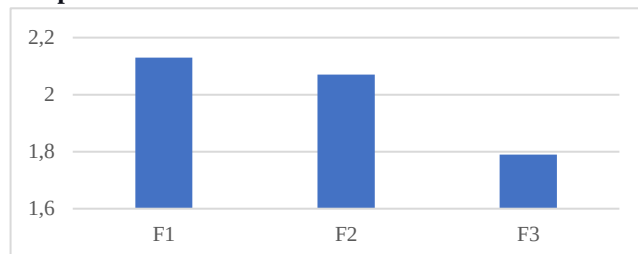
RESULTS

Organoleptic Test Results for Enteral Formula with Snakehead Fish Flour and Pumpkin Flour

The results of the organoleptic acceptance test for the enteral formula with snakehead fish flour and pumpkin flour, which underwent Friedman test analysis, can be seen in Graph 1.



Graph 1. Mean Rank Formulation Formula Enteral



Graph 2. Average Ranking Scores of Enteral Formula with Snakehead Fish Flour and Pumpkin Flour

The highest overall preference rating (F1) was achieved with the addition of 55 grams of snakehead fish flour + 60 grams of pumpkin flour. This was followed by enteral formula F2 (60 grams snakehead fish flour + 55 grams pumpkin flour) and enteral formula F3 (57 grams snakehead fish flour + 58 grams pumpkin flour). It can be observed that higher additions of snakehead fish flour tend to decrease the overall acceptance of the enteral formula. This trend is influenced by the appearance, aroma, taste, and texture overall.

Proximate Analysis Results of Enteral Formula with Snakehead Fish Flour and Pumpkin Flour

Proximate analysis conducted includes examination of protein, fat, carbohydrate, and dietary fiber content. Research results on the nutritional content of enteral formula from snakehead fish flour and pumpkin flour are shown in Table 2.

Table 2. Comparison of Proximate Analysis Results of Enteral Formula with Snakehead Fish Flour and Pumpkin Flour with Standards

Parameter	Formula F1	Standard
Total Energy (kcal/100g)	163.09	-
Protein (%)	9.47	8.5-10 ^a
Fat (%)	3.05	8-9.7 ^a
Carbohydrates (%)	24.44	22-25.4 ^a
Dietary fiber (%)	5.90	2.4-5 ^a
Energy Density (kal/ml)	0.55	0.5-2.0 ^b

Source: ^a) (ASPEN, 2014) and ^b) (Rolfes *et al.*, 2006)

Measurement Results of Physical Properties of Enteral Formula with Snakehead Fish Flour and Pumpkin Flour

Table 3. Comparison of Characteristics of Enteral Formula with Snakehead Fish Flour and Pumpkin Flour with Standards

Characteristics	Formula F1	Standard
Colour	L 56.3	-
	a 5.1	
	b 12.4	
pH	5.95	>3,5 ^a
Viscosity (cP)	47.9	1-50 ^b

Source: ^a) (Nilesh *et al.*, 2011) ^b) (ADA, 2002)

Measurement Results of Microbiological Properties of Enteral Formula with Snakehead Fish Flour and Pumpkin Flour

The enteral formula with snakehead fish flour and pumpkin flour was diluted to 10⁻⁶, then cultured in agar media. The bacterial count was measured after incubation for 2x24

hours, resulting in 3.5 x 10⁶ colonies/ml. This indicates that the bacterial count does not meet the requirements according to the SNI 2009 standard, which is 5 x 5 x 10⁴ colonies/ml.

DISCUSSION

Color

Most panelists preferred the F1 treatment because its color and appearance most closely resembled milk. In the F2 and F3 treatments, the color of the enteral formula was slightly darker. The enteral formula with snakehead fish flour and pumpkin flour had a yellowish-white color with a slight greenish-black tint. As the proportion of snakehead fish flour and pumpkin flour increased, the resulting enteral formula became whiter and more yellow. The white color is influenced by skim milk and maltodextrin, while the yellow color is influenced by pumpkin flour and snakehead fish flour, which undergo color changes due to the drying process. The greenish-black color comes from stevia powder.

Taste

Most panelists preferred the taste of the enteral formula in the F2 treatment compared to the F1 and F3 treatments. This is because the enteral formula in the F2 treatment had a more ideal taste compared to F1 and F3. The F1 and F3 treatments still had a slightly off-flavor, due to a higher pumpkin flour content compared to snakehead fish flour. The taste of the enteral formula with snakehead fish flour and pumpkin flour had a sufficient level of sweetness because the proportions of stevia powder and maltodextrin in the F1, F2, and F3 formulas were the same. This formula has a unique taste due to the pumpkin and snakehead fish, which are generally consumed as dishes and rarely as beverages.

Aroma

The enteral formula with snakehead fish flour and pumpkin flour has a distinctive aroma derived from skim milk, snakehead fish flour, pumpkin flour, stevia powder, and Virgin Coconut Oil (VCO). The VCO and

stevia powder add a rich aroma to this formula. The F2 formula was the most preferred because it had a lower proportion of pumpkin flour compared to the F1 and F3 formulas. Pumpkin flour has a distinctive and slightly off aroma, so an increase in its proportion leads to a decrease in the panelists' preference.

Texture

The texture of the enteral formula with snakehead fish flour and pumpkin flour is in powder form with medium particle size, and when dissolved, the formula becomes homogeneous, though with some fine sediment from the stevia powder. Skim milk and maltodextrin also influence the texture of the enteral formula with snakehead fish flour and pumpkin flour.

Protein

The protein content of the enteral formula with snakehead fish flour and pumpkin flour is 9.47% of the total calories. This indicates that the formula meets the requirements for a diabetes enteral formula, which according to ASPEN (2014), should be 8.5-10% of the total energy. This enteral formula is formulated to be high in protein. The protein in the enteral formula with snakehead fish flour and pumpkin flour comes from snakehead fish, which is rich in essential amino acids and contains albumin. The albumin in snakehead fish is of higher quality compared to albumin in eggs. The high protein value in this formula is beneficial for diabetic patients experiencing hypoalbuminemia caused by gangrene, as they require a substantial protein intake (Sayuningsih *et al.*, 2018).

Fat

The fat content of the enteral formula with snakehead fish flour and pumpkin flour is 3.05% of the total calories. This indicates that the formula does not meet the requirements for a diabetes enteral formula, which according to ASPEN (2014), should be 8-9.7% of the total energy. This is because snakehead fish is a type of fish that has high

protein content and low fat. The fat in the enteral formula with snakehead fish flour and pumpkin flour comes from Virgin Coconut Oil (VCO). Virgin Coconut Oil can help manage hyperglycemia and improve glucose tolerance because it has antioxidant effects that enhance insulin secretion (Iranloye *et al.*, 2013).

Carbohydrate

The carbohydrate content of the enteral formula with snakehead fish flour and pumpkin flour is 24.44% of the total calories. This indicates that the formula meets the requirements for a diabetes enteral formula, which according to ASPEN (2014), should be 22-25.4% of the total energy. The low carbohydrate content in this enteral formula follows the principles of diabetic enteral nutrition, which emphasizes low-carbohydrate intake. The main source of carbohydrates in this enteral formula is pumpkin flour. The polysaccharides in pumpkin flour can increase insulin levels and improve glucose tolerance, thereby reducing blood glucose levels. This is supported by research conducted by Zhang *et al.* (2013).

Dietary Fiber

The dietary fiber content of the enteral formula with snakehead fish flour and pumpkin flour is 5.90% of the total calories. This indicates that the formula meets the requirements for a diabetes enteral formula, which according to ASPEN (2014), should be 2.4-5% of the total energy. The fiber in this enteral formula comes from pumpkin flour. It is known that pumpkin contains soluble fiber such as pectin, which is believed to help control glucose absorption (Hartono, 2004).

Energy density

The energy density of the enteral formula with snakehead fish flour and pumpkin flour is 0.55 calories/ml. This indicates that the formula meets the requirements, as according to Rolfes *et al.* (2006), the recommended range is 0.5-2.0 calories/ml. Energy density is calculated by dividing the energy content by volume. Low energy density is beneficial for

diabetic patients with obesity. Each serving of the enteral formula with snakehead fish flour and pumpkin flour consists of 75 grams of the formula dissolved in 200 ml of warm water, providing 122.3 calories per serving.

Color

The color analysis results of the enteral formula with snakehead fish flour and pumpkin flour showed an L value of 56.3 for brightness. This is due to the dark color of the pumpkin flour and the addition of stevia powder, which makes the enteral formula slightly darker. The a value, indicating the intensity of red color in the enteral formula with snakehead fish flour and pumpkin flour, is 5.1. The red color in the formula comes from the pumpkin flour. The b value, indicating the intensity of yellow color in the formula, is 12.4. The yellow color is produced by the pumpkin flour, due to the drying temperature used in the process of making the pumpkin flour.

pH

The pH value of the enteral formula with snakehead fish flour and pumpkin flour is 5.95. This indicates that the formula meets the requirement according to (Nilesh *et al.*, 2011), which states that the pH should be >3.5. The enteral formula with snakehead fish flour and pumpkin flour is acidic in pH, influenced by the skim milk content that contains lactose. The conversion of lactose to lactic acid occurs naturally due to the activity of microorganisms, which produce lactic acid and lower the pH (Umar, 2014).

Viscosity

The viscosity value of the enteral formula with snakehead fish flour and pumpkin flour is 47.9 mPa.s. This indicates that the formula meets the requirement according to ADA (2002), which suggests a range of 1-50 cP (centipoise). Viscosity measurement was conducted using an ndj-8s viscometer. Viscosity can be influenced by the composition of the enteral formula with snakehead fish flour and pumpkin flour, which contains pectin as a thickening agent

(Wakita *et al.*, 2012).

Microbiology

During the process of making the enteral formula, researchers followed the manufacturing procedure and storage guidelines. Temperature is one of the factors that can affect the growth of food spoilage microbes. According to research by Annisa *et al.* (2020), most microbes thrive between temperatures of 20°C to 45°C. The enteral formula is prepared at 70°C, and then stored, allowing the temperature to decrease, which can result in the formula being unfit for consumption if more than one hour passes after preparation. In studies such as Vieira *et al.* (2018), non-commercial diets have shown higher microbiological contamination and lower adherence to microbiological standards.

CONCLUSION

The enteral formula with snakehead fish flour and pumpkin flour, containing snakehead fish flour, pumpkin flour, virgin coconut oil, stevia, and maltodextrin, can be recommended as a supplementary food or meal replacement for diabetic patients. The most preferred formula is Formula F1, it offers high fiber content low carbohydrate content high protein content and low-fat content

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CONFLICT OF INTEREST

All authors declare that there is no conflict of interest.

REFERENCES

- Adams, G. G., Imran, S., Wang, S., Mohammad, A., Kok, S., Gray, D. A., Channell, G. A., Morris, G. A., & Harding, S. E 2011, 'The hypoglycaemic effect of pumpkins as anti-diabetic and functional medicines', *Food Research International*, Vol. 44, Issue 4, pp. 862–867. <https://doi.org/10.1016/j.foodres.2011.03.016>
- Akbaylar, H 2002. 'Basic principles of enteral feeding', *Turkish Journal of Gastroenterology*, Vol. 13, Issue 4, pp. 186–191.
- Almatsier S. 2005. *Penuntun Diet*. Penerbit PT Gramedia Pustaka Utama. Jakarta.
- American Diabetes Association. 'Diagnosis and Classification of Diabetes Melitus', *Diabetes Care* Jan 2014;37 Suppl 1:S81-90.
- Annisa, W. I., Ardiaria, M., Rahadiayanti, A., Fitranti, D. Y., Dieny, F. F., Afifah, D. N., & Nissa, C 2020, 'Microbiology quality and shelf life analysis of enteral formulas based on tempeh flour and yam flour', *Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition)*, 8(2), 85–91. <https://doi.org/10.14710/jgi.8.2.85-91>
- Asosiasi Dietisien Indonesia (AsDI) Cabang Jawa Barat. 2005. Panduan Pemberian Makanan Enteral. Dalam Jurnal Formulasi Makanan Enteral Berbasis Tepung Tempe Sebagai Alternatif Makanan Enteral Tinggi Protein. Available at: <https://doi.org/10.34011/juriskesbdg.v11i2.702>
- Buckle K.A., R.A. Edward, W.R. Day, G.H. Fleet dan, M. Wootton 2010, *Ilmu Pangan*, Universitas Indonesia Press, Jakarta.
- Clinical Nutrition Week 2014 2014. *Journal of Parenteral and Enteral Nutrition*, 38(1), 124–149. <https://doi.org/10.1177/0148607113516083>
- Desnilasari, D., & Kumalasari, R 2017. 'Characteristic of Fermented Drink from Whey Cheese with Addition of Mango (Mangifera x odorata) Juice', *IOP Conference Series: Earth and Environmental Science*, 101(1). <https://doi.org/10.1088/1755-1315/101/1/012024>
- Diagnosis and classification of diabetes melitus. 2014. *Diabetes Care*, 37(SUPPL.1). <https://doi.org/10.2337/dc14-S081>
- Eny Sayuningsih, Ani Intiyati, B. G. R 2018, 'Kadar Albumin Darah Pada Penderita Diabetes Melitus Dengan Gangren', *Jurnal Penelitian Kesehatan*, 61–68.
- Gaman P. & Sherrington 1994. *Pengantar Ilmu Pangan Pengantar Ilmu Pangan Nutrisi dan Mikrobiologi*. Gajah Mada University Press, Yogyakarta.
- Guillon, F., & Champ, M 2000, 'Structural and physical properties of dietary fibres, and consequences of processing on human physiology', *Food Research International*, 33(3–4), 233–245. [https://doi.org/10.1016/S0963-9969\(00\)00038-7](https://doi.org/10.1016/S0963-9969(00)00038-7)
- Hartono A 2004, *Terapi Gizi & Diet Rumah Sakit*, Edisi 2, EGC, Jakarta.
- Hawa, I. I., & Murbawani, E. A 2015. 'Pengaruh Pemberian Formula Enteral Berbahan Dasar Labu Kuning (Cucurbita Moschata) Terhadap Kadar Glukosa Darah Postprandial Tikus Diabetes Melitus' *Journal of Nutrition College*, 4(4), 387–393. <https://doi.org/10.14710/jnc.v4i4.10115>
- Hendrasty, H.K 2003. *Tepung Labu Kuning, Pembuatan dan Pemanfaatannya*. Penerbit Kanisius. Yogyakarta (E-Book). Available at: https://books.google.com/books/about/Teknologi_Pengolahan_Pangan_Tepung_Labu.html?id=7MnEnbfcQC
- Iranloye, B., Oludare, G., & Olubiyi, M 2013. 'Anti-diabetic and antioxidant effects of virgin coconut oil in alloxan induced diabetic male Sprague Dawley rats', *Journal of Diabetes Mellitus*, 3(4), 221–226. <https://doi.org/10.4236/jdm.2013.34034>
- Joshi, I., Sharma, K and 2014, 'Formulation of standart (nutriagent std) and high protein (Nutriagent Protein Plus)

- Ready to Constitute Enteral Formula Feeds', *International Journal of Scientific & Tecnology Research*, Vol:3(5).
- Kawasaki, N. 2010, 'Effects of Gelatinization of Enteral Nutrients on Human Gastric Emptying', *Journal Gastroenterology Research*.
<https://doi.org/10.4021/gr2010.06.213>
- Kementerian Kesehatan RI. 2018. Risesdas. In *Laporan Risesdas Nasional 2018*.
- L. Buchori 2007, 'Pembuatan Gula Non Karsinogenik Non Kalori Dari Daun Stevia', *Reaktor*, 11, 57–60.
http://eprints.undip.ac.id/427/1/Artikel_Luqman_Buchori.pdf
- Lestari, D. N. 2017, 'Sifat Fisik, Ph Dan Angka Kuman Makanan Cair Formula Rumah Sakit Dan Formula Komersial Berdasarkan waktu Tunggu Di Rsud Muntilan Kabupaten Magelang', Skripsi, Poltekkes Kemenkes Yogyakarta, Yogyakarta.
- Listyanto, N., & Andriyanto, S 2009, 'Ikan Gabus (*Channa Striata*) Manfaat Pengembangan Dan Alternatif Teknik Budidayanya', *Media Akuakultur*, 4(1), 18.
<https://doi.org/10.15578/ma.4.1.2009.18-25>
- Lukito W, Tambunan V, Gunawan I, Ambarwati FD 2008. *Pedoman Praktis Pemilihan Formula Nutrisi Enteral*. Perhimpunan Dokter Spesialis Gizi Klinik Indonesia, Jakarta.
- Mahardika, N 2017, 'Analisis Komposisi Kimia Daging dan Tepung Ikan Gabus (*Channa striata*)', *Journal of Chemical Information and Modeling*, 53(9), 1689–1699.
<https://doi.org/10.1017/CBO9781107415324.004>
- Mahmud, M. K., Hermana, Nazarina, Zulfianto, N. A., Marudut, Jahari, A. B., 2017, Tabel Komposisi Pangan Indonesia 2017, Jakarta : Persagi
- Marinda, F. D., Suwandi, J. F., & Karyus, A 2016, 'Tatalaksana Farmakologi Diabetes Melitus Tipe 2 pada Wanita Lansia dengan Kadar Gula Tidak Terkontrol', *J Medula Unila*, 5(2), 7.
- Mokhalalati, J. K., Druyan, M. E., Shott, S. B., & Comer, G. M 2004, 'Microbial, nutritional and physical quality of commercial and hospital prepared tube feedings in Saudi Arabia', *Saudi Medical Journal*, 25(3), 331–341.
- Moritoh, Y., Takeuchi, K., & Hazama, M 2009, 'Voglibose, an alpha-glucosidase inhibitor, to increase active glucagon-like peptide-1 levels', *Molecular and Cellular Pharmacology*, 1(4), 188–192.
<https://doi.org/10.4255/mcpharmacol.09.22>
- Nilesh, M. R., Vilas, P. A., Ambadas, J. S., & Nilesh, M 2011, 'Formulation Development of Enteral Nutrition Products', *International Research Journal of Pharmacy*, 2(3), 19–28.
- Perkeni, 2015, *Konsensus Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 di Indonesia*, 5th ed., Perkeni, Jakarta.
- Prastari, C., Yasni, S., & Nurilmala, M 2017, 'Karakteristik Protein Ikan Gabus Yang Berpotensi Sebagai Antihiperglikemik', *Jurnal Pengolahan Hasil Perikanan Indonesia*, 20(2), 413–423.
<https://doi.org/10.17844/jphpi.v20i2.18109>
- Pratiwi, L. E., & Noer, E. R 2014, 'Analisis Mutu Mikrobiologi Dan Uji Viskositas Formula Enteral Berbasis Labu Kuning (*Curcubita Moschata*) Dan Telur Bebek' *Journal of Nutrition College*, 3(4), 951–957.
<https://doi.org/10.14710/jnc.v3i4.6915>
- Rolfes SR, Pinna K, Whitney E 2006, *Understanding Normal and Clinical Nutrition*, 8th ed p. 113–115; 663–667, Wadsworth Cengage Learning, USA.
- Santoso, A. H. 2009, 'Uji potensi ekstrak ikan gabus (*Channa striata*) sebagai Hepatoprotector pada tikus yang diinduksi dengan parasetamol', Tesis, Institut Pertanian Bogor, Bogor.
- Sedigheh, A., Jamal, M. S., Mahbubeh, S., Somayeh, K., Mahmoud, R. kopaei, Azadeh, A., & Fatemeh, S 2011, 'Hypoglycaemic and hypolipidemic

- effects of pumpkin (cucurbita pepo l.) on alloxan-induced diabetic rats', *African Journal of Pharmacy and Pharmacology*, 5(23), 2620–2626. <https://doi.org/10.5897/AJPP11.635>
- Shafri, M., & Manan, A 2012, 'Therapeutic potential of the haruan (*Channa striatus*): From food to medicinal uses', *Malaysian Journal of Nutrition*, 18(1), 125–136.
- Soekarto. T. S 1985, *Penilaian Organoleptik untuk Industri Pangan dan Hasil Peternakan*. Bhartara Karya Aksara, Jakarta.
- Standar Nasional Indonesia 2005. *MP-ASI Bubuk SNI 01-7111.1-2005*. Badan Standarisasi Nasional, Jakarta.
- Susanti, K., I, Taruna, I., dan S 2012, 'Kajian Fisik Tepung Kecambah Kacang Hijau Hasil Pengeringan Fluidized Bed Dryer Study on the Physical Properties of Fluidized Bed Dried Mung Beans Sprouts Powders', *Teknologi Pertanian*.
- Tjekyan, R 2014, 'Angka Kejadian dan Faktor Risiko Diabetes Melitus Tipe 2 di 78 RT Kotamadya Palembang Tahun 2010', *Majalah Kedokteran Sriwijaya*, 46(2), 85–94.
- Trisnawati, S. K., & Setyorogo, S 2013, 'Faktor Risiko Kejadian Diabetes Melitus Tipe II Di Puskesmas Kecamatan Cengkareng Jakarta Barat Tahun 2012', *Jurnal Ilmiah Kesehatan*, 5(1), 6–11.
- Triyono, A 2010, 'Mempelajari Pengaruh Maltodekstrin dan Susu Skim Terhadap Karakteristik Yoghurt Kacang Hijau (*Phaseolus radiatus* L.)', Seminar, 1–8.
- Umar, 2014, 'Derajat Keasaman dan Angka Reduktase Susu Sapi Pasteurisasi dengan Lama Penyimpanan yang Berbeda', Tesis, Universitas Syiah Kuala.
- Usha, R., Lakshmi, M., & Ranjani, M 2010, 'Nutritional, sensory and physical analysis of pumpkin flour incorporated into weaning mix', *Malaysian Journal of Nutrition*, 16(3), 379–387.
- Volk, W.A and M.F. Wheeler 1993, *Mikrobiologi Dasar*. Edisi Kelima. Jilid 1. Penerbit Erlangga, Jakarta.
- Wakita, M., Masui, H., Ichimaru, S., & Amagai, T 2012, 'Determinant factors of the viscosity of enteral formulas: Basic analysis of thickened enteral formulas', *Nutrition in Clinical Practice*, 27(1), 82–90. <https://doi.org/10.1177/0884533611427146>
- Widowati, Sri, Suarni, O. Komalasari, & Rahmawati 200, 'Pumpkin (*Curcubita moschata* Durh) an Alternative Staple Food and Other Utilization in Indonesia', Balai Besar Penelitian dan Pengembangan Pascapanen Pertanian. Vol 1, 41-48. Bogor

IMPLEMENTATION OF HEALTH EXAMINATION IN INTEGRATED HEALTH POST (POSBINDU) AND CHARACTERISTICS OF POSBINDU PARTICIPANTS RELATED HEALTH OUTCOMES: CASE STUDY IN KARANGLO VILLAGE, SLEMAN REGENCY, YOGYAKARTA, INDONESIA

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ABSTRACT

Background: Pos Pembinaan Terpadu (POSBINDU) was an Indonesian government program to promote and prevent NCDs in the community. A high prevalence of non-communicable diseases (NCDs) are found in Yogyakarta, Indonesia. This study analyze factors associated with blood pressure, blood glucose, cholesterol, and uric acid levels in POSBINDU participants.

Method: This study was an observational study with a cross-sectional design that used secondary data from POSBINDU examination results in Karanglo Village, Tempel, Sleman Regency, Yogyakarta during 2023. A total of 145 participants aged above 15 years old were recorded. Participant characteristics included age, gender, frequency of visits, and nutritional status. Health outcomes measured included blood pressure, random blood glucose level, uric acid in blood, and blood cholesterol without fasting. Chi-square analysis was used to determine the association between participant characteristics and health outcomes. This analysis used *software*

Result: We revealed that 41.26% of participants were overweight and 51.26% of participants had central obesity. The results of the analysis showed that there was an association between age and blood pressure ($p=0.00$), while gender was associated with random blood glucose level ($p=0.03$). However BMI and weight circumference were not associated with blood pressure and blood glucose level. All participants' characteristics were not associated with uric acid in blood and blood cholesterol ($p>0.05$).

Conclusion: This study showed the suboptimal implementation of POSBINDU activities. Specifically, the missed opportunity in screening for male and elderly groups. Education in POSBINDU is needed to maintain and improve knowledge related to risk factors of NCDs.

Keywords: Noncommunicable diseases; Hypertension; Diabetes mellitus; POSBINDU; Public health

INTRODUCTION

The government of Indonesia has launched an integrated program that includes a community-based program implemented in an integrated, routine, and periodic approach for the early detection and prevention of NCDs named Pos Pembinaan Terpadu (POSBINDU). It is held by trained volunteers or cadres, and under the supervision of a Primary Health Centre (PHC) health worker to serve communities with minimum age 15 years and above. It involves the prevention

and early detection of NCDs, including counseling, health education, physical activities, and screening for NCDs and their risk factors. The main activities in POSBINDU include health screening for NCDs, i.e hypertension, diabetes and the risk factors i.e BMI and waist circumference (MoH of RI, 2019; Putra et al., 2021). POSBINDU could help the Indonesian population's early detection of NCDs (Sujarwoto & Maharani, 2022).

Multimorbidity related to NCDs was linked to increased healthcare utilization, an

increased risk of catastrophic medical expenses, and decreased productivity. Given Indonesia's aging population, the prevalence of multimorbidity among NCDs places a significant financial burden on people, households, the healthcare system, and society at large. Approximately 60% of the insurance program's overall expenditures were attributable to NCDs. Thus, it is important to address NCDs through preventative and promotional programs in order to improve Indonesia's healthcare system and ensure the long-term viability of its health insurance policy (Marthias et al., 2021).

The increasing trends of non-communicable diseases (NCD) in Indonesia require more attention. High prevalence of hypertension in Yogyakarta based on measurement for age >15 years old is 30.4%, higher than national prevalence. Same condition was found in diabetes mellitus (DM), whose prevalence in Yogyakarta is 3.6%, higher than national prevalence of DM (2.2%). Central obesity prevalence in Yogyakarta also showed higher (38.9%) than national prevalence (36.8%). Health examination locations were only 17.3% in POSBINDU (MoH of RI, 2023b).

POSBINDU in Karanglo village is 1 of 10 POSBINDU in Pondokrejo that is located in Tempel Sub-district, Sleman Regency, Yogyakarta. This POSBINDU actively serves 257 people in productive age and 57 elderly.

This study aims to describe residents participation in POSBINDU activities and analyze factors associated with blood pressure, random blood glucose, cholesterol, and uric acid levels in blood in participants of POSBINDU in Karanglo Village, Pondokrejo, Sleman Regency, Yogyakarta.

METHODS

Study setting

This study was conducted in Karanglo Village, Tempel District, Sleman Regency,

Yogyakarta in 2023. Participants were local residents, starting from adolescents to elderly. Karanglo Village has approximately a total population 1800 people. Most of the population is working in the agricultural sector and casual laborers. This POSBINDU is under the Tempel PHC supervisor.

Study design

This study was an observational study with a cross-sectional design that used secondary data from POSBINDU examination results in Karanglo Village, Tempel, Sleman Regency, Yogyakarta from January through December 2023.

Sample size and sampling procedure

Location was selected purposive because of provision of data in 2023. Data about community members using POSBINDU was gathered from POSBINDU users in the PHC community. All of the participants were local residents above 15 years old. In total, 145 participants were recorded.

Measurements of variables

Outcome variables are NCDs (blood pressure, blood glucose, uric acid, and blood cholesterol). Sociodemographic variables which were available on the POSBINDU register, were included: age group (adults = 15-59 years old and elderly = ≥ 60 years old), gender (male/female), and frequency of visits. Weight and height were calculated to know Body Mass Index (BMI) and categorized into underweight, normal, and overweight. Obese were included in overweight. Cut off point for waist circumference classified by gender, >80 cm for female and >90 cm for male were categorized as high. Meanwhile blood pressure categorized into normal (systolic <120 mmHg and diastolic <80 mmHg) and hypertension (systolic ≥ 120 mmHg or diastolic ≥ 80 mmHg) (MoH of RI, 2023a). Random blood glucose without fasting classified into normal (<200 mg/dl) dan diabetes (≥ 200 mg/dl) (MoH of RI, 2020)

Uric acid in blood was categorized into normal (3.5-7 mg/dl for male and 2.6-6 mg/dl for female) and high (>7 mg/dl for male and

>6 mg/dl for female) (Madyaningrum et al., 2020). Blood Cholesterol classified into desirable (<200 mg/dl) and high (≥ 200 mg/dl) (MoH of RI, 2018).

Statistical analysis

Characteristics of respondents were presented descriptively. The proportion presented in the analyses. We further conduct chi-square to assess the statistical significance of the differences. STATA 17 version software was used to analyze the data. P-value <0.05 was considered significant.

RESULTS AND DISCUSSION

Participation of community in POSBINDU

Data from 365 POSBINDU visitors (145 participants) in 2023 were analyzed.

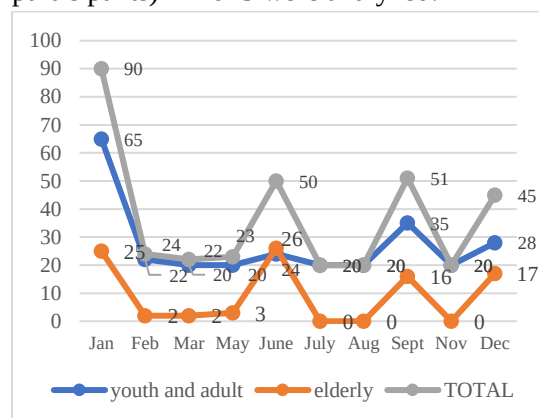


Figure 1. POSBINDU visitor trend in 2023

The findings showed that more female and adult participants. Approximately 74% were female participants. In 2023, total 10 times of POSBINDU activities with 4 times integrated with elderly (held every 3 months, that is in January, June, September, and December). Meanwhile, POSBINDU took a break in April and October. POSBINDU was organized by 10 cadres and assisted by university students who had internships in PHC.

POSBINDU Visitor

Based on picture 1, POSBINDU visitors increased when elderly were invited to come. The peak number of visitors happened in January. It might have been due to PHC's

invitation for everyone to attend POSBINDU. Karanglo village Karanglo only has a participant database for middle adult and elderly age groups, so participation rates were only shown for those two age groups. Pre-elderly (45-59 y.o) participation rates were highest in January (30.68%) whereas they were lowest in November (6.82%). On the other hand, elderly participation rate reached its highest in June (45.61%). For those groups, they never surpass 50%. In Yogyakarta, PHC became the highest choice for health examination (22.7%) while the proportion in POSBINDU was 17.3% (MoH of RI, 2023b). This suboptimal coverage was possibly due to lack of priority for NCD screening, lack of awareness and access to POSBINDU. However, because there are a lot of missing data points from the measurements, these results should be regarded with caution.

Table 1. POSBINDU Visitor Characteristics

Characteristics	n	%
Age group (y.o)		
15 - 59	112	77.24
≥ 60	33	22.76
Gender		
Male	38	26.21
Female	107	73.79
Number of visits		
1 time	49	33.79
2-4 times	83	57.24
5-6 times	13	8.97
BMI		
Underweight	12	8.39
Normal	72	50.35
Overweight	59	41.26
Waist Circumference		
Normal	58	48.74
High	61	51.26

From table 1, we know that 77.24% of POSBINDU visitors were 15-59 y.o. Maybe it was due to the elderly only purposely being invited in 4 times, when Posyandu Lansia, a community-based screening and management for the elderly population was integrated with POSBINDU. Indonesian Health Survey in 2023 also showed that POSBINDU visitors were higher in elderly than any other age group (MoH of RI, 2023b). In addition, we measured the youngest POSBINDU participant was 18 years old.

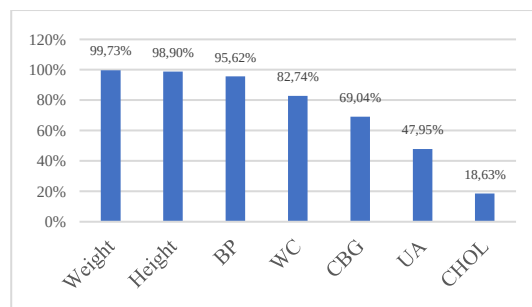
Out of the 365 visits by 145 participants, most (73.79%) were female. Men pay less attention to their health. Overall percentage of people in Indonesia that had never been checked i.e weight, height, blood pressure, blood glucose and waist circumference, were higher in male. It is similar to Indonesia national data that revealed only 6.3% of male that were examined in POSBINDU (MoH of RI, 2023b). The missed opportunity to screen male in POSBINDU is quite concerning because the majority of them are smokers. The lack of male involvement in POSBINDU is missing one of the the key target populations for NCDs risk factors screening. Analysis of a national survey in 2023 reported 43.8% prevalence of smoking with approximately 40% of males aged 15–55 years old and 14% of male adolescents are current smokers. (MoH of RI, 2023b). Previous study also showed that male were less active in POSBINDU. Lack of awareness, access problems to POSBINDU, and lack of coordination among stakeholders, were one of the causes of lower participation among male (Widyaningsih et al., 2022). Family support is required to make the POSBINDU operate more effectively. Health professionals must actively educate the public about the value of using POSBINDU (Tinambunan & Wibowo, 2019)

Although commonly POSBINDU was held on Saturday, it did not automatically make the target coverage become high. The low coverage of POSBINDU visitors perhaps due to irregular residents' jobs, such as farmers and casual laborers that did not follow the working days. We found that the participants visited POSBINDU only once (33.79%) with the majority (57.24%) being accessed 2-4 times. Communities who access POSBINDU are related with good knowledge but not with a good attitude or practice (Mashuri et al., 2024).

We also found that 41.26% of visitors were overweight and 51.26% of visitors had high waist circumference (central obesity).

These findings are consistent with an earlier study about POSBINDU under the supervision of the Yogyakarta City Health Office that reported central obesity prevalence was about 53.03% (Poniasih et al., 2024).

Blood pressure, blood glucose level, uric acid, and blood cholesterol of POSBINDU visitor



Abbreviations: BP = Blood Pressure, WC = Waist Circumference, CBG = Casual Blood Glucose Level, UA = Uric Acid, CHOL = Total Cholesterol

Figure 2. Visitors health examination rate in POSBINDU

Out of 365 visits, approximately 95.62% of visitors got their blood pressure measured. 98.90% and 99.73% had anthropometric measurements, but less than 19% had blood cholesterol examinations. The highest proportion of available data were for weight measurements, followed by height and blood pressure information. Last, our analysis identified higher missing values for blood cholesterol measurements (18.63%). The previous survey in Yogyakarta, found that there were 63.3% residents above 15 years old that had never been checked cholesterol, 72.6 never been measured waist circumference. Majority (61.3%) has measured weight once and the majority (51.6%) never measured height. In blood pressure, there were 30.6% people that had never been checked, and 61.3% no blood glucose (MoH of RI, 2023b). Further explanation for the lower blood measurements data was insufficient measurement or insufficient reporting and recording. In order to improve intervention, it is critical to make sure that key screening data can be tracked down and monitored. It is crucial to provide cadres with training to enhance their proficiency in doing

assessments, obtaining medical histories, and reporting the results. There is a need for a standardized screening procedure with integrated reporting.

Association Between Participant Characteristics And Health Outcomes

The results of the analysis showed that there was an association between age and

blood pressure ($p=0.00$), while gender was associated with random blood glucose level ($p=0.03$). However BMI and weight circumference were not associated with blood pressure and blood glucose and blood glucose level. All participants' characteristics were not associated with uric acid in blood and blood cholesterol ($p>0.05$) (**Table 2**).

Table 2. Participant characteristics by classification of blood pressure, blood glucose, urid acid, and blood cholesterol

Characteristics	Blood Pressure			Random Blood Glucose Level			Uric acid in blood			Blood cholesterol		
	Normal	Hypertension	<i>p</i>	Normal	Diabetes	<i>p</i>	Normal	High	<i>p</i>	Desirable	High	<i>p</i>
Age group (y.o)												
15 - 59	43	67	0.004	76	6	0.749	44	23	0.988	18	15	0.445
≥ 60	4	29		30	3		19	10		5	7	
Sex												
Male	9	29	0.160	17	4	0.034	13	4	0.299	2	0	0.157
Female	38	67		89	5		50	29		21	22	
Number of visits												
1 time	13	36	0.498	23	2	0.528	15	5	0.169	5	5	0.603
2-4 times	29	52		70	7		38	26		15	16	
5-6 times	5	8		13	0		10	2		3	1	
BMI												
underweight	2	10	0.252	9	1	0.943	5	3	0.143	1	3	0.418
normal	28	45		52	4		33	11		9	6	
overweight	17	41		44	4		23	19		11	13	
Waist Circumference												
Normal	20	37	0.842	48	4	0.913	32	12	0.204	7	6	0.899
High	20	40		52	4		27	18		15	14	

Growing older is commonly correlated with a rise in blood pressure. Blood pressure can be significantly impacted by microscopic and macroscopic alterations to the heart, vascular system, and autonomic nervous system that may arise with advanced age. There are many different and complex reasons contributing to this rise in blood pressure, including specific environmental and lifestyle factors in addition to age-related ones (Singh et al., 2024). Meanwhile, in this study hypertension was more prevalent among adult (15-59 y.o). This finding due to higher number of adults than elderly participants. Awareness, treatment, and control of hypertension were poorer among adults compared to elderly and were lower among male compare to female (Geevar et al., 2022). Other study revealed that adult were more frequent to consume caffeine and had higher stress level. Both factors were

significantly correlated with hypertension (Sutarjana, 2021).

In Indonesians, females were more likely to have NCDs multimorbidity than male (Marthias et al., 2021). The sex differences in diabetes may be primarily explained by gender differences in body anthropometry and patterns of adipose tissue accumulation. Women may be more susceptible to diabetes-related vascular disease than males are because of physiological differences between the sexes, such as those related to hormones or genetics (de Ritter et al., 2020). Psychosocial stress may be a more significant factor in women's diabetes risk. Women are more susceptible than males to changes in their bodies and hormones throughout their lives as a result of reproductive circumstances (Kautzky-Willer et al., 2023).

In a previous study, increasing BMI and waist circumference, both male and female, was associated with a significant rise in the

risk of high blood pressure in older adults (Zhang et al., 2021; Putra et al., 2022). Both increasing waist circumference and BMI provided a comparative performance for the prediction of diabetes and were positively associated with the possibility of developing the disease (Abe et al., 2021). Another study showed that high waist circumference increased the risks of developing hypertension, type 2 diabetes mellitus, and hypercholesterolemia (Darsini et al., 2020). Meanwhile the findings from this study revealed that BMI and weight circumference were not associated with blood pressure, blood glucose level, and blood cholesterol.

As people aged, hyperuricemia increased more common. Women had a higher prevalence of hyperuricemia than men over the age of 65, as determined by sex-specific cut-off points (Zitt et al., 2020). Increased BMI and waist circumference, and abdominal obesity, may be important risk factors for hyperuricemia (Bae et al., 2023). On the other hand, based on this study, BMI and waist circumference were not associated with uric acid in blood. Maybe this result was due to insufficient samples.

This study has some limitations. First, our study is only included in one location; therefore the generalizability to a broader environment should be considered. Second, we conducted a cross-sectional study or only visited once that does not determine the causality or temporal relationship. Third, the missed reporting and consistency of reporting the POSBINDU participants

CONCLUSION

This study revealed the ineffective use of POSBINDU activities, especially the missing chance to screening for elderly and male groups. Education in POSBINDU is required to preserve and advance understanding of NCDs risk factors.

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CONFLICT OF INTEREST

All author declared that there was no conflict of interest

REFERENCES

- Abe, M., Fujii, H., Funakoshi, S., Satoh, A., Kawazoe, M., Maeda, T., Tada, K., Yokota, S., Yamanokuchi, T., Yoshimura, C., Mimata, R., Takahashi, K., Ito, K., Yasuno, T., Kuga, T., Mukoubara, S., Akiyoshi, K., Kawanami, D., Masutani, K., & Arima, H. (2021). Comparison of Body Mass Index and Waist Circumference in the Prediction of Diabetes: A Retrospective Longitudinal Study. *Diabetes Therapy*, 12(10), 2663–2676. <https://doi.org/10.1007/s13300-021-01138-3>
- Bae, J., Park, K.-Y., Son, S., Huh, Y., & Nam, G. E. (2023). Associations between obesity parameters and hyperuricemia by sex, age, and diabetes mellitus: A nationwide study in Korea. *Obesity Research & Clinical Practice*, 17(5), 405–410. <https://doi.org/10.1016/j.orcp.2023.09.007>
- Darsini, D., Hamidah, H., Notobroto, H. B., & Cahyono, E. A. (2020). Health Risks Associated with High Waist Circumference: A Systematic Review. *Journal of Public Health Research*, 9(2), jphr.2020.1811. <https://doi.org/10.4081/jphr.2020.1811>
- de Ritter, R., de Jong, M., Vos, R. C., van der Kallen, C. J. H., Sep, S. J. S., Woodward, M., Stehouwer, C. D. A., Bots, M. L., & Peters, S. A. E. (2020).

- Sex differences in the risk of vascular disease associated with diabetes. *Biology of Sex Differences*, 11(1), 1. <https://doi.org/10.1186/s13293-019-0277-z>
- Geevar, Z., Krishnan, M. N., Venugopal, K., Sanjay, G., Harikrishnan, S., Mohanan, P. P., Mini, G. K., & Thankappan, K. R. (2022). Prevalence, Awareness, Treatment, and Control of Hypertension in Young Adults (20–39 Years) in Kerala, South India. *Frontiers in Cardiovascular Medicine*, 9. <https://doi.org/10.3389/fcvm.2022.765442>
- Kautzky-Willer, A., Leutner, M., & Harreiter, J. (2023). Sex differences in type 2 diabetes. *Diabetologia*, 66(6), 986–1002. <https://doi.org/10.1007/s00125-023-05891-x>
- Madyaningrum, E., Kusumaningrum, F., Wardani, R. K., Susilaningrum, A. R., & Ramdhani, A. (2020). Buku Saku Kader: Pengontrolan Asam Urat di Masyarakat. *Fk-Kmk Ugm*.
- Marthias, T., Anindya, K., Ng, N., McPake, B., Atun, R., Arfyanto, H., Hulse, E. S., Zhao, Y., Jusril, H., Pan, T., Ishida, M., & Lee, J. T. (2021). Impact of non-communicable disease multimorbidity on health service use, catastrophic health expenditure and productivity loss in Indonesia: a population-based panel data analysis study. *BMJ Open*, 11(2), e041870. <https://doi.org/10.1136/bmjopen-2020-041870>
- Mashuri, Y. A., Widyaningsih, V., Premanawasti, A., Koot, J., Pardoel, Z., Landsman-Dijkstra, J., Postma, M., & Probandari, A. (2024). Differences in knowledge, attitude, and practice regarding hypertension by access to a community-based screening program (POSBINDU): A cross-sectional study from four districts in Indonesia. *PLOS ONE*, 19(5), e0303503. <https://doi.org/10.1371/journal.pone.0303503>
- 303503
- MoH of RI. (2018). *Berapa Nilai Kolesterol Total Anda?* P2PTM Kemenkes RI. <https://p2ptm.kemkes.go.id/infographic-p2ptm/hipertensi-penyakit-jantung-dan-pembuluh-darah/berapa-nilai-kolesterol-total-anda>
- MoH of RI. (2019). Petunjuk Teknis Pos Pembinaan Terpadu (Posbindu) bagi Kader. *Direktorat Jendral Pencegahan Dan Pengendalian Penyakit*.
- MoH of RI. (2020). *Yuk, mengenal apa itu penyakit Diabetes Melitus (DM)*. P2PTM Kemenkes RI. <https://p2ptm.kemkes.go.id/infographic-p2ptm/penyakit-diabetes-melitus/page/5/yuk-mengenal-apa-itu-penyakit-diabetes-melitus-dm>
- MoH of RI. (2023a). *Buku Panduan Keterampilan Dasar Kader Bidang Kesehatan*.
- MoH of RI. (2023b). *Survei Kesehatan Indonesia (SKI) dalam Angka*.
- Poniasih, A., Sunarti, S., Sulistyawati, S., & Rokhmawati, R. (2024). Description of non-communicable diseases and risk factors related to lifestyle among POSBINDU (Integrated Guidance Posts) participants in Yogyakarta in 2022. *Jurnal Cakrawala Promkes*, 6(1), 22–27.
- Putra, E. S., Junita, J., & Siregar, S. (2021). Konsumsi minuman manis prediktor risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 10(2), 89–97.
- Putra, E. S., & Junita, J. (2022). Rasio lingkar pinggang tinggi badan dan aktivitas fisik sebagai risiko prediabetes remaja Kota Jambi. *Riset Informasi Kesehatan*, 11(1), 45–53.
- Singh, J. N., Nguyen, T., Kerndt, C. C., & Dhamoon, A. S. (2024). Physiology, Blood Pressure Age Related Changes. In *StatPearls*. <http://www.ncbi.nlm.nih.gov/pubmed/19878368>
- Sujarwoto, & Maharani, A. (2022). Participation in community-based

healthcare interventions and non-communicable diseases early detection of general population in Indonesia. *SSM - Population Health*, 19, 101236. <https://doi.org/10.1016/j.ssmph.2022.101236>

<https://doi.org/10.1038/s41598-020-64587-z>

Sutarjana, M. A. (2021). HUBUNGAN FREKUENSI KONSUMSI KAFEIN DAN TINGKAT STRES DENGAN KEJADIAN HIPERTENSI PADA USIA DEWASA MUDA. *GIZI INDONESIA*, 44(2), 145–154. <https://doi.org/10.36457/gizindo.v44i2.536>

Tinambunan, D. S., & Wibowo, A. (2019). Factors Affecting The Success of Posyandu for The Elderly in Indonesia: A Systematic Review. *Strengthening Hospital Competitiveness to Improve Patient Satisfaction and Better Health Outcomes*, 119–129. <https://doi.org/10.26911/the6thicph-FP.02.02>

Widyaningsih, V., Febrinasari, R. P., Pamungkasari, E. P., Mashuri, Y. A., Sumardiyono, S., Balgis, B., Koot, J., Landsman-Dijkstra, J., & Probandari, A. (2022). Missed opportunities in hypertension risk factors screening in Indonesia: a mixed-methods evaluation of integrated health post (POSBINDU) implementation. *BMJ Open*, 12(2), e051315. <https://doi.org/10.1136/bmjopen-2021-051315>

Zhang, W., He, K., Zhao, H., Hu, X., Yin, C., Zhao, X., & Shi, S. (2021). Association of body mass index and waist circumference with high blood pressure in older adults. *BMC Geriatrics*, 21(1), 260. <https://doi.org/10.1186/s12877-021-02154-5>

Zitt, E., Fischer, A., Lhotta, K., Concini, H., & Nagel, G. (2020). Sex- and age-specific variations, temporal trends and metabolic determinants of serum uric acid concentrations in a large population-based Austrian cohort. *Scientific Reports*, 10(1), 7578.

THE INFLUENCE OF 'TESIMIA' ON THE KNOWLEDGE AND ATTITUDES OF FEMALE ADOLESCENTS REGARDING ANEMIA

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ABSTRACT

Background: Anemia is a condition where is a decrease in the number of erythrocytes as indicated by a decrease in hemoglobin levels, hematocrit and erythrocyte count. Based on previous research, the frequency of anemia in adolescent girls is 26.5% in one of the junior high schools in Jambi City, adolescent girlss who have low knowledge was 51.5% and having a poor attitude was 51.5%. this shows that young women do not yet know that anemia has a bigimpact on their own health. This figure shows that anemia is still a health problem that needs attention in Jambi Province.

Method: This type of research is Quantitative research using the pre-Eksperiment method, research design using a One group pretest – posttest design with a total sample of 55 respondents taken by purposive sampling. Data collection used a knowledge questionnaire and attitude checklist instrument. Data analysis used the wilcoxon test,

Result: It is known that Asymp.Sig (2-tailed) has a value of 0.001. Because the value of 0.001 is smaller than ≤ 0.05 , there is a difference in the results of health education using anemia crossword puzzle for class VII students at SMP 19 Jambi City in the pretest and posttest.

Conclusion: Present the main conclusions and their implications. There is an influence of health education using anemia crossword puzzle on knowledge and attitudes towards preventing anemia in class VII students of SMP 19 Jambi City

Keywords: “Health education, crossword puzzle, anemia

INTRODUCTION

According to the World Health Organization (WHO), anemia is a condition where the body has abnormal hemoglobin levels. Hemoglobin (Hb) is needed to transport oxygen, if the concentration is less than normal, the capacity of the blood to transport oxygen also decreases, causing fatigue, weakness, lethargy, dizziness and shortness of breath. (Citrakesumasari, 2016).

The incidence of in adolescent girls occurs at several ages that are usually affected by anemia, consisting of 57.1% of adolescent girls aged 10-18 years and 39.5% aged 19-45 years. Woman have the highest risk of anemia, especially in female adolescents. It can also be seen from the 2018 Health

Research Results that anemia in adolescent girls increased to 48.9% in 2019 due to lifestyle patterns and nutritional deficiencies (Julaecha, 2020).

One Junior High School showed that of the five students who were asked about anemia, three students said they did not know what anemia was, one person knew about anemia and one person could only mention a little about preventing anemia, namely by aeting colored vegetables, green. With the above problems it can be concluded that the knowledge of young women about anemia is very lacking, especially among the young women who are still in junior high school, who need knowledge, prevention and implementation of healthy living policies to protect against anemia. (Efni, 2020).

Mahmudah's research result (2018) stated that the influence of crossword puzzle media on understanding balanced diets by applying crossword puzzle strategies can influence knowledge and attitudes and improve balanced nutrition. The use of crossword puzzle media has not been carried out on junior high school teenagers, so this researcher hopes that this anemia '*Tesimia*' crossword puzzle can create interest in research and make people interested in studying Anemia.

In the initial survey at SMP 19 Jambi City, it was found that the knowledge of the female students who were interviewed regarding the prevention of anemia had absolutely no idea what anemia was, its prevention, the impacts it caused and no one provided information on the importance of preventing anemia in adolescents, only giving supplementary tablets. Blood to female students, from UKS data and interview with UKS supervisors, female students often faint suddenly during ceremonies or not during ceremonies, interest in research at SMP 19 Jambi City on the grounds that the location of the research location is affordable.

General Objectives, the general aim of this research is to determine the educational effect of using the Anemia Crossword game '*Tesimia*' in increasing Knowledge and Attitudes about anemia among female Students at SMPN 19 Jambi City.

METHODS

Research design, the method used Quantitative which uses the Pre-experiment method, the research design use a One Group Pretest – Posttest. The sampling technique is Purposive Sampling, Purposive Sampling with inclusive and exclusive criteria which takes proportions to obtain a representative sample, in choosing this method you can take object from each class that are determined in balance with the number of subjects in each female student so as to obtain a representative

sample. The population in this study were class VII students at State Middle Schools 19 Jambi City with 127 female students. The sample size for this research was class VII junior high school students SMPN Jambi City which met the criteria consisted of 55 respondents. Execution time this research on Tuesday, 21 May 2024.

In this research, knowledge and attitudes can be used using a research instrument in the form of a questionnaire (list of questions) and the attitude variable using this checklist instrument was prepared by the researcher with reference to material about anemia. The questions used are closed or structured questions, the questions are made in such a way that respondents just have to choose or answer existing questions. The data collection method in this research is a questionnaire which has been tested for validity and reliability at SMP 14 Jambi City on 30 students and was declared suitable for use. Data processing in this research is Editing, Coding, Scoring, Tabulating, and Cleaning.

Univariate analysis aims to explain the characteristics of each research variable. To find out the average value. Bivariate analysis explains the influence of education using the '*tesimia*' crossword media in increasing knowledge and attitudes at SMPN 19 Jambi City, a normality test was carried out using Kolmogorov-Smirnov because the research subjects were ≥ 50 people, if the data was normally distributed ($p > 0.05$) then the Pareid T-test we used, while the data was not normally distributed ($p < 0.05$) then Wilcoxon statistical Analysis was carried out, if the statistical test result is ≤ 0.05 it means that H_a is accepted.

RESULTS AND DISCUSSION

This study aims to determine the effect of '*Tesimia*' anemia, crossword education on the knowledge and attitudes of young women regarding anemia among female students at

SMPN 19 Jambi City. The respondents selected as samples were class VII Students aged 12-13 years based on the results of sampling using sampling techniques purposive besides getting 55 respondents, in general the description of the respondents' personal data is age. General data are presented in the results research as follows:

The distribution of respondents based on the age frequency variable for class VII Students at SMPN 19 Jambi City can be seen in table 1, below:

Table 1. Frequency Distribution of Respondents Age

Age	Frequency	Presentase
12 years old	20	36,5%
13 years old	35	63,6%
Amount	55	100%

Based on table 3.1 it is known that the respondents aged 12 years were 18 female students with a percentage 33% while the respondents aged 13 years, were 37 female students with a percentage 67% it can be concluded that respondents aged 13 years dominate again in this study.

Table 2. Distribution of the average value of female students knowledge and attitudes regarding anemia in Class VII students at SMPN 19 Jambi City

Variabel	Mean	Mean Difference	Min	Max	95% / CI Lower-Upper
Knowledge					
Before (pretest)	4.40	3.29	2	6	4.16 - 4.64
After (posttest)	7.69		5	10	7.38 - 8.00
Attitude					
Before (Pretest)	23.93	10.87	20	29	23.17 - 24.68
After (Posttest)	34.80		35	38	34.18 - 35.42

Based on table 1 it shows that on average there was an increase in knowledge before and after the "Tesimia" anemia crossword education where knowledge before anemia crossword education "Tesimia" increased to 7.69. there was an increase in knowledge of (3.29) after the intervention using the anemia crossword game media among female students at SMPN 19 Jambi City. In this study there were 10 knowledge questions, after obtaining the respondent's answers, they were corrected and tabulated before being given the intervention, there were still many errors, but after being given the intervention there was an

improvement. The increase in respondents' knowledge was known from the results of the second questionnaire, namely the post-test, increased knowledge of anemia was caused by being given educational treatment on the "Tesimia" crossword puzzle.

Problem because red blood cells contain hemoglobin which carries oxygen to body tissues, anemia can cause various complications including fatigue and stress on the body's organs. (Ervina, 2018). Adolescent girls who are anemia are at risk of becoming anemia women of childbearing age. Furthermore when they become mothers, anemia can cause chronic energy deficiency during pregnancy (KEMENKES, 2022). Changes in mood, skin that looks pale, often experiencing, dizziness, experiencing Jaundice, heartbeat beating faster than usual, experiencing shortness of breath, restless legs syndrome and even swollen feet and hands if you have severe anemia. (KEMENKES, 2023)

Cause of anemia consist of blood loss, lack of red blood cell production, high levels of blood cell damage, other common causes that cause anemia, namely lack of iron, vitamin B12 or folar axzum, consumption of drugs, the destruction of red blood cells more quickly than usual is caused by immune system problems. (KEMENKES, 2023). Theory Support according to (Notoadmodjo, 2010) which states that high knowledge will cause a person to behave better towards an object whereas less knowledge will cause a person to have a negative attitude towards that object (Lestari, et al., 2023). Impact of anemia is disrupted growth and development, increased susceptibility to infection because the immune system decreases making it more susceptible to infection. (KEMENKES, 2018).

In this study there were 10 attitude question, after obtaining the respondents answers, they were corrected and tabulated it turned out that many of the respondents answers before being given the intervention

were still wrong, but after being given the intervention, there was an improvement in the respondents attitudes, which was known from the results of the second questionnaire, namely the post-test.

CONCLUSION

It this chapter i will conclude this research from the results of the data in the previous chapters, so the conclusion my research is entitled ‘‘The influence of anemia crossword puzzle education on the understanding and attitudes of young women regarding anemia among female students at SMPN 19 Jambi City this is, The average knowledge value before the education on the anemia crossword game was that the total score 4.40, but after being given education on the anemia crossword game, many positive answers were found to be 7.89, meanwhile the average attitude before the anemia crossword game education was obtained with a total score of 23.93, but after being given anemia crossword game education, many people answered positively as hig as 34.00,. It is know that based on the results of data analysis, it is found that the volume is 0.001, which means that there is a significant or meaningful influence on the recognition and words about anemia among female students at SMPN 19 Jambi City, It is known that based on the results of data analysis, it is found that sale is 0.001, which means that there is asignificant influence of nutritional education and meaning with the teica media of anemia crossword puzzle at SMPN 19 Jambi City.

This research itself certainly has advantages that need to be continuously improved in this research, including, in changing attitudes, the overall effectiveness takes 3 to 6 months for the attitude to become a habit as expected, the time allocotated to carry out intervention activities is very limited because it must be divided into teaching snd learning hours, the next limitation is that there are other activities carried out byfemale

students who are given intervention even though they have been warned to postpone it first, limited space or lack of lighting, which interferes with crossword media intervention.

According to research by Wulan et al (2019) this crossword puzzle in included in the educational game categorybecause in this crossword puzzle there are elements of educational games such as answeing questions contained in boxes designed horizontally and downwards, and there is material that discusses the game.

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CONFLICT OF INTEREST

The author has stated that in this article there is no or potential confirct of interest from either the author or the agency in connection with the research that has been conducted, both based on authoship and publication.

REFERENCES

- Citrakesumasari. (2016). Anemia Gizi Masalah dan Pencegahannya. Kalika
- Ervina, R. (2018). Hubungan Pola Makan Dengan Kejadian Anemia pada Remaja Putri di MTs Lubuk Buaya Tahun 2018. E-Skripsi Universitas Andalas. Tersedia dari:<http://scholar.unand.ac.id/id/eprint/3814>
- Efni, N., & Fatmawati, T. Y. (2022). Edukasi Pencegahan Anemia pada Remaja

- Putri. PROSIDING Seminar Kesehatan Nasional, 1(1), 312–317
- Julaecha. (2020). Upaya Pencegahan Anemia pada Remaja Putri . Jurnal Abdimas Kesehatan, 2(2), 109–112.
- Kemenkes. (2018). *Pedoman Pencegahan dan Penanggulangan Anemia pada Remaja Putri dan Wanita Usia Subur*. Kemenkes.
- Kemenkes. (2022a). *7 Dampak Anemia pada Remaja*. Kemenkes.
- Kemenkes. (2022b, July 29). Pencegahan dan Pengobatan Penyakit Anemia. *Kemenkes*.
- Kemenkes. (2023a). Mengenal Gejala Anemia pada Remaja. *Kemenkes*.
- Lestari, N., A, J. P., & Dewi, F. (2023). Hubungan Pengetahuan dengan Sikap Orang Tua dalam Pemberian Vaksinasi Human Papilloma Virus (HPV) pada Remaja Putri SMP X Jakarta. 4(1), 24–31.
- Mahmudah, U. (2019). Pengaruh media teka-teki silang terhadap pengetahuan gizi seimbang pada anak sekolah dasar. *Ilmu Gizi Indonesia*, 02(02), 107–114.
- Wulan, N. P. J. D., Suwatra, I. I. W., & Jampel, I. N. (2019). Pengembangan Media Permainan Edukatif Teka-Teki Silang Berorientasi Pendidikan Karakter Pada Mata Pelajaran IPS. *Jurnal Edutech Undiksha*, 7(1), 66–74.

INFLUENCE OF MEDIA COUNSELING BOARD GAME “JAGATES” ON KNOWLEDGE AND ATTITUDE FOR DIABETES PREVENTION AT SDN 93 JAMBI CITY

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ABSTRACT

Background: Diabetes is a chronic disease characterized by increased blood sugar levels due to the inability to produce or use insulin effectively. The risk factor for type 2 diabetes is lifestyle. One effort to reduce the prevalence and improve attitudes towards preventing diabetes mellitus is outreach through the board game "JAGATES". This research aimed to determine the effect of counseling through the board game "JAGATES" in increasing knowledge and attitudes towards preventing diabetes mellitus in class V students at SDN 93 Jambi City.

Method: This research is a non-probability research with a one-group pre-test post-test design using total sampling. This research was carried out at SDN 93 Jambi City. Univariate descriptive analysis includes frequency and percentage distribution, bivariate test with Shapiro-Wilk and Wilcoxon signed-rank test

Result: It is known that Asymp.Sig (2-tailed) has a value of 0.000. Because the value of 0.000 is smaller than ≤ 0.05 , there is a difference in the results of counseling through the board game "JAGATES" for class V students at SDN 93 Jambi City in the pretest and posttest.

Conclusion: Present the main conclusions and their implications. There is an influence of counseling through the board game "JAGATES" on knowledge and attitudes toward preventing diabetes mellitus in class V students at SDN 93 Jambi City

Keywords: diabetes mellitus; knowledge; attitudes; board game; JAGATES

INTRODUCTION

Diabetes is a chronic disease characterized by increased blood sugar levels because the body cannot produce or use insulin effectively. Type I diabetes is a chronic disease characterized by the body's inability to produce insulin caused by damage to pancreatic beta cells due to autoimmune, genetic or idiopathic factors. On the other hand, type II diabetes mellitus is characterized by the inability to maintain normal blood sugar levels due to lifestyle changes due to progressive dysfunction of pancreatic beta cells due to insulin resistance. (ADA, 2017).

Diabetes mellitus (DM) is caused by metabolic disorders that occur in the pancreas

and is characterized by increased blood sugar levels, often called hyperglycemia, which is caused by a decrease in the amount of insulin in the pancreas. Diabetes mellitus can cause various macrovascular and microvascular complications. DM disease can cause cardiovascular disorders. This disease is a very serious disease that can cause stress and heart attacks if not treated immediately (Lestari, et al., 2021).

According to the 2023 Indonesian Health Survey, the prevalence of diabetes mellitus at all ages according to Jambi province is 0.9% with 11,588 cases, the highest cases occurred in DKI Jakarta 3.1% with 33,552 cases, while the lowest cases occurred in Papua Mountains 0, 2% with 4,563 cases and for Indonesia the

prevalence is 1.7% with 877,531 cases. The prevalence of diabetes mellitus according to characteristics is the highest at age 65-74 years, 6.7% with 44,881 cases, while the lowest is at age ≤ 1 year, 0.19% with 11,518 cases.

Based on data obtained from the Jambi City Health Service, it is known that diabetes mellitus data shows that the number of sufferers in 2022 will reach 57.9% with a total of 12,232 people. Based on 2022 data, there were 389 cases of diabetes mellitus at the Rawasari Community Health Center and this will increase in 2023 by 44.73% with 582 cases. Based on this initial data, it can be seen that diabetes cases increase every year.

Knowledge can be increased through health education activities through various types of health promotion media, namely through leaflets, posters, banners, flyers, brochures, games, etc. that can increase knowledge. The media used to increase knowledge in elementary school students can be games. Playing while learning is an effective method that can be used to increase knowledge, by using board games students become more responsive because students are more active and interactive and can increase cooperation between players. With board games, the message you want to convey to the audience can be achieved. delivered.

Based on the background of the problem, there is still a lack of students' knowledge and attitudes towards preventing diabetes mellitus, the problem formulation in this research is: Is there an influence of counseling using the board game media "JAGATES (Prevent and Prevent Diabetes)" on increasing knowledge and attitudes towards preventing diabetes mellitus? in class V students of Elementary School 93 Jambi City. The aim of this research is to determine the effect of counseling using the board game "JAGATES" on knowledge and attitudes towards preventing diabetes in class V students at SDN 93 Jambi City.

METHODS

This type of research is quantitative research with a non-probability method. The design used in this research is one group pre-post test design,

This research design was used to test the effect of counseling on the board game "Jagates" on knowledge and attitudes towards preventing diabetes mellitus in students at SDN 93 Jambi City. Measurements of knowledge and attitudes were carried out before being given counseling (pre-test) and after being given counseling (post-test).

This research was conducted at SDN 93 Jambi City in May 2024. The population in this research were all class V students at SDN 93 Jambi City. Data processing is collected using a questionnaire, data processing will be carried out using Editing, Coding, Transferring, Tabulating.

Data analysis was carried out univariate and bivariate. The statistical test for bivariate analysis is using the Shapiro-Wilk and Wilcoxon signed rank test using the SPSS application tool at a confidence level of 95% ($\alpha = 0.05$). Hypothesis testing is carried out by comparing the P value at the 95% confidence level with the following criteria; if the distribution is normal ($P \geq 0.05$) then the analysis used is Paired T - Test. If the normality test is not ($P \leq 0.05$) if it is not normally distributed then the Wilcoxon test is carried out if the P-value $P \leq 0.05$ then H_a is accepted. Data is presented in tabular and textual form.

RESULTS AND DISCUSSION

Table 1 Frequency distribution of research subject characteristics based on age and gender

Characteristics of research subjects	F	%
Age		
11 years old	35	78,7
12 years old	12	21,3
Gender		
Boy	24	51
Girl	23	49

The characteristics of the subjects in the study can be seen in Table 1. The results of the study show that the sample characteristics of students at SDN 93 Jambi City were predominantly male (51%) with ages 11 years (78.7%). The normality test uses the Shapiro-Wilk test. Pre-test and post-test sig values.

Table 2 Effect of Counseling Using the Board Game "JAGATES" on Knowledge and Attitudes about Diabetes Mellitus

Variabel	Mean ± SD	Mean Different ± SD	Min-Max	95%CI Lower-Upper	P-value
Knowledge Before	2.26±0.607	3.95±0.276	3-6	4.08-4.43	$P \leq 0.001$
After	8.21±0.883		6-10	7.95-8.47	
Attitude Before	5.55±0.686	2.92±0.118	4-7	5.35-5.55	$P \leq 0.001$
After	8.47±0.804		7-10	8.23-8.70	

The effect of counseling on class V students at SDN 93 Jambi City using the board game "JAGATES" to increase knowledge and attitudes is presented in table 2. These results have shown that counseling in efforts to prevent diabetes mellitus has increased knowledge and attitudes in class V students at SDN 93 Jambi City is presented in table 2.

The results of the statistical data analysis show that there is a difference in average knowledge (difference of 3.95) and average attitude (difference of 2.92) between before being given counseling and after being given counseling using the board game "JAGATES". Therefore, it can be concluded that counseling using the board game media "JAGATES" can significantly ($p \leq 0.05$) improve the knowledge and attitudes of fifth grade students at SDN 93 Jambi City.

The results of this research show that there is an influence of counseling using the board game "JAGATES" on the knowledge and attitudes of elementary school children regarding efforts to prevent diabetes mellitus. These results are in accordance with research on elementary school children in Bogor regarding increasing elementary school students' knowledge and attitudes regarding balanced nutrition through monopoly game

intervention. The results of this research showed that there was an increase in elementary school children's knowledge after playing the monopoly game and discussing balanced nutrition. The intervention using the monopoly game with discussion had the effect of increasing knowledge and attitudes compared to just playing the monopoly game without discussion. There was an increase in the average value of students' knowledge scores about balanced nutrition after being given intervention using the monopoly game media (Fitriyanti, et al., 2021).

These results are in line with research conducted by (Islamiyah, et al., 2023), namely that there is a difference in the effectiveness value of snakes and ladders media in the pretest and posttest. This can be said to be effective because there is an increase in pretest and posttest scores, from this snakes and ladders media it is also easy to understand what good learning attitudes and behavior are, what are the tips for having good learning attitudes and behavior Increasing the knowledge of elementary school students must also be accompanied by changes. his behavior. To support this process, incentives are needed that can improve the attitudes of elementary school students through efforts that can encourage them to implement healthy behavior in their daily lives.

Learning using board games has a positive impact on the development of students' skills, this game creates an atmosphere of learning through playing, learning through communication and learning through thinking. The use of board games can help make it easier for students to better understand and remember learning material in a comfortable atmosphere (Triastuti, et al., 2017).

Basically, a game that is good for children is one that has benefits, especially in terms of educational learning. Currently, board games have various types, especially to educate children. The aim of the board game itself is to help improve the quality of memory

because the game requires you to remember the written rules of the game (Rizkha & Pangganguspa, 2022).

In this research, researchers used the theory of planned behavior. This is because this theory shows that behavioral control is also considered by individuals independently of subjective attitudes and norms. Behavioral control refers to the ability to carry out a behavior. TPB explains that a person's behavior is based on their intention to behave (Ajzen, 2005).

In a similar study entitled "prediction of healthy eating patterns through the Theory of Planned" this is that the information a person has influences the behavior and beliefs they will display, this kind of attitude causes a person to receive a positive or negative assessment of themselves (Sulaeman, et al., 2017). A similar researcher entitled "Nurse Behavior in the Implementation of Diabetes Mellitus Education Based on the Theory of Planned Behavior" states that a person feels good if it is based on intentions and desires for what is good for him (Rohmatul Laili, 2016).

CONCLUSION

There is a difference in the average knowledge and attitudes towards preventing diabetes mellitus among fifth grade students at SDN 93 Jambi City between before and after being given counseling using the board game "JAGATES". Extension using the board game media "JAGATES" can significantly increase knowledge and attitudes towards preventing diabetes mellitus.

Suggestions, therefore, it is necessary to disseminate information related to diabetes mellitus through attractive and creative health promotion methods and media in schools as a support for successful prevention and improving the health status of school children.

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CONFLICT OF INTEREST

The author has stated that in this article there is no or potential conflict of interest from either the author or the agency in connection with the research that has been conducted, both based on authorship and publication.

REFERENCES

- Fitriyanti, R., Sriprahastuti, B. & Cicih , L. H. M., 2021. Intervensi Permainan Monopoli dan Diskusi Gizi Seimbang Untuk Meningkatkan Pengetahuan dan Sikap Siswa Sekolah Dasar Di Kabupaten Bogor. *Journal Of Nutrition College*, pp. 197-206.
- Islamiyah , N. I., Shilochah, R. P., Zakiyah, S. & Prihatiningsih, R., 2023. Keefektifan Media Ular Tangga Untuk Meningkatkan Sikap dan Perilaku Belajar Pada Siswa Kelas 7. pp. 1910-1917.
- Lestari , Zulkarnain & ST, A. S., 2021. Diabetes Melitus : Review Etiologi, Patofisiologi, Gejala, Penyebab, Cara Pemeriksaan, Cara Pengobatan dan Cara Pencegahan. *Journal UIN Alauddin*.
- Rizkha , I. A. & Anggapuspa , L. M., 2022. Perancangan Board Game Pengenalan Gizi Seimbang Sebagai Media Eedukasi Anak Usia 9-12 Tahun. *Jurnal Barik* , Volume 4, pp. 2747-1195.
- Sulaeman , E. S., Murti, B., Setyawan , H. &

Rinawati, S., 2017. Aplikasi Theory of Planned Behavior Pada Perilaku Pemberian Asi Eksklusif : Studi Kasus. Jurnal Kedokteran Yasri , pp. 084-100.

Triastuti, D., Akbar , S. & Irawan, E. B., 2017. Pengembangan Media Papan Permainan Panjat Pinang. Jurnal Pendidikan , pp. 1344-1350.

THE IMPACT OF PARENTAL KNOWLEDGE ON ORAL HEALTH MAINTENANCE AND THE PREVALENCE OF DENTAL CARIES IN TODDLERS AT POSYANDU IN SUNGAI GELAM

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ABSTRACT

Background: Maintaining oral health is crucial for young children, but many parents may not have adequate knowledge about proper dental care, leading to higher rates of dental caries. This study explores the impact of parental understanding on the prevalence of dental caries among toddlers attending Posyandu in Sungai Gelam.

Method: The research design used was a cross-sectional study. The study population consisted of parents and toddlers at Posyandu Sambung Rasa Tujuh, Rt 34, Kec. Sungai Gelam, with up to 30 participants. Sampling was done using total sampling. Examination sheets and questionnaires were used as research instruments. Data collection involved individual examinations of teeth and mouth to determine the prevalence of dental caries in children under 5 years old, as well as completing a questionnaire about parents' knowledge on oral health maintenance.

Result: Based on the research results, the prevalence of dental caries among toddlers at Posyandu was 19 individuals (63.3%), and there were 11 parents (36.7%) with high knowledge. This indicated a relationship between parental knowledge about oral health maintenance and the prevalence of dental caries in toddlers at Posyandu Sambung Rasa Tujuh, Rt 34, Kec. Sungai Gelam (p-value = 0.047).

Conclusion: there was a significant relationship between parental knowledge of oral health and the prevalence of dental caries in toddlers.

Keywords: parental knowledge; oral health care; toddler's caries prevalence

INTRODUCTION

Oral health in toddlers is significantly influenced by their parents' knowledge and attitudes toward dental care. Parents play a crucial role in shaping their children's habits and behaviors, including those related to oral hygiene and health. The early years of a child's life are critical for establishing good oral health practices, which can prevent dental caries and other oral health issues later in life (Sandy, 2018).

Dental caries is a prevalent chronic infectious disease that results from the metabolism of sugars by cariogenic bacteria, leading to the demineralization of tooth structure. It is a preventable disease, and parents can significantly impact its prevention by implementing good oral hygiene practices and dietary habits in their children from an early age (World Health Organization, 2019).

According to the 2018 Basic Health Research, the prevalence of dental and oral issues in Indonesia reached 57.6% (Kementrian Kesehatan RI, 2018). The

highest proportion of dental problems in Indonesia is decayed, and painful teeth.

Healthy teeth not only affect their function but also the shape of the face. Misplaced teeth, damaged, or missing teeth can impact the overall facial appearance (Oeschger et al., 2022). Dental care performed at home is crucial. Children learn good habits from their parents' example. Even infants will notice when their mother lovingly cleans their teeth (Dieng et al., 2020; Köse et al., 2023).

The stage of preschool children's health development heavily depends on the care and attention of adults or parents, especially the mother. The mother's role is essential in determining the child's growth and development. Therefore, the health status of children, including dental and oral health in children under 5 years old, is largely influenced by parental behavior, particularly the knowledge, attitudes, and actions of mothers (Dieng et al., 2020).

Parents' perceptions, knowledge, and behavior can affect the children's access to preventive dental care and professional oral care (Duijster et al., 2015). Children need dental health education as early as possible to learn how to maintain good and proper oral health. The active role of parents in the growth and development of the child is very important, especially when the child is still in preschool age (Wowor et al., 2023). The active role of parents involves guiding, understanding, reminding, and encouraging their child (Alamoudi et al., 2023).

Therefore, the researchers are eager to understand the extent of the relationship between parents' knowledge about dental and oral health care and the prevalence of dental caries in toddlers at Posyandu Sambung Rasa Tujuh, Sungai Gelam sub-district, in 2024.

METHODS

This study employed a cross-sectional design, targeting a sample of mothers and

their toddlers at Posyandu Sambung Rasa Tujuh, located in Rt 34, Sungai Gelam sub-district, in 2024. A total of 30 participants were selected for this study.

Data on the mothers' knowledge of dental and oral health care were collected using a structured questionnaire. The prevalence of dental caries in toddlers was determined through an oral cavity examination conducted by trained healthcare professionals.

The collected data were analyzed using statistical methods, specifically the Chi-square test, to determine the relationship between the level of knowledge among mothers and the prevalence of dental caries in their toddlers. This analysis aimed to identify significant correlations and draw conclusions regarding the impact of parental knowledge on the oral health outcomes of their children.

RESULTS AND DISCUSSION

The results showed that most of the mothers (63,3%) in this research were young housewives between 20 and 29 (Table 1). Housewives have more time for child-rearing than working mothers, which allows them to play a particularly dominant role in shaping their children's behavior. Since they are often the primary caregivers, housewives can invest more time and attention in nurturing their children's physical, emotional, and cognitive development. This increased availability enables them to be more involved in daily routines, discipline, education, and moral guidance (Dhingra & Keswani, 2019).

Table 1. Descriptive of respondents

Criteria	N	%
Mothers' Age (years)		
20-29	19	63,3
30-39	11	36,7
Mothers' Occupation		
Housewives	20	66,7
Working Mother	10	33,3
Toddlers' Ages (years)		
1-2	16	53,3
3-4	14	46,7

Based on the results of Table 2, it was found that most parents have low knowledge, which is 63.3%, while high knowledge is 36.7%.

Parental knowledge is very important in shaping dental and oral hygiene behavior because poor dental and oral health behavior can prevent the risk of caries. Parents with low knowledge about dental and oral health tend to have habits that do not support their children's dental and oral health. The process of implementing dental and oral hygiene requires a process that can start from the home environment so that children follow various parental actions related to dental and oral care.

Behavior is the action or activity concerned. The process of forming the expected behavior requires time and the ability of parents to educate their children (Notoatmodjo, 2012). Thus, if the parents' lifestyle is healthy, it will be applied to their children. One of these is maintaining dental and oral health by brushing teeth at least twice a day, namely in the morning after breakfast and at night before going to bed, using toothpaste that contains fluoride and is appropriate for the age, about the size of a pea (Clarke & Stevens, 2019).

Table 2. Statistical analysis to asses the relationship between mother knowledge and toddler's caries status

Mother knowledge	Toddler's Caries status				TOTAL		P-Value
	Caries present		Caries absent				
	N	%	N	%	N	%	
High	4	36,4	7	63,6	11	100	0,047
Low	15	78,9	4	21,1	19	100	
Total	19	63.3	11	36,7	30	100	

In this study, it was found that most parents with low knowledge have children with dental caries in their oral cavity. Conversely, most parents with high dental health knowledge do not have children with caries in their oral cavity. Statistical analysis results show a significant relationship between mothers' knowledge about dental health maintenance and the prevalence of caries in young children (p-value 0,047).

Previous research has shown a correlation between parental knowledge and the incidence of dental caries in children. This means that the level of knowledge parents have about oral health can influence the likelihood of their children developing dental caries (Afiati et al., 2017; Afrinis et al., 2021; Fadlilah, 2019; Fitriani, 2018; Jyoti et al., 2019; Larasati et al., 2021; Muhtar et al., 2020).

Parents with better knowledge about dental care are more likely to implement effective oral hygiene practices for their children. They tend to be more consistent in brushing their children's teeth, using fluoride toothpaste, and avoiding sugary foods that contribute to caries (Salama et al., 2020).

Additionally, these parents understand the importance of regular dental check-ups and are more likely to schedule them, which can help in early detection and prevention of dental issues. Their awareness about the impact of diet on oral health leads them to regulate their children's sugar intake and provide healthier food choices. Overall, parental knowledge about dental health plays a crucial role in preventing caries, as informed parents are more likely to adopt practices that support better oral health, reducing the risk of caries in their children (Dali et al., 2019).

To promote good dental health in children, proper nutrition plays a key role. It is important to ensure that children receive a balanced diet rich in nutrients, including fresh fruits and vegetables while limiting the intake of sugary foods (Benahmed et al., 2021). Encouraging healthy eating habits not only supports overall well-being but also helps in preventing tooth decay and other oral health issues. Additionally, parents should set a good example by maintaining their own oral hygiene practices and by making regular visits to the dentist every 3-6 months (Antoniadou & Varzakas, 2021).

Brushing habits are equally crucial in maintaining dental health. Children should use a soft-bristled toothbrush along with

toothpaste that contains fluoride, appropriate for their age, using an amount equivalent to the size of a pea. It is recommended that children brush their teeth at least twice a day, specifically after breakfast and before bed.

For children aged 2-3 years, while they may start brushing on their own, parental guidance is still necessary to ensure proper technique. This includes brushing all surfaces of the upper and lower teeth with a back-and-forth motion, at least eight times on each surface. Avoid sharing toothbrushes among family members and discourage habits such as using a pacifier before bedtime. For children aged 3-5 years, the focus remains on brushing twice daily, reducing sweet and sticky foods, and avoiding habits like thumb-sucking that can lead to misaligned teeth (Kementerian Kesehatan RI, 2012).

In contrast to this study, other research has found no significant relationship between parental knowledge and the incidence of dental caries in children (Rompis et al., 2016; Sukarsih et al., 2018).

This discrepancy could be due to various factors. For instance, some studies may have had different methodologies, such as varying sample sizes, populations, or definitions of "parental knowledge." Additionally, the effectiveness of parental knowledge might be influenced by other factors like socio-economic status, access to dental care, or cultural attitudes towards oral health, which could potentially obscure the direct impact of parental knowledge alone (Ghasemianpour et al., 2019; Safiri et al., 2016).

In some cases, the implementation of dental care practices might not solely depend on parental knowledge but also on other external influences or barriers. Consequently, while knowledge is an important factor, it might not always directly correlate with the prevalence of dental caries due to the complex interplay of multiple variables.

CONCLUSION

From this study, it can be concluded that there was a significant relationship between mothers' knowledge of their toddlers' caries status.

REFERENCES

- Afiati, R., Duarsa, P., Ramadhani, K., & Diana, S. (2017). Hubungan Perilaku Ibu Tentang Pemeliharaan Kesehatan Gigi. *Dentino Jurnal Kedokteran Gigi*, 11(1), 56–62.
- Afrinis, N., Farizah, N., & Pahlawan Tuanku Tambusai, U. (2021). Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini Analisis Faktor yang Berhubungan dengan Kejadian Karies Gigi Anak Usia Dini. *Jurnal Pendidikan Anak Usia Dini*, 5(1), 763–771.
<https://doi.org/10.31004/obsesi.v5i1.668>
- Alamoudi, R. M., Showlag, R. A., Almuji, N. J., Alzahrani, A. M., Aladwani, W. I., Alboeid, A. A., Alsaleh, Y. T., Alali, J. Y., Alahmadi, A. J., Nayas, L. M., & Al-Qahtani, H. M. (2023). The impact of parental oral health behaviors on the oral health of children. *International Journal Of Community Medicine And Public Health*, 10(11), 4451–4456.
<https://doi.org/10.18203/2394-6040.ijcmph20233149>
- Benahmed, A. G., Gasmi, A., Dadar, M., Arshad, M., & ... (2021). The role of sugar-rich diet and salivary proteins in dental plaque formation and oral health. *Journal of Oral ...*.
<https://www.sciencedirect.com/science/article/pii/S1349007921000116>
- Clarke, L., & Stevens, C. (2019). Preventing dental caries in children: why improving children's oral health is everybody's business. *Paediatrics and Child Health (United Kingdom)*, 1–7.

- <https://doi.org/10.1016/j.paed.2019.09.004>
- Dali, M., Koirala, B., & Shrestha, S. (2019). Knowledge, Awareness and Perception Regarding Importance of Primary Teeth among Parents Visiting Dental OPD, BPKIHS, Dharan, Nepal. *Birat Journal of Health Sciences*, 3(3). <https://doi.org/10.3126/bjhs.v3i3.22192>
- Dhingra, V., & Keswani, S. (2019). Impact of Working and Non - Working Mothers on Development of their Children in Madhya Pradesh. *International Journal of Research in Advent Technology*, 7(3). <https://doi.org/10.32622/ijrat.732019104>
- Dieng, S., Cisse, D., Lombrail, P., & Azogui-Lévy, S. (2020). Mothers' oral health literacy and children's oral health status in Pikine, Senegal: A pilot study. *PLoS ONE*, 15(1), 1–12. <https://doi.org/10.1371/journal.pone.0226876>
- Duijster, D., De Jong-Lenters, M., De Ruiter, C., Thijssen, J., Van Loveren, C., & Verrips, E. (2015). Parental and family-related influences on dental caries in children of Dutch, Moroccan and Turkish origin. *Community Dentistry and Oral Epidemiology*, 43(2), 152–162. <https://doi.org/10.1111/cdoe.12134>
- Fadlilah, S. (2019). Hubungan tingkat pengetahuan orang tua tentang kesehatan gigi dengan terjadinya karies pada anak prasekolah di TK Aisyiyah Bustanul Athfal. *Journal of Oral Health Care*, 7(1). <https://doi.org/10.29238/ohc.v7i1.343>
- Fitriani, D. T. (2018). Hubungan Pengetahuan Ibu Tentang Kesehatan Gigi Dengan Karies Gigi Pada Anak Usia 2-4 Tahun Di Paud Tunas Melati Sambak Indah. *Kesehatan Gigi*, 4(01).
- Ghasemianpour, M., Bakhshandeh, S., Shirvani, A., Emadi, N., Samadzadeh, H., Moosavi Fatemi, N., & Ghasemian, A. (2019). Dental caries experience and socio-economic status among Iranian children: A multilevel analysis. *BMC Public Health*, 19(1). <https://doi.org/10.1186/s12889-019-7693-1>
- Jyoti, N. P. C. P., Giri, P. R. K., Handoko, S. A., Kurniati, D. P. Y., & Rahaswanti, L. W. A. (2019). Hubungan tingkat pengetahuan dan perilaku ibu dalam merawat gigi anak terhadap kejadian karies anak di TK Titi Dharma Denpasar. *Bali Dental Journal*, 3(2). <https://doi.org/10.51559/bdj.v3i2.34>
- Kementerian Kesehatan RI. (2012). *Pedoman Pemeliharaan Kesehatan Gigi dan Mulut Ibu Hamil dan Anak Kecil bagi Tenaga Kesehatan di Fasilitas Pelayanan Kesehatan*. Kementerian Kesehatan RI.
- Kementrian Kesehatan RI. (2018). Laporan Riskesdas 2018 Nasional. In *Kementerian Kesehatan Republik Indonesia* (pp. 146–379).
- Köse, H. D., Yavuz, B. Ş., & Kargül, B. (2023). Oral and Dental Health Knowledge and Attitudes among Parents of Children. *Clinical and Experimental Health Sciences*, 13(1), 84–91. <https://doi.org/10.33808/clinexphealthsci.1056574>
- Larasati, R., Mabruroh, H. A., Suharnowo, H., & Sugito, B. H. (2021). Systematic Literature Review: Hubungan Pengetahuan Ibu Dengan Kejadian Karies Gigi Anak Prasekolah. *Jurnal Kesehatan Gigi Dan Mulut (JKGM)*, 3(2), 55–60. <https://doi.org/10.36086/jkgm.v3i2.822>
- Muhtar, S., Hatta, I., & Kusuma Wardani, I. (2020). HUBUNGAN TINGKAT PENGETAHUAN IBU TENTANG KESEHATAN

- GIGIDENGAN TINGKAT
KEBERSIHAN GIGI DAN
MULUT PADA ANAK
DIKABUPATEN BARITO
KUALA. *Jur. Ked. Gigi*), 4(1).
- Notoatmodjo, S. (2012). Pendidikan dan perilaku kesehatan. *Jakarta : Rineka Cipta*.
- Oeschger, E. S., Kanavakis, G., Cocos, A., Halazonetis, D. J., & Gkantidis, N. (2022). Number of Teeth Is Related to Craniofacial Morphology in Humans. *Biology*, 11(4). <https://doi.org/10.3390/biology11040544>
- Rompis, C., Pangemanan, D., & Gunawan, P. (2016). Hubungan tingkat pengetahuan ibu tentang kesehatan gigi anak dengan tingkat keparahan karies anak TK di Kota Tahuna. *E-GIGI*, 4(1). <https://doi.org/10.35790/eg.4.1.2016.11483>
- Safiri, S., Kelishadi, R., Heshmat, R., Rahimi, A., Djalalinia, S., Ghasemian, A., Sheidaei, A., Motlagh, M. E., Ardalan, G., Mansourian, M., Asayesh, H., Sepidarkish, M., & Qorbani, M. (2016). Socioeconomic inequality in oral health behavior in Iranian children and adolescents by the Oaxaca-Blinder decomposition method: The CASPIAN- IV study. *International Journal for Equity in Health*. <https://doi.org/10.1186/s12939-016-0423-8>
- Salama, F., Alwohaibi, A., Alabdullatif, A., Alnasser, A., & Hafiz, Z. (2020). Knowledge, behaviours and beliefs of parents regarding the oral health of their children. *European Journal of Paediatric Dentistry*, 21(2), 103–109. <https://doi.org/10.23804/ejpd.2020.21.02.03>
- Sandy, L. P. A. (2018). PERAN ORANG TUA TERHADAP KETERAMPILAN MENYIKAT GIGI DAN MULUT PADA ANAK DISABILITAS INTELEKTUAL. *Jurnal Teknosains*. <https://doi.org/10.22146/teknosains.32343>
- Sukarsih, Silfia, A., & Febrianti, S. (2018). Hubungan Pengetahuan Ibu Tentang Pemeliharaan Kesehatan Gigi dengan Status Karies pada Anak TK AL-Hikmah Kota Jambi tahun 2018. *Jurnal Bahan Kesehatan Masyarakat*, 2(2).
- World Health Organization. (2019). *Ending childhood dental caries: WHO implementation manual*. apps.who.int. <https://apps.who.int/iris/bitstream/handle/10665/330643/9789240000056-eng.pdf>
- Wowor, V. N. S., Mariati, N. W., & Kalalo, M. J. (2023). Hubungan Dukungan Orang Tua pada Kesehatan Gigi Mulut Anak dan Status Kebersihan Mulut. *E-GiGi*, 12(1), 117–124. <https://doi.org/10.35790/eg.v12i1.50358>
- Antoniadou, M., & Varzakas, T. (2021). Breaking the vicious circle of diet, malnutrition and oral health for the independent elderly. *Critical Reviews in Food Science and Nutrition*, 1–23. <https://doi.org/10.1080/10408398.2020.1793729>

DOES A SHORT MOVIE AFFECT TUBERCULOSIS PREVENTION KNOWLEDGE AND ATTITUDES OF YOUTH CADRES?

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ABSTRACT

Background: Tuberculosis remains one of the top deadly diseases in the world today. Good knowledge and attitudes are crucial in preventing Tuberculosis. One effort to improve knowledge and attitudes towards Tuberculosis prevention is through education using short movie. This study aims to analyze the effect of short movie on knowledge and attitudes about Tuberculosis prevention on youth cadres

Method: This research is a quantitative study with a pre-experimental method and a one-group pre-test and post-test design. The population in this study includes all youth cadres in the working area of Putri Ayu Health Center, Jambi City. The sample was taken using total sampling techniques with 45 respondents. The data analysis used was univariate and bivariate analysis with the Paired T-Test statistical test.

Result: The results showed that the knowledge and attitudes of the respondents increased after being given education using short movie media, with a significance value of $p = 0.000$ ($p < 0.05$).

Conclusion: Short movie had an effect on the knowledge and attitudes about Tuberculosis Prevention of youth cadres in the working area of Putri Ayu Health Center, Jambi City.

Keywords: tuberculosis; short movie; knowledge; attitude

INTRODUCTION

Tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis* which has infected almost a third of the world's population. Tuberculosis can attack anyone, regardless of age or gender. More than 10 million people suffer from Tuberculosis every year and 1.5 million people die every year. This makes it the top deadly disease in the world. In 2022 Tuberculosis will become the second cause of death in the world after COVID-19 (WHO, 2023).

According to data from the World Health Organization (WHO), currently Indonesia has the 2nd highest number of tuberculosis cases in the world. In 2023, Tuberculosis cases in Indonesia are estimated to number 1,060,000. With the number of Tuberculosis cases found being 792,404 cases. Deaths due to Tuberculosis in Indonesia reached 134,000, down compared to 144,000 deaths in 2021 (Kemenkes RI, 2024).

According to the Jambi Province Central Statistics Agency (2024), there were 12,682 cases of pulmonary tuberculosis in Jambi

Province, an increase of more than 200% from 2020 with 4,838 cases. In 2022, Merangin Regency will be ranked first with a total of 3,639 cases. The second position is occupied by Sarolangun Regency with 3,494 cases. The third position is Jambi City with 1,942 cases (Badan Pusat Statistik Provinsi Jambi, 2024).

Community Health Centers as primary health care centers have an important role in preventing and controlling Tuberculosis. One approach used is through the role of health cadres, including youth cadres. Youth cadres are teenagers who are selected/voluntarily volunteered and trained to participate in implementing adolescent health services for themselves, their peers, their families and the community (Podungge et al., 2021)

According to WHO, teenagers are a group with an age range of 10-19 years. At this age, teenagers develop rapidly physically, cognitively and psychosocially. This impacts their thinking, feelings, decision making, and interactions with the environment around them (WHO, 2024).

Seeing this phenomenon, researchers provided innovative health education using short movie to increase teenagers' knowledge and attitudes about preventing tuberculosis. Short movie has their own characteristics that are different from long story movie. Based on research conducted by Zulfa Sulaihah in 2019, short movie was proven to be able to increase teenagers' knowledge and attitudes about preventing free sex. From the results of the pretest and posttest as well as the evaluation carried out, a significant increase was seen (Suhailah et al., 2019). Supported by Sinurat's research, which shows that there is an influence of health promotion using short movie about COVID-19 on the knowledge and attitudes of students at SMP N 13 Pematangsiantar (Sinurat, 2021)

Based on this background, this study aimed to analyze the effect of short movie to increase Tuberculosis prevention knowledge

and attitudes of youthe cadres in the working area of Putri Ayu Health Center Jambi City.

METHODS

This research is a quantitative study with a pre-experimental method and a one-group pre-test and post-test design. The research obtained ethical feasibility from the Heath Research Ethics Commission of the Jambi Ministry of Health Polytechnics.

The research was conducted in the working area of the Putri Ayu Health Center. From February to Mei 2024. The sample was taken using total sampling techniques with 45 respondents' youth cadres.

Tuberculosis knowledge was collected through interviews using a questionnaire consisting of 15 questions. The questionnaire was tested for validity and reliability, with a Cronbach's alpha of 89,2%. Assessment of Tuberculosis Knowledge by giving a score: if the answer is correct, they were given a score of 1, and if the answer incorrect, they were given a score of 0.

Tuberculosis Prevention attitudes was collected through interviews using a statement questionnaire consisting of 10 statements. The questionnaire was tested for validity and reliability, with a Cronbach alpha of 98,6%. Assessment of Tuberculosis prevention attitudes by giving a score 1-5, 5 for strongly agree, 4 for agree, 3 for neither agree nor disagree, 2 for disagree, 1 for strongly disagree.

The pre-requisite test results (Shapiro Wilk) for parametric analysis showed that the data is normally distributed ($p > 0,05$) for the knowledge variable and the attitudes variable. Therefore, inferential data analysis was performed using Paired T-Test at a significance level of 95%.

RESULTS AND DISCUSSION

The differences in youth cadres Tuberculosis prevention knowledge before and after being given a short movie

Table 1. Distribution of Mean Pre-Test and Post-Test Tuberculosis Prevention Knowledge

Variable	N		Mean	Std. Deviation	Min-Max
Tuberculosis Knowledge	45	Pre-test	8.91	2.410	1-14
		Post-test	12.73	1.273	11-15

Source: Primary Data (2024)

Based on Table 1, it shows that the respondent's knowledge during the pre-test had an average score of 8.91 and post-test 12.73. This means that after being given education using short film media about Tuberculosis, the respondents' knowledge score increased by 3.82.

After being given education using short movie media, respondent's knowledge about Tuberculosis increased. The information provided in this research is an explanation of the meaning, symptoms, prevention, transmission, risk factors and treatment of Tuberculosis. In line with what Mubarak said, one of the factors that influences knowledge is information (Mubarak, 2011).

It can be concluded that there was an increase in the average knowledge score of respondents after being given education using short movie media.

The differences in youth cadres Tuberculosis prevention attitudes before and after being given a short movie

Based on table 2, it shows that the respondent's attitudes during the pre-test had an average score of 31.80 and post-test 42.87. This means that after being given education using short movie about Tuberculosis, there was an increase in the respondent's attitude value by 11.07. This is in line with research by Sulaihah (2019) which explains that SEM (Short Education Movie) or short movie can

increase the positive attitudes of teenagers regarding free sex (Suhailah et al., 2019).

Table 2. Distribution of Mean Pre-Test and Post-Test Tuberculosis Prevention Attitudes

Variable	N		Mean	Std. Deviation	Min-Max
Tuberculosis Prevention Attitudes	45	Pre-test	31.80	2.389	27-36
		Post-test	42.87	2.106	38.47

Source: Primary Data (2024)

It can be concluded that education using short movie can increase the average positive attitude of teenagers in preventing tuberculosis.

The Effect of Education Using Short Movie on Tuberculosis Prevention Knowledge

Table 3. Paired T-Test Test Results Variable Tuberculosis Prevention Knowledge

Variable	Mean (s.b)	Difference (s.b)	CI 95%	P-value
Knowledge before education using short movie (n=45)	8.91 (2.41)	3.82	4.34 – 3.30	0.000
Knowledge after education using short movie (n=45)	12.73 (1.14)			

Based on table 3, the results of the Paired T-Test statistical test, it shows a significance value smaller than 0.05, $P=0.000$. This shows that there is a significant difference between before and after education using short movie media and knowledge about preventing tuberculosis among youth cadres in the working area of the Putri Ayu Health Centre, Jambi City. After being given health education about tuberculosis using short movie, all respondents experienced an increase in their knowledge.

According to Notoadmodjo, an important step in health education is creating messages and media that are appropriate to the target. The methods and media used to convey information also influence the delivery of information, and this can have a significant impact on increasing knowledge (Notoadmodjo, 2010).

This is in line with research by Suhailah (2019) which shows that short movie have a

significant influence on increasing students' knowledge at Darma Siswa Vocational School (Suhailah et al., 2019). Supported by Sinurat's research, which shows that there is an influence of health promotion using short movie about COVID-19 on students' knowledge at SMP N 13 Pematangsiantar (Sinurat, 2021).

According to researchers, providing education using short movie has been proven to increase Tuberculosis prevention knowledge on youth cadres in the working area of the Putri Ayu Health Center, Jambi City. It can be assumed that the information provided can be understood well by respondents so that there is an increase in the average value of respondents' knowledge in the post-test.

The Effect of Education Using Short Movie on Tuberculosis Prevention Attitudes

Table 4. Paired T-Test Test Results Variable Tuberculosis Prevention Attitudes

Variable	Mean (s.b)	Difference (s.b)	CI 95%	P-value
Attitudes before education using short movie (n=45)	31.80 (2.38)	11.06	11.97 – 10.15	0.000
Attitudes after education using short movie (n=45)	42.87 (2.10)			

Based on table 4, the results of the bivariate test using the Paired T-Test statistical test, a P value <0.05 was obtained, P=0.000. This shows that there is a significant influence of education using short movie media on Tuberculosis prevention attitudes on youth cadres in the working area of the Putri Ayu Health Center, Jambi City.

According to Handayani, audiovisual media is a medium that is effective in improving a person's attitude (Handayani & Ristrini, 2010). The short movie in this study shows events that can arouse the feelings of the audience, such as a scene of coughing up blood, which makes the audience afraid of experiencing something similar. This is in

line with the theory that the content of messages in movie has a significant influence on feelings, emotions, levels of acceptance or rejection of the information provided (Nurseto, 2011).

This research are in line with research by Mulyati (2015), which states that there is a positive influence of Health Education through movie on mothers' attitudes during the IVA test in Kawarang Regency (Mulyati et al., 2015).

According to researchers, providing education using short movie has been proven to improve Tuberculosis prevention attitudes on youth cadres in the working area of the Putri Ayu Health Center, Jambi City. This is assumed to be because the presentation of the material in the short film is clear, easy to understand and more interesting.

CONCLUSION

Short Movie Media can increase Youth Cadres Knowledge and Attitudes of Tuberculosis prevention. The Short Movie can be used as a media for health promotion programs.

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CONFLICT OF INTEREST

This research, there are no conflicts of interest regarding funding, including names in published articles, and the data collection process

REFERENCES

- Badan Pusat Statistik Provinsi Jambi. (2024). *Kasus Penyakit 2022*. <https://jambi.bps.go.id/indicator/30/1383/1/kasus-penyakit.html>
- Handayani, L., & Ristrini. (2010). Pengaruh Model Pembelajaran Kesehatan Menggunakan Multimedia terhadap Perubahan Pengetahuan dan Sikap siswa SLTP terkait Faktor Resiko Penyakit Jantung Koroner. *Buletin Penelitian Sistem Kesehatan*.
- Kemenkes RI. (2024). *Dashboard TB Indonesia*.
- Mubarak, W. I. (2011). *Promosi Kesehatan untuk Kebidanan*. Salemba Medika.
- Mulyati, S., Suwarsa, O., & Desy Arya, I. F. (2015). Pengaruh Media Film Terhadap Sikap Ibu Pada Deteksi Dini Kanker Serviks. *Jurnal Kesehatan Masyarakat*, 11(1), 16. <https://doi.org/10.15294/kemas.v11i1.3401>
- Notoadmodjo, S. (2010). *Promosi Kesehatan Teori dan Aplikasi*. Rineka Cipta.
- Nurseto. (2011). Membuat Media Pembelajaran Menarik. *Jurnal Ekonomi Dan Pendidikan*.
- Podungge, Y., Nurlaily, S., & Yulianti, S. (2021). *Buku Referensi Remaja Sehat, Bebas Anemia*. Deepublish.
- Sinurat, S. N. (2021). Pengaruh Media Video Animasi dan Film Pendek terhadap Pengetahuan Sikap Siswa Mengenai Covid-19 di Smp Negeri 13 Pematangsiantar Tahun 2021. *Universitas Sumatera Utara*.
- Suhailah, Z., Kusumaningrum, T., Aria, D., & Nastiti, A. (2019). Pendidikan Kesehatan Media Short Education Movie (SEM) terhadap Pengetahuan dan Sikap Remaja Tentang Seks Bebas (Health Education with Short Education Movie (SEM) on Knowledge and Attitudes of Adolescents About Free Sex). <http://e-journal.unair.ac.id/PMNJ|145JournalHomepage:https://e-journal.unair.ac.id/PMNJ/index>
- WHO. (2023). *Global Tuberculosis Report 2023*.
- WHO. (2024). *Adolescent health*. https://www.who.int/health-topics/adolescent-health#tab=tab_1

CONSUMPTION PATTERNS AND INCIDENTS OF STUNTING AMONG SUKU ANAK DALAM (SAD) TODDLER IN MUARO JAMBI: ETHNOGRAPHIC STUDY

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ABSTRACT

Background: The incidence of stunting among SAD toddlers in Nyogan Village, Muaro Jambi is 42.2%. Stunting is caused by children not getting adequate and adequate nutrition at all stages of life. Overcoming stunting requires addressing the main direct cause, namely consumption patterns. The aim of this research is to analyze consumption patterns and the incidence of stunting among SAD toddlers in Muaro Jambi Regency using an ethnographic study.

Method: This research uses a qualitative methodology with an ethnographic research design. Data collection used visual methods, in-depth interviews, FGD (focus group discussion), anthropometric measurements, and the Food Frequency Form. The research informants consisted of 15 mothers of toddlers as the main informants and 5 key informants. Researchers used the triangulation method of sources, methods and data to test the validity of the data. Data analysis uses thematic analysis.

Result: The research results found that 4 (26.7%) SAD toddlers were stunted. The food consumption patterns of SAD toddlers are not met in quantity, namely a lack of consumption of both animal and vegetable protein, vegetables and fruit. Likewise, with energy, protein, fat and carbohydrate intake. This SAD fulfills its food needs by purchasing and its purchasing power depends on the results of fishing. Some of the fish are consumed and sold to buy other food needs.

Conclusion: The food consumption patterns of stunted SAD toddlers are insufficient. Informants need to seek information from health workers about healthy and nutritionally balanced food, cheap and affordable according to purchasing power.

Keywords: Consumption Pattern; stunting; SAD toddler

INTRODUCTION

Stunting refers to chronic malnutrition, which can have long-term impacts such as stunted growth, reduced cognitive and mental abilities, increased vulnerability to disease, reduced economic productivity, and reduced fertility. Stunting is caused by children not receiving sufficient and adequate nutrition at all stages of life. This condition can have a significant impact on the long-term health and survival of children, as well as the productivity of the Indonesian economy and the country's ability to achieve national and international development goals (UNICEF, 2020).

In 2018, 22.2% of children under five or around 150.8 million children were stunted in

2018. More than a third of stunted children under five in the world came from Asia (31.9%) and Africa (33.1%) (World Health Organization, 2019). Based on the World Bank's global database in 2022, there were 18 countries with stunting prevalence above 30% in 2018, with Indonesia ranking first in the Southeast Asia region at 30.8% (The World Bank, 2022). National stunting prevalence reached 30.8% in 2018, but will decrease to 21.5% in 2023. The prevalence of stunting in Jambi Province was 30.1% in 2018 and reached 13.5% in 2023 (BKPK Kemenkes, 2024; Kemenkes RI, 2019). Even though the reduction in stunting in Jambi province reached the target of 14%, Muaro Jambi has the sixth highest prevalence of child stunting in Jambi province at 18.6%, meaning that

approximately 1 in 5 toddlers in this district is stunted. (BKPK Kemenkes, 2022).

Muaro Jambi is one of the regions in Indonesia which is a priority area for reducing stunting by up to 14% by 2024. Muaro Jambi is one of 514 districts/cities focused on integrated interventions to reduce stunting in 2022, in line with the objectives of the National Medium Term Development Plan (RPJMN) for 2020-2024, expanded from the 360 districts/cities in the previous year (Kementerian PPN/ Bappenas, 2021). Many cases of stunting in Jambi are caused by poverty, especially SAD. SAD is increasingly trapped in poverty because livelihoods that depend heavily on hunting are increasingly reduced due to the collection of forest products that are increasingly scarce due to changes in land use (Asril, 2017).

SAD or Orang Rimba is a indigenous community in Jambi Province which is spread out in small groups in secondary forests and oil palm plantations and industrial plantation forests in Jambi Province (Sukmareni, 2021). There are still quite a lot of SAD communities in Jambi Province. The number of SAD in Jambi Province up to 2010 was recorded at 6,773 families or 28,883 people spread across 8 districts, namely Muaro Jambi, Batanghari, Tebo, Sarolangun, Merangin, Bungo, West Tanjung Jabung and East Tanjung Jabung. There are several groups that have been fostered and housed by the government, including in Nyogan Muaro Jambi Village since 2004 (Dinas Sosial Tenaga Kerja dan Transmigrasi, 2013).

One of the health problems that often occurs in the SAD community is low nutritional status and the problem of poverty in the SAD community, so that they are easily attacked by disease and have an impact on their nutritional status (Sari and Putri, 2021). Haris, A found that the incidence of stunting among SAD toddlers in Nyogan Village, Muaro Jambi was 42.2% (Haris et al., 2019).

Nurizka's research found that the Baduy tribe's way of life and good nutritional sources

make a big contribution to the nutritional quality of the community. Baduy's ability to preserve biodiversity makes local food rich in nutrition and abundant. Baduy never lack food, in contrast to non-indigenous communities who are vulnerable to food shortages. Therefore, maintaining the culture of preserving nature and developing local food production in the Baduy Tribe is one strategy to improve the nutritional status of the community (Nurizka et al., 2020).

Based on interviews with health workers, specifically for the incidence of stunting in toddlers living in remote areas, especially in SAD living in Nyogan Muaro Jambi Village, there is no special data collection yet. This is due to the difficulty of accessing information and technology, as well as the low utilization of health services in the SAD community, so it is feared that the stunting rate in SAD may be high. Based on the description above, researchers are interested in conducting an ethnographic study on consumption patterns and the incidence of stunting among SAD toddlers in Muaro Jambi.

METHODS

This qualitative research, with an ethnographic research design, aims to study and collect data on consumption patterns of toddlers based on daily cultural norms and activities adopted by the Anak Dalam tribe community in Nyogan Muaro Jambi Village. This research was conducted in Nyogan Muaro Jambi Village, Jambi Province, from May 2023 to December 2023. The sampling technique uses purposive sampling. The informants for this research consisted of 15 main informants and 5 key informants.

The data collection techniques used were visual, in-depth interviews, structured interviews using food frequency forms, FGDs, and anthropometric measurements. To test the validity of qualitative data, researchers used triangulation (combined) methods, including triangulation of sources,

methods and data. The qualitative analysis carried out is thematic analysis, which is a way to carry out data analysis aimed at identifying patterns or finding themes through the data obtained by the researcher. To obtain themes, researchers mapped the research data as in Figure 1.



Figure 1 Thematic data analysis process

Table 1 Characteristics of Main Informants in SAD in Muaro Jambi Regency

Informant code	Age (Years)	Mother Education	Mother Work	Father Education	Father Work
01	25	Elementary school	Housewife	elementary school	Fisherman
02	32	not completed in primary school	Housewife	not completed in primary school	Private
03	20	not completed in primary school	Housewife	elementary school	Fisherman
04	22	Junior high school	Housewife	not completed in primary school	Fisherman
05	28	not completed in primary school	Trader	not completed in primary school	Laborer
06	23	Senior high school	Housewife	Senior high school	Farmer
07	23	Junior high school	Trader	elementary school	Laborer
08	40	not completed in primary school	Trader	not completed in primary school	Fisherman
09	23	not completed in primary school	Housewife	elementary school	Private
10	40	Elementary school	Housewife	Junior high school	Laborer
11	16	Elementary school	Housewife	not completed in primary school	Fisherman
12	27	Elementary school	Housewife	Junior high school	Farmer
13	23	Elementary school	Housewife	not completed in primary school	Fisherman
14	33	not completed in primary school	Fisherman	elementary school	Fisherman
15	21	Elementary school	Housewife	not completed in primary school	Laborer

Source: Main Informant Primary Data, 2023

The main informants in this study were mothers of SAD toddlers aged 16-40 years and most of them still had low education, 6 people had not finished elementary school and 7 heads of families had also not finished elementary school. The occupation of 11 main informants is housewife, while 7 heads of families work as fishermen along the Nyogan River. The Nyogan River is the source of life for SAD. The majority of SAD do not have a definite job, almost all make their living as fishermen.

The next informants were key informants consisting of 5 people, namely the Head of the Nutrition Section of the Muaro Jambi District Health Service, nutrition workers at the Tempino Health Center, Village Midwives, community leaders (Temenggung) and the Head of Nyogan Village. In-depth interviews

RESULTS AND DISCUSSION

Informant Characteristics

The informants consisted of 15 SAD mothers of toddlers in Nyogan village as the main informants and 5 key informants. The characteristics of the main informants can be seen in table 1.

were conducted with these key informants. The characteristics of key informants can be seen in table 2.

Table 2 Characteristics of Key Informants in SAD in Muaro Jambi Regency

Informant Code	Type of informant	Education
01	Nutritionist at the Muaro Jambi Regency Health Office	Master of Public Health
02	Tempino Health Center nutritionist	Third Diploma in Midwifery
03	Nyogan Village Midwife	Third Diploma in Midwifery
04	Temenggung SAD traditional head	No school
05	Nyogan village head	Senior high school

Source: Key Informant Primary Data, 2023

Qualitative Data Analysis Process Patterns

The pattern of the qualitative data analysis process for consumption patterns among SAD toddlers can be seen in Figure 2.

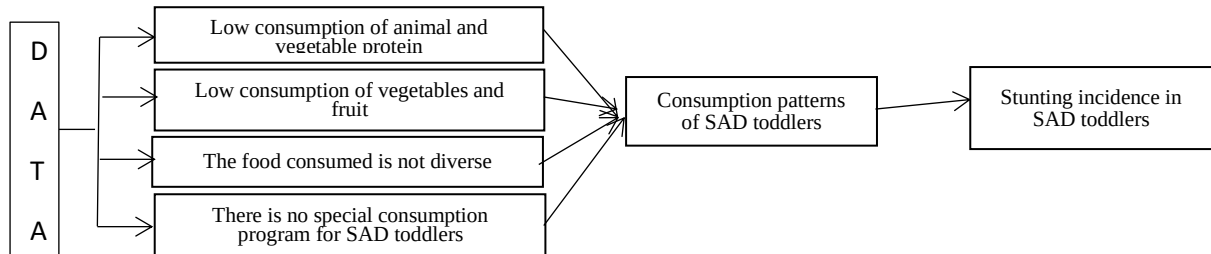


Figure 2 Qualitative Data Analysis Process Pattern "Consumption Patterns and Stunting Incidents in SAD Toddlers in Muaro Jambi

Incidents of Stunting in SAD Toddlers in Muaro Jambi

The SAD toddlers in this study ranged in age from 16 to 58 months. The results of anthropometric measurements of SAD toddlers, in the form of height, were entered into the WHO Antro application to get the HAZ score (TB/U), with the average HAZ score (TB/U) being -2.01 ± 0.4 . Furthermore, grouped based on Permenkes RI No. 2 of 2020 concerning Children's Anthropometric Standards, it was found that 4 SAD toddlers were stunted and 11 were not stunted. The incidence of SAD toddlers at risk of stunting can be seen more clearly in table 3.

Table 3 Incidence of Stunting in SAD Toddlers in Muaro Jambi

informant's toddler	Age (months)	Height (cm)	HAZ score (TB/U)	Nutritional status
01	18	77,0	-1,96	Not stunted
02	30	86,8	-1,22	Not stunted
03	56	95,8	-2,72	Stunted
04	26	79,2	-2,54	Stunted
05	20	78,8	-1,90	Not stunted
06	19	77,8	-1,94	Not stunted
07	35	87,5	-1,98	Not stunted
08	29	81,0	-2,63	Stunted
09	36	88,0	-1,97	Not stunted
10	18	78,0	-1,51	Not stunted
11	16	74,0	-1,54	Not stunted
12	39	90,8	-1,91	Not stunted
13	17	74,0	-1,95	Not stunted
14	31	85,0	-1,91	Not stunted
15	58	97,0	-2,43	Stunted

Source: Anthropometric Primary Data, 2023

Consumption Patterns of Stunting SAD Toddlers in Muaro Jambi

Consumption patterns are seen from the amount, type and frequency of food for SAD toddlers. The amount of food consumed is obtained from the nutrients contained in the

food consumed to fulfill the body's needs in carrying out activities. The types of food consumed by SAD toddlers in Nyogan Village usually develop from local food and culture. The frequency of eating for SAD toddlers was analyzed based on the number of meals in a day of staple foods, animal and vegetable proteins, vegetables and fruit. Consumption patterns based on the frequency of food consumed by SAD toddlers can be seen in figure 4.

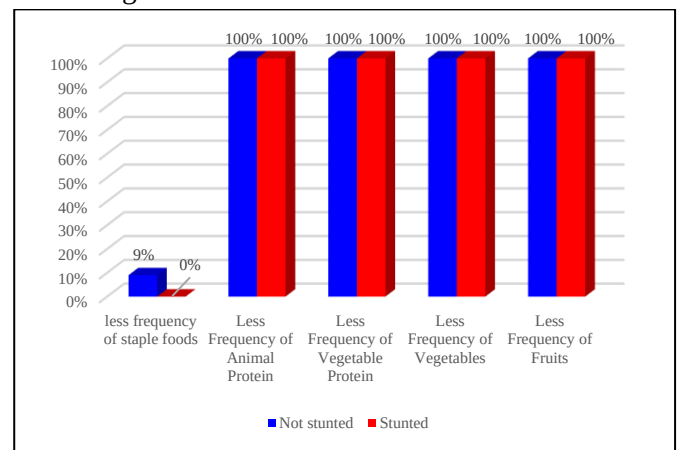


Figure 4 Frequency of consumption of staple foods, animal protein, vegetable protein, vegetables and fruit among SAD toddlers in Muaro Jambi

In Figure 4, the frequency of food sources of carbohydrates in the form of cereals and tubers for stunting SAD toddlers has been fulfilled (100%), namely 3 times / day, nothing is missing. SAD usually consumes food sourced from the forest. However, SAD who live in the Trans Social settlement of Nyogan Village consume food

obtained by purchasing, especially staple foods. However, the frequency of food sources of animal protein, vegetable protein, vegetables and fruit for stunting SAD toddlers is less (100%). The average consumption of animal protein is only once/day and rarely or even no consumption of vegetable protein.

Food consumption for SAD toddlers at risk of stunting is influenced by fishing results from fishing in the river around Nyogan Village, while animal protein from white meat, namely poultry and other livestock, is very low or even not consumed at all due to the informant's low economic capacity. Meanwhile, consumption of vegetables and fruit has not been fulfilled, on average only once/day, some even do not consume it at all. This is because the condition of the land occupied by SAD does not support cultivation, as a result of oil palm plants almost filling every land where it is located. Consumption patterns based on the type of food consumed by SAD toddlers can be seen in Figure 5.

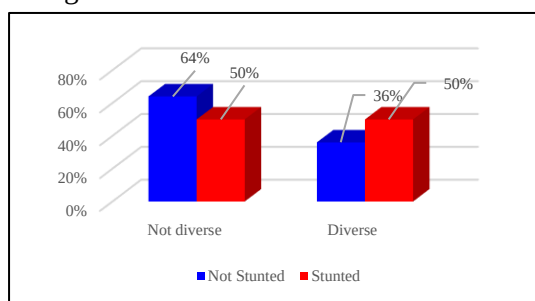


Figure 5 Types of food consumed by SAD toddlers in Muaro Jambi

The consumption patterns of stunted SAD toddlers based on the type of food ingredients are 50% not diverse because they consume less than 5 types of food ingredients consisting of staple foods, animal protein, vegetable protein, vegetables and fruit, and the other 50% of stunted SAD toddlers have varied consumption patterns. Even though it is diverse, the quantity or amount consumed is not yet sufficient. Consumption patterns based on the amount of food consumed in the form of energy, protein, fat and carbohydrate

intake in SAD toddlers can be seen in Figure 6.

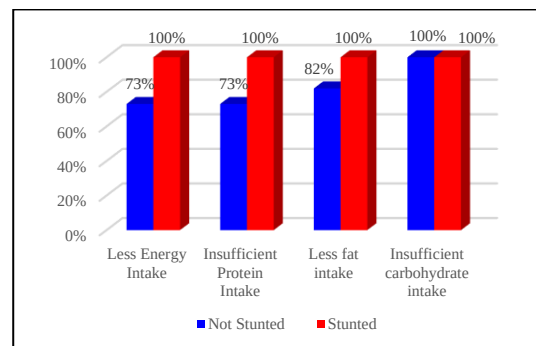


Figure 6 Percentage of Insufficient Energy, Protein, Fat and Carbohydrate Intake on Nutritional Adequacy Rates for SAD Toddlers in Muaro Jambi

Based on Figure 6, it can be seen that the intake of energy, protein, fat and carbohydrates in 4 SAD toddlers who are stunted is insufficient in the amount of nutrients according to nutritional adequacy figures and age. The consumption of toddlers is not sufficient in quantity, because to meet their protein needs, most of it only comes from fish, while animal protein from white meat, namely poultry and other livestock, is very low or even not consumed at all. Likewise, consumption of vegetables and fruit has not been fulfilled.

Based on the results of research data exploration, the consumption patterns of SAD toddlers based on frequency, namely lack of consumption of animal, vegetable protein, vegetables and fruit as well as lack of energy, protein and fat and carbohydrate intake, are the causes of stunting in SAD toddlers. The results of this study are in line with Pradigdo who found that sedentary SAD toddlers had more diverse eating patterns compared to sedentary toddlers with SAD. SAD toddlers who do not hunt usually eat rice as a staple food (2 to 3 times per day), along with vegetables, animal side dishes and fruit. All nomadic SAD toddlers have restrictions on eating certain foods (poultry, animals), except water animals. Nomadic SAD toddlers have higher rates of malnutrition than sedentary children (Pradigdo et al., 2022).

All living creatures need food to survive, and toddlers need it for the growth and development of their bodies. Food consumption is important to meet the body's energy needs, although energy reserves provide buffer reserves in times of hunger. A person's nutritional consumption can determine the level of health or nutritional status they achieve. If the body is at an optimum level of health where the tissues are saturated with all nutrients, then the body is free from disease and has the highest endurance. Malnutrition status occurs when food consumption is less than the body's needs. Humans need energy to maintain life, support growth and carry out physical activity. Energy is obtained from carbohydrates, fats and proteins in food (Almatsier, 2016; Notoatmodjo, 2012).

According to Beaton GH and Ghasserni H (1982), the main cause of stunting was known from the start to be a deficiency of macronutrients such as energy and protein. Apart from macronutrients, deficiencies in single micronutrients such as zinc have been proven to play a role in growth deficits (Lamid, 2015). Pradigdo (2022) found that sedentary SAD toddlers had more diverse eating patterns compared to sedentary toddlers with SAD. All nomadic SAD toddlers have restrictions on eating certain foods (poultry, animals), except water animals. Nomadic SAD toddlers have higher rates of malnutrition than sedentary children (Pradigdo et al., 2022).

CONCLUSION

Food consumption patterns for SAD toddlers are based on frequency, namely lack of consumption of animal, vegetable protein, milk, vegetables and fruit as well as lack of energy, protein and fat and carbohydrate intake. The amount of nutrients in all SAD toddlers who are stunted is insufficient according to nutritional adequacy figures and age. Informants sought as much information

as possible regarding healthy and balanced nutritious food that was cheap and affordable within their purchasing power, both from electronic media and health workers to increase the nutritional knowledge of mothers of SAD toddlers.

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CONFLICT OF INTEREST

In this research there is no conflict of interest in writing the manuscript.

REFERENCES

- Almatsier, S., 2016. Prinsip Dasar Ilmu Gizi. PT Gramedia Pustaka Utama, Jakarta.
- Asril, S., 2017. Lama Hidup Nomaden, Kini Suku Anak Dalam Punya Hunian Tetap.
- BKPK Kemenkes, 2022. Status Gizi SSGI 2022.
- BKPK Kemenkes, 2024. Survei Kesehatan Indonesia (SKI) 2023 dalam Angka.
- Dinas Sosial Tenaga Kerja dan Transmigrasi, 2013. Profil Komunitas Adat Terpencil (KAT) dan Program Pemberdayaan KAT di Provinsi Jambi.
- Gibney, M.J., Margetts, B.M., Kearney, J.M., Arab, L., 2013. Gizi Kesehatan Masyarakat. EGC, Jakarta.
- Haris, A., Fitri, A., Kalsum, U., 2019. Determinan Kejadian Stunting dan Underweight Kejadian Stunting dan Underweight pada Balita Suku Anak Dalam di Desa Nyogan Kabupaten Muaro Jambi Tahun 2019, Jurnal Kesmas Jambi. JK MJ.
- Kemenkes RI, 2019. Laporan RISKESDAS 2018 Provinsi Jambi.

- Kementerian PPN/Bappenas, 2021. Keputusan Menteri Perencanaan Pembangunan Nasional/Kepala Badan Perencanaan Pembangunan Nasional Nomor KEP.10/M.PPN/HK/02/2021.
- Lamid, A., 2015. Masalah Kependekan (Stunting) pada Anak Balita: Analisis Prospek Penanggulangannya di Indonesia. IPB Press, Bogor.
- Notoatmodjo, S., 2012. Kesehatan Masyarakat Ilmu dan Seni. Rineka Cipta, Jakarta.
- Nurritzka, R.H., Mutia Wenny, D., Agustina, 2020. Comparison Study About Determinants of Children Under Five Years Malnutrition Between Indigenous and Non Indigenous Communities in Indonesia. Malaysian Journal of Public Health Medicine 20, 22–29.
- Pradigdo, S.F., Kartasurya, M.I., Azam, M., 2022. Gambaran Pola Makan, Tabu, Infeksi dan Status Gizi Balita Suku Anak Dalam di Provinsi Jambi. Amerta Nutrition 6, 126–132.
- Sari, R.E., Putri, F.E., 2021. Edukasi Gizi Seimbang dan Pemantauan Status Gizi Anak Usia 0-2 Tahun pada Suku Anak Dalam (SAD) Desa Bukit Suban Kecamatan Air Hitam Kabupaten Sarolangun. JURNAL SALAM SEHAT MASYARAKAT (JSSM) 3, 43–49.
- Suciyanti, D., Wangge, G., Iskandar, E., Fahmida, U., Supali, T., 2021. Social determinants and access to Water-Sanitation-Hygiene as dominant risk factors of stunting among under-five children in rural area of East Indonesia. Preprints (Basel) 1–15.
- Sukmareni, 2021. Alam Sumatera “Pendidikan dan Sumber Kehidupan Orang Rimba.”
- Supariasa, I.D.N., 2016. Penilaian Status Gizi, 2nd ed. EGC.
- Suwekatama, W., Kandarina, B.I., Purwaningrum, D.N., 2021. Social Determinations Of Stunting In Lauje Children (Age 24-59 Months) Palasa District, Parigi Moutong Regency, Central Sulawesi. <http://etd.repository.ugm.ac.id/>.
- The World Bank, 2022. Prevalence of stunting, height for age (% of children under 5).
- UNICEF, 2020. Situasi Anak di Indonesia 2020. Jakarta.
- World Health Organization, 2019. World Health Statistics data visualizations dashboard [WWW Document

THE RELATIONSHIP OF KNOWLEDGE WITH FEVER SELF-MEDICATION BEHAVIOR IN THE RT COMMUNITY. 2 TELAGO BIRU SIULAK DISTRICT

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ABSTRACT

Background: Knowledge is closely related to self-medication, the higher the knowledge, the higher the self-medication behavior. Self-medication is self-medication without a doctor's prescription, such as fever. The research aimed to determine the relationship between knowledge and behavior regarding fever self-medication in the RT community. 2 Telago Biru Siulak Villages in 2024.

Method: Descriptive analytical analysis was used using a sample of 69 respondents, the data collection method used a questionnaire, and data analysis used the Chi-Square statistical test.

Result: showed that the characteristics of respondents involving 69 respondents were that women were more likely to self-medicate for fever (79.97%), age range 17 – 25 years (37.7%), high school/equivalent education (47.0%), most occupation was a housewife (33.3%), and respondent income < Rp. 1,000,000 (36.2%), with Good knowledge (62.3%), Good behavior (52.2%) and the relationship between knowledge and fever self-medication behavior shows Good (62.3%), Fair (29.0), and Poor (87%) with Chi-Square count > Chi-Square table, namely 89,225 > 9.488.

Conclusion: There is a significant relationship between knowledge and fever self-medication behavior with a significance value of 0.000.

Keywords: Self-medication, Knowledge, Behavior, Fever

INTRODUCTION

Self-medication (self-medication) is one of the strategies carried out by the community, but not all have requirements, conditions, and situations where self-medication cannot be carried out depending on infrastructure, community attitudes and there are situations where self-medication must be carried out, self-medication is important to do in increasing access public health towards drugs, but not all types of drugs can be self-medicated (Kenre, 2022).

Based on reference data from the Central Statistics Agency (BPS) in 2022 in Jambi Province, it is reported that the percentage of people who carry out self-medication is 84.03%, this percentage of self-medication is

greater compared to the percentage in 2021 of 83.32% (BPS, 2022). Then through observations, 90% of people keep medicines in their homes, some are over-the-counter medicines and limited over-the-counter medicines such as paracetamol tablets, panadol, Trifamol, Grafadon, Fasidol caplets, Sanmol tablets, and Bodrex Sanaflu, but some keep prescription medicines such as Diclofenac.

From observation data obtained from the people of Telago Biru Village who work as ASN and Farmers, whose work is finished in the afternoon at 17.00 WIB, in this village there are health facilities, namely the health center and pharmacy which only operate until 14.00 WIB, other health facilities, namely The pharmacy is 11 km from Telago Biru

Siulak Village. The increase in self-medication occurred because the health facilities in this village only operated briefly, and other health facilities were far away.

It is difficult for people to get direct access to medicines from health facilities and a lack of knowledge about storing their medicines, so people can only use medicines they have at home, such as fever medicine (Paracetamol) which should be effective within 3 days because access to health facilities is far away. This drug is used for a long period, which reduces the effectiveness of the drug and the fever becomes worse and can cause seizures in children.

Research conducted by Wulandari et al (2016) found that 171 respondents (73.7%) out of 232 respondents had good knowledge. Meanwhile, from research conducted by Agatha (2020), out of 88 respondents, 35 respondents (39.7) had good knowledge and 77 respondents (87.5%) had appropriate fever self-medication behavior. Then, from research conducted by Fatkhurohmah et al (2020), the number of respondents with good knowledge was greater, namely 77 respondents (78.6%), respondents with sufficient knowledge, namely 15 respondents (15.3%), and respondents with less knowledge, namely 6 respondents (6, 1%).

According to the World Health Organization (WHO), the selection and use of modern, herbal, and traditional medicine by an individual to treat disease or symptoms of disease (Kenre, 2022). The high percentage of people who carry out self-medication or self-medicate require guidance or socialization so that people can carry out self-medication appropriately and correctly.

Access to public health facilities is limited, resulting in people having to store medicines independently and low knowledge resulting in inappropriate use of medicines. Therefore, education regarding self-medication in the community must be increased. Similar research has never been carried out before in Telago Biru Siulak

Village. This research is expected to provide information about the relationship between knowledge and fever self-medication behavior in the RT community. 2 Telago Biru Siulak Village in 2024 so that the relationship between knowledge and behavior regarding fever self-medication in the RT community is known. 2 Telago Biru Siulak Villages in 2024.

METHODS

This type of research is a type of quantitative descriptive research that will look at the relationship between respondent characteristics and fever self-medication behavior in the people of Telago Biru Village, Kec. Siulak uses the Chi-Square data processing method (Machali, 2021).

The population in this study was the entire community in the RT. 2 Telago Biru Siulak Village with a population of RT 2 Telago Biru Village based on BPS Siulak sub-district 300 residents RT 2 only 100 residents carried out self-medication for fever. In 2022, the proportion of BPS who carry out self-medication for fever is 84.03%. From the 84.03% proportion that has been mentioned, a population of 84 samples from 100 populations was obtained (Machali, 2021).

The sampling technique is by using random sampling, namely simple random sampling according to the criteria (Supardi et al, 2016). These criteria include inclusion and exclusion criteria.

Inclusion Criteria:

- a. Residents aged 18-60
- b. Willing to fill out the questionnaire
- c. Implementing Fever Self-Medication

Exclusion Criteria:

- a. People who can't read
- b. Residents who do not apply self-medication have a fever
- c. Residents aged <18 years

Then the formula used to calculate the sample size is the Slovin formula as follows (Rachmadi, 2022):

$$n = N/(1+N(e)^2)$$

n = Number of samples

N = Number of population

e = Error rate

Total population of RT 2. Telago Biru Village, Kec. Siulak is 83. So the number of samples is:

$$n = 84/(1+84(0.005)^2)$$

$$= 69$$

$$= 69 \text{ People}$$

This research was conducted in Telago Biru Village, District. Siulak. This research was conducted on January 10 – May 22, 2024. The samples in this study were taken using simple random sampling (SRS) (Supardi et al, 2016).

The data in this study is primary data obtained directly by researchers by filling out questionnaires to 69 research samples from residents of RT 2 Telago Biru Village, Kec. Siulak, from the 100 population, the proportion that fell into the inclusion category was 84 respondents, then each house was numbered 1 – 84 who carried out self-medication for fever, then the sample was drawn randomly to get 69 respondents.

Data processing

Processing demographic data (age, gender, education, occupation, and income) of research samples. Data obtained from all data collection results were collected, and then descriptive data processing was carried out using MS Excel.

Data processing on the implementation of self-medication for fever in RT communities. 2 Telago Biru District. Siulak is carried out based on the answers to the questions given to the sample. The instrument used is a questionnaire containing 10 questions behavioral questions and 10 behavioral questions. Assessment conditions are as follows:

Behavioral Questionnaire:

- Answers are always given a score of 4
- Answers are often given a score of 3
- Rare answers are given a score of 2
- Answers are never given a value of 1

Knowledge Questionnaire:

Wrong answers are given a value of 1

The correct answer is given a score of 2

The results obtained are then calculated in percentages based on the following formula:

$$P = X/N$$

Information:

P : Knowledge percentage

X : Number of correct answers

N : Number of questions

After calculating the percentage, the value of each sample is categorized into the following interpretations (Arikunto, 2013):

Good	>75%
Fair	56 – 74%
Less	<55%

Data analysis

Data obtained from the questionnaire will be processed with the help of a computer using a 2 variable statistical test program. Data obtained from questionnaires regarding respondent characteristics and knowledge of fever self-medication were entered into a 2-variable statistical test program.

Data processing uses descriptive analysis using MS Excel to explain the characteristics of each variable. The qualitative data analyzed included age, gender, education level, occupation, income, distance to health facilities, and implementation of self-medication for fever. For the answer category regarding self-medication behavior fever use a Likert scale with answer options always, often, rarely, and never with a scale of 4 – 1. The results obtained were categorized as good behavior if >75%, sufficient if 56-74%, and poor if <55% (Arikunto, 2013).

To determine the existence of a relationship between categorical variables, bivariate analysis was used using cross-tabulation analysis and the Pearson chi-square test with a significance limit used in this study of 0.05 (5%) with the condition that if the chi-square statistical value > df value then there is a relationship whereas if the chi-square statistical value < df value then there is no relationship (Ugiana et al., 2018).

RESULTS AND DISCUSSION

Table 1. Frequency Distribution of Respondent Characteristics

Age	Amount	%
17 – 25	26	37.7
26 – 35	4	5.8
36 – 45	22	31.9
46 – 55	13	18.8
56 – 65	4	5.8
Total	69	100.0
Gender		
Man	14	20.3
Woman	55	79.7
Total	69	100.0
Last education		
Elementary school/equivalent	6	8.7
Middle school/equivalent	1	1.4
High school/equivalent	33	47.8
College	29	42.0
Total	69	100.0
Work		
Employees (Public/Private)	19	27.5
Laborer	0	0.0
Self-employed	7	10.1
Medical personnel	1	1.4
TNI/POLICE	1	1.4
IRT	23	33.3
Etc	18	26.1
Income Level		
>. IDR 1,000,000	25	36.2
Rp 2,000,000 – Rp.3,000,000	23	33.3
Rp.3,000,000 – Rp.4,000,000	11	15.9
>. Rp 4,000,000	10	14.5
Total	69	100.0

Based on Table 1, it is known that the highest age frequency distribution is at the age of 17 - 25 years with 26 respondents (37.7%), the second is at the age of 36 - 45 years, namely 22 respondents (31.9%), then the lowest age frequency distribution is at 56 - 65 years, namely 4 respondents (5.8%). This is not in line with research conducted by (Probosiwi 2022) that the highest age for self-medication is 26 - 35 years, while (Sayuti et al. 2022) said that the highest age for self-medication is 50 - 60 years, this happens because the village Telago Biru aged 17 – 25 years often feel more independent in managing their health and tend to look for quick solutions to health problems such as fever. This generation grew up in an era of extensive information, where they can easily access information about fever symptoms and their treatment independently. , sometimes without direct consultation with a health professional, while 36 – 45-year-olds may

have previous experience with hay fever and feel confident in recognizing and treating the symptoms with common medications, those busy with careers and family responsibilities may have self-medication as a more efficient way to treat minor health problems such as fever.

Based on Table 1 It is known that the highest gender frequency distribution is women, namely 55 respondents (79.7%) and the lowest gender frequency is men, 14 respondents (20.3%). This is in line with research conducted by (Maulidah, Wiwin Rohma, et al 2021) and (Putri et al. 2022) where more women self-medication for fever, this happened because when filling out the questionnaire in Telago Biru Village many women in place, and women often have a more dominant role in family health care.

Based on Table 1, it is known that the frequency distribution of the highest level of education is high school/equivalent, namely 33 respondents (47.8%), the second is tertiary education, 29 respondents (42.0%), and the lowest frequency is junior high school/equivalent, 1 respondent (1.4%). This is in line with research conducted by (Sari, 2020) that the education that carries out the most self-medication for fever is high school and the least is middle school.

Based on Table 1, it is known that the highest frequency distribution of jobs is a housewife with 23 respondents (33.3%), the second is an employee (public/private) with 19 respondents (27.5%), and the lowest job is a laborer with 0 respondents (0.0%). This is in line with research conducted by (Sari 2020) and (Sayuti et al. 2022) that the job most often involves self-medication, namely housewives, this is because sometimes access to health facilities can be difficult for housewives, either because of the remote location, cost, or transportation problems, some fever reducers can be easily purchased at drug stores without needing a doctor's prescription.

Based on Table 1, it is known that the frequency distribution of the highest income level is < Rp. 1000,000 with 25 respondents (36.2%), and the second is with an income of Rp. 2,000,000 – Rp. 3,000,000 as many as 23 respondents (33.3%), and the least was income of > Rp. 4,000,000 as many as 10 respondents (14.5%). This is in line with research conducted by (Putri et al. 2022) that the highest income level for fever self-medication is < Rp. 1,000,000, this is because people with low incomes may not be able to or find it difficult to access adequate health services, this can be caused by expensive doctor consultation fees, self-medication may be chosen to save costs, because visiting a doctor and buying prescribed medicines can become a financial burden for them.

1. Distribution of Fever Self-Medication Knowledge

Table 2. Frequency Distribution of Fever Self-Medication Knowledge

Self-medication Knowledge		
Category	Amount	%
Not enough	6	8.7
Enough	20	29.0
Good	43	62.3
Total	69	100

Based on Table 2, it is known that the frequency distribution of knowledge of self-medication for fever in the community of RT 2, Telago Biru Village, is in the good category of 43 respondents (62.3%), in the sufficient category of 20 respondents (29.0%), and in the poor category of 6 respondents (8.7%). This shows that the community has high levels of knowledge about self-medication for fever in treating the disease they are suffering from.

2. Frequency Distribution of Fever Self-Medication Behavior

Table 3. Frequency Distribution of Fever Self-Medication Behavior

Self-medication Behavior		
Category	Amount	%
Not enough	7	10.1
Enough	26	37.7
Good	36	52.2
Total	69	100

Based on Table 3, it is known the frequency distribution of fever self-

medication behavior in RT. 2 Telago Biru Village with 36 respondents (52.2%) in the good category, 26 respondents (37.7%) in the fair category, 7 respondents (10.1%) in the poor category.

3. Questionnaire Validity and Reliability Test

The validity test in this study used the Pearson product-moment correlation test using 39 respondents who were RT residents. 2 Telago Biru, Siulak District, which carries out fever self-medication. The questionnaire given to respondents to test validity consisted of 10 statement items regarding fever self-medication behavior and 10 statement items regarding knowledge of fever self-medication. After carrying out the validity test, the results obtained were valid items, namely question items that had a calculated r value higher than the r table.

- Validity and reliability test results of the fever self-medication knowledge questionnaire

Table 4. Knowledge Questionnaire Validity Test Results

No Question	R Count	R Table N = 69 (n-22)	Description
1	0,607	0,2369	Valid
2	0,781		Valid
3	0,805		Valid
4	0,781		Valid
5	0,805		Valid
6	0,731		Valid
7	0,781		Valid
8	0,607		Valid
9	0,805		Valid
10	0,731		Valid

Valid items are then tested for reliability using the Cronbach's Alpha test and an alpha value will appear.

Table 5. Knowledge Questionnaire Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	N of Items
,911	10

From the Cronbach's alpha test, the alpha value of the questionnaire regarding fever self-medication behavior was 0.911. In general, reliability is considered satisfactory if it is ≥ 0.70 . If the alpha value > 0.70 means acceptable reliability, while > 0.80 suggests good reliability, then more than 0.90 means

excellent reliability and 1 means perfect reliability. (perfect reliability). If the alpha value is <0.70 then it is said to be low reliability (no reliability). So this data is said to be highly reliable because the alpha value is $0.911 > 0.90$, which can be said to be excellent reliability data (Nuryadi et al. 2017).

- b. Validity and reliability test results of the fever self-medication behavior questionnaire

Table 6. Validity Test Results of the Self-Medication Behavior Questionnaire

No Question	R Count	R Table N = 69 (n-2)	Description
1	0,834		Valid
2	0,922		Valid
3	0,550		Valid
4	0,886		Valid
5	0,797	0,2369	Valid
6	0,875		Valid
7	0,862		Valid
8	0,899		Valid
9	0,878		Valid
10	0,626		Valid

The items are valid, then a reliability test is carried out using Cronbach's Alpha test and an alpha value will appear.

Table 7. Behavioral Questionnaire Reliability Test Table

Reliability Statistics	
Cronbach's Alpha	N of Items
,939	10

From the Cronbach's alpha test, the alpha value of the questionnaire regarding fever self-medication behavior was 0.939. In general, reliability is considered satisfactory if it is ≥ 0.70 . If the alpha value > 0.70 means acceptable reliability, while > 0.80 suggests good reliability, then 0.90 means excellent reliability and 1 means perfect reliability. If the alpha value is <0.70 then it is said to be low reliability (no reliability). So this data is said to be highly reliable because the alpha value is $0.939 > 0.90$, which can be said to be excellent reliability data (Nuryadi et al. 2017).

4. Demographic Characteristics of the Research Sample

From the results of data collection by researchers, the total research sample that filled out the questionnaire completely was

69 respondents. The demographic characteristics of the research sample can be differentiated based on gender, age, education level, occupation, and income level.

5. Cross Tabulation of Respondents' Knowledge by Age

Table 8. Cross Tabulation Results of Knowledge with Age

	Self-medication Knowledge			Total
	Not enough	Enough	Good	
17 – 25	2 (2.9%)	9 (13.0%)	15 (21.7%)	26 (37.7%)
26 – 35	1 (1.4%)	2 (2.9%)	1 (1.4%)	4 5.8%
36 – 45	2 (2.9%)	3 (4.3%)	17 24.6%	22 31.9%
46 – 55	0 (0.0%)	6 8.7%	7 10.1%	13 18.8%
56 – 65	1 (1.4%)	0 0.0%	3 4.3%	4 5.8%
Total	6 (8.7%)	20 29.0%	43 62.3%	69 100.0%

Based on Table 8, it is known that the results of the cross-tabulation of age and knowledge of fever self-medication are in a good category. Where many of those aged 17 – 45 years have good self-medication knowledge, 52 respondents (75.4%). This is not in line with research (Probosiwi 2022) where in his research it is stated that many people do self-medication at the age of 26 - 35 years and (Sayuti et al. 2022) in his research it is stated that many people do self-medication at the age of 50 - 60 years, this is because aged 17 – 25 years in Telago Biru Village often feel more independent in managing their health and tend to look for quick solutions to health problems such as fever.

6. Cross Tabulation of Respondents' Knowledge by Gender

Table 9. Results of Cross Tabulation of Knowledge by Gender

	Self-medication Behavior			Total
	Not enough	Enough	Good	
Man	0	2	12	14
Gender	0.0%	2.9%	17.4%	20.3%
Woman	6	18	31	55
	8.7%	26.1%	44.9%	79.7
Total	6	20	43	69
	8.7%	29.0%	62.3%	100%

Based on Table 9, it is known that the

results of cross-tabulation of gender with knowledge of fever self-medication are in a good category. Where most women carry out self-medication well, amounting to 79.7%, while the lowest number of men is 20.3%. This is in line with research (Probosiwi 2022) and (Putri et al. 2022) that many women carry out self-medication.

7. Cross Tabulation of Respondents' Knowledge with Last Education

Table 10. Results of Cross Tabulation of Knowledge with Last Education

		Self-medication Behavior			Total
		Not enough	Enough	Good	
Last education	Elementary	0	0	6	6
	School/Equivalent	0.0%	0.0%	8.7%	8.7%
	Middle	1	0	0	1
	School/Equivalent	1.4%	0.0%	0.0%	1.4%
	High	4	10	19	33
	School/Equivalent	5.8%	14.5%	27.5%	47.8%
	College	1	10	18	29
		1.4%	14.5%	26.1%	42.0%
Total		6	20	43	69
		8.7%	29.0%	62.3%	100.0 %

Based on Table 10, it is known that the results of the tabulation of the most recent educational intervals of respondents with self-medical knowledge were mostly from high school/equivalent level (47.8%) and at least 1 respondent from junior high school/equivalent level (1.4%). The results of this research are in line with research by (Natalia, 2021 (Rachmadi 2022), and (Sari 2020) that the highest level of education of respondents was high school graduates/equivalent. It can be seen that the level of education in high school or equivalent has a higher level of knowledge about self-medication for fever, this is in contrast to the results obtained by (Restiyono, 2016), that the higher a person's level of education, the easier it is to receive information, so that they have a lot of knowledge, such as self-medication.

8. Cross Tabulation of Respondents' Knowledge by Occupation

Based on Table 11, it can be seen from the cross-tabulation results of respondents'

occupations with knowledge of self-medication, that respondents had the most work as housewives (31.0%) and the least as workers 0 respondents (0.0%).

Table 11. Cross Tabulation Results of Knowledge and Occupation

		Self-medication Knowledge			Total
		Not enough	Enough	Good	
	Employees (Public/Private)	1	7	11	19
		1.4%	10.1%	15.9%	27.5%
	Laborer	0	0	0	0
		0/0%	0.0%	0.0%	0.0%
Work	Self-employed	0	3	4	7
		0.0%	4.3%	5.8%	10.1%
	Medical personnel	0	1	0	1
		0.0%	1.4%	0.0%	1.4%
	TNI/Police	0	0	1	1
		0.0%	0.0%	1.4%	1.4%
	IRT	4	1	18	23
		5.8%	1.4%	26.1%	33.3%
	Etc	1	8	9	18
		1.4%	11.6%	13.0%	26.1%
Total		6	20	43	69
		8.7%	29.0%	62.3%	100.0 %

This is in line with research conducted by (Sari 2020) and (Putri et al. 2022) that the work of housewives dominates the research results. The more activities a person has, the easier it is to get information, where the information obtained will be a provision to support a person's needs, such as health problems. The more information a person obtains, the easier or more capable it will be for a person to maintain their health.

9. Cross Tabulation of Knowledge with Income Level

Table 12. Results of Cross Tabulation of Knowledge with Income Level

		Self-medication Knowledge			Total
		Not enough	Enough	Good	
	< 1,000,000	3	5	17	25
		4.3%	7.2%	24.6%	36.2%
	2,000,000 –	0	5	18	23
	3,000,000	0.0%	7.2%	26.1%	33.3%
	3,000,000 –	3	6	2	11
	4,000,000	4.3%	8.7%	2.9%	15.9%
	> 4,000,000	0	4	6	10
		0.0%	5.8%	8.7%	14.5%
Total		6	20	43	69
		8.7%	29.0%	62.3%	100.0%

Based on Table 12, it is known that the cross-tabulation results of respondents' income level with knowledge of self-medication show that the income of respondents who carry out self-medication is

at most < Rp. 1,000,000 as many as 25 respondents (36.2%) and at least those with income < Rp. 4,000,000 as many as 10 respondents (14.5%). This is in line with research conducted by (Putri et al. 2022) and (Sari 2020). Income will affect a person's social status, the higher a person's income, the easier it is to meet their health needs.

10. Cross Tabulation of Respondent Behavior with Age

Table 13. Cross Tabulation Results of Behavior with Age

	Self-medication Behavior			Total
	Not enough	Enough	Good	
17 – 25	2	8	16	26
	2.9%	11.6%	23.2%	37.7%
26 – 35	2	2	0	4
	2.9%	2.9%	0.0%	5.8%
36 – 45	2	6	14	22
	2.9%	8.7%	20.3%	31.9%
46 – 55	0	7	6	13
	0.0%	10.1%	8.7%	18.8%
56 – 65	1	3	0	4
	1.4%	4.3%	0.0%	5.8%
Total	7	26	36	69
	10.1%	37.7%	52.2%	100.0%

Based on Table 13, it is known that the results of the cross-tabulation of behavior and the age of respondents who carried out self-medication for fever were in a good category. Where many of those aged 17 - 25 years carry out self-medication well, namely 26 respondents (37.7%) and the least are those aged 26 - 35 years and 56 - 65 years. This is not in line with research (Probosiwi 2022) where in his research it is stated that many people do self-medication at the age of 26 - 35 years and (Sayuti et al. 2022) in his research it is stated that many people do self-medication at the age of 50 - 60 years, because in 17 – 25-year-olds in Telago Biru Village often feel more independent in managing their health and tend to look for quick solutions to health problems such as fever. As one gets older, one's responsiveness increases. As one becomes more mature, one will have more levels of experience, which will affect the level of knowledge one has.

11. Cross Tabulation of Respondent Behavior by Gender

Based on Table 14, it is known that the results of the cross-tabulation between

gender and the implementation of self-medication for fever are in a good category.

Table 14. Results of Cross Tabulation of Behavior by Gender

		Self-medication Behavior			Total
		Not enough	Enough	Good	
Gender	Man	0	3	11	14
		0.0%	4.3%	15.9%	20.3%
	Woman	7	23	25	55
		10.1%	33.3%	36.2%	79.7%
Total		7	26	36	69
		10.1%	37.7%	52.2%	100.0%

Where many women carry out self-medication well, namely 79.7%, while men are 20.3%. This is in line with research (Probosiwi 2022) and (Putri et al. 2022) that many women carry out self-medication. Women tend to be more concerned about health issues, their concern is not only for themselves but also for their children and families (Kurniawati, 2019). Women have a good role in handling complaints of illness both for themselves and for their families in maintaining and handling health problems.

12. Cross Tabulation of Respondent Behavior with Last Education

Table 15. Results of Cross Tabulation of Behavior with Last Education

		Self-medication Behavior			Total
		Not enough	Enough	Good	
Last Education	Elementary School/Equivalent	1	4	1	6
		1.4%	5.8%	1.4%	8.7%
	Middle School/Equivalent	1	0	0	1
		1.4%	0.0%	0.0%	1.4%
	High School/Equivalent	4	12	17	33
		5.8%	17.4%	24.6%	47.8%
	College	1	10	18	29
		1.4%	14.5%	26.1%	42.0%
Total		7	26	36	69
		10.1%	37.7%	52.2%	100.0%

Based on Table 15, it is known that the results of the cross-tabulation of education and self-medication behavior mostly came from the high school/equivalent level, 33 respondents (47.8%). The results of this research are in line with research by (Natalia, 2021 (Rachmadi 2022) and (Maulidah, Wiwin Rohma. Ardianto, Nanang. Salmasfatah 2021).

13. Cross Tabulation of Respondent Behavior by Occupation

Based on Table 16, it is known that the results of the cross-tabulation of respondents'

occupations with self-medication behavior of respondents have the most work as housewives, 23 respondents (33.3%) and the least as workers, 0 respondents (0.0%). This is in line with research conducted by (Sari 2020) and (Sayuti et al. 2022) that the work of housewives dominates the research results.

Table 16. Cross Tabulation Results of Behavior and Occupation

		Self-medication Behavior			Total
		Not enough	Enough	Good	
Work	Employees (Public /Private)	2	7	10	19
		2.9%	10.1%	14.5%	27.5%
	Self-employed	0	3	4	7
		0.0%	4.3%	5.8%	10.1%
	Laborer	0	0	0	0
		0.0%	0.0%	0.0%	0.0%
	Medical personnel	0	0	1	1
		0.0%	0.0%	1.4%	1.4%
	TNI/Police	0	0	1	1
		0.0%	0.0%	1.4%	1.4%
Etc	IRT	4	8	11	23
		5.8%	11.6%	15.9%	33.3%
		1	8	9	18
Total		1.4%	11.6%	13.0%	26.1%
		7	26	36	69
		10.1%	37.7%	52.2%	100.0%

14. Cross Tabulation of Respondent Behavior with Income Level

Table 17. Cross Tabulation Results of Behavior with Income Level

		Self-medication Behavior			Total
		Not enough	Enough	Good	
Income Level	< 1,000,000	4	8	13	25
		5.8%	11.6%	18.8%	36.2%
	2,000,000 – 3,000,000	0	8	15	23
		0.0%	11.6%	21.7%	33.3%
	3,000,000 – 4,000,000	3	6	2	11
		4.3%	8.7%	2.9%	15.9%
	> 4,000,000	0	4	6	10
Total		0.0%	5.8%	8.7%	14.5%
		7	26	36	69
		10.1%	37.7%	52.2%	100.0%

Based on Table 17, it is known that the cross-tabulation results of respondents' income levels with fever self-medication behavior show that the income of respondents who carry out fever self-medication at most earns < Rp. research conducted by (Putri et al. 2022) and (Putri et al. 2022).

15. The Relationship between Knowledge and Fever Self-Medication Behavior in the Community of RT 2 Telago Biru Village, Siulak District, Kerinci Regency in 2024

Self-medication for fever plays an important role for the body in maintaining

health. To assess the fever implementation variable, a questionnaire was used. The following are the results of the Chi-Square test of fever self-medication knowledge and fever self-medication behavior.

Table 18. Relationship between knowledge and fever self-medication behavior

Self-Medication Knowledge * Self-Medication Behavior Crosstabulation						
		Self-medication Behavior			Total	
		Not enough				
		Count	6	0	0	6
Self-medication Knowledge	Not enough	Expected Count	.6	2.3	3.1	6.0
		% within Self-Medication Knowledge	100.0%	0.0%	0.0%	100.0%
		% of Total	8.7%	0.0%	0.0%	8.7%
	Enough	Count	0	18	2	20
		Expected Count	2.0	7.5	10.4	20.0
		% within Self-Medication Knowledge	0.0%	90.0%	10.0%	100.0%
		% of Total	0.0%	26.1%	2.9%	29.0%
	Good	Count	1	8	34	43
		Expected Count	4.4	16.2	22.4	43.0
		% within Self-Medication Knowledge	2.3%	18.6%	79.1%	100.0%
Total		% of Total	1.4%	11.6%	49.3%	62.3%
		Count	7	26	36	69
		Expected Count	7.0	26.0	36.0	69.0
		% within Self-Medication Knowledge	10.1%	37.7%	52.2%	100.0%

Based on the research results in Table 18, it is known that the relationship between knowledge of fever self-medication and fever self-medication behavior is in a good category, namely 34 respondents (79.1%), 8 respondents with good knowledge behave quite well (18.6%), 1 respondent with good knowledge behaves less (2.3%). %), then people with sufficient knowledge with good behavior were 2 respondents (10.0%), enough knowledgeable with good behavior were 18 respondents (90.9%), enough knowledgeable with poor behavior were 0 respondents (0.0%), and people with poor knowledge with good behavior good by 0 respondents (0.0%), less knowledgeable with

good behavior by 0 respondents (0.0%), less knowledgeable with less behavior by 6 respondents (100.0%).

Table 19. Chi-Square Test Results

Chi-Square Tests						
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)	Point Probability
Pearson Chi-Square	89.225 ^a	4	,000	,000		
Likelihood Ratio	66,227	4	,000	,000		
Fisher's Exact Test	58,028			,000		
Linear-by- Linear Association	41.617 ^b	1	,000	,000	,000	,000
N of Valid Cases	69					

Based on Table 19 of the Chi-Square Test results, it is known that the calculated Chi-Square value > Chi-Square table is $89,225 > 9.488$. So there is a significant relationship between knowledge and fever self-medication behavior where the significance value obtained is $0.000 > 0.005$. This is in line with research (Widyaningrum, Admaja, and Khusna 2021) where there is a relationship between knowledge and self-medication behavior.

CONCLUSION

Characteristics of respondents involving 69 respondents showed that women were more likely to self-medicate for fever (79.97%), age range 17 – 25 years (37.7%), high school/equivalent education (47.0%), most occupation was housewife (33.3%), and respondent's income < Rp. 1,000,000 (36.2%), with Good knowledge (62.3%), good behavior (52.2%) and the relationship between knowledge and fever self-medication behavior shows Good (62.3%), Fair (29.0), and Poor (87%).

Based on the results of the Chi-Square Test, it is known that the calculated Chi-Square value > Chi-Square table is $89,225 > 9.488$. So there is a significant relationship between knowledge and fever self-medication behavior where the significance value obtained is $0.000 > 0.005$.

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CONFLICT OF INTEREST

The author declares that there are no competing conflicts of interest.

REFERENCES

- BPS. (2022). Persentase Penduduk Yang Mengobati Sendiri Selama Sebulan Terakhir. Badan Pusat Statistik, 1–4. <https://www.bps.go.id/indicator/30/1974/1/persentase-penduduk-yang-mengobati-sendiri-selama-sebulan-terakhir.html>.
- Fatkurohmah et al. (2020). Tingkat Pengetahuan Ibu Rumah Tangga Tentang Swamedikasi Demam Pada Anak Di Kelurahan Kejambon. Akhmad Aniq Barlian, 7(1), 1–10. <http://ejournal.poltektegal.ac.id/index.php/parape>
- Kenre, I. (2022). Komunikasi Farmasi.
- Adnan, S. (2018). Pengantar Psikologi. www.onlinedoctranslator.com
- Agatha, E. D. (2020). Swamedikasi Demam Di Sosial Media.
- Arikunto. (2013). Skala ukur pengetahuan (Vol. 66, Issue 1997).
- BPS. (2022). Persentase Penduduk Yang Mengobati Sendiri Selama Sebulan Terakhir. Badan Pusat Statistik, 1–4. <https://www.bps.go.id/indicator/30/1974/1/persentase-penduduk-yang-mengobati-sendiri-selama-sebulan-terakhir.html>
- Departemen Kesehatan RI. (2006). Pedoman Penggunaan Obat Bebas dan Bebas Terbatas Departemen Kesehatan Republik Indonesia. Departemen Kesehatan Republik Indonesia, 10–79.
- Fatkurohmah et al. (2020). Tingkat

- Pengetahuan Ibu Rumah Tangga Tentang Swamedikasi Demam Pada Anak Di Kelurahan Kejambon. Akhmad Aniq Barlian, 7(1), 1–10. <http://ejournal.poltektegal.ac.id/index.php/parape>
- Kenre, I. (2022). Komunikasi farmasi.
- Machali, I. (2021). Metode Penelitian Kuantitatif. In Laboratorium Penelitian dan Pengembangan FARMAKA TROPIS Fakultas Farmasi Universitas Mualawarman, Samarinda, Kalimantan Timur (Issue April). [https://digilib.uin-suka.ac.id/id/eprint/50344/1/Metode Penelitian Kuantitatif %28Panduan Praktis Merencanakan%2C Melaksa.pdf](https://digilib.uin-suka.ac.id/id/eprint/50344/1/Metode%20Penelitian%20Kuantitatif%20Panduan%20Praktis%20Merencanakan%20Melaksa.pdf)
- Maslow. (2022). Konsep Dasar Maslow.
- Maulidah, Wiwin Rohma., et al. (2021). Hubungan Pengetahuan Orang Tua Swamedikasi dan Penanganan Demam Pada Anak di SDN Gunungrejo 02 Malang. 7(2), 1455–1469.
- Mukarromah, A. (2019). Rancangan kuesioner kepercayaan swamedikasi. 56–71.
- Notoatmodjo, S. (2012). Pengertian Pengetahuan Menurut Notoatmodjo. Rineke Cipta.
- Notoatmojo, soekidjo. (2003). Pendidikan Dan Perilaku Kesehatan.
- Nuryadi, Astuti, T. D., Utami, E. S., & Budiantara, M. (2017). Buku Ajar Dasar-dasar Statistik Penelitian. In Sibuku Media.
- Probosiwi, N. (2022). Gambaran Tingkat Pengetahuan Swamedikasi Demam Pada Masyarakat Di Desa X Kabupaten Kediri. Jurnal Inovasi Farmasi Indonesia (JAFI), 3(1), 27. <https://doi.org/10.30737/jafi.v3i1.2313>
- Putri, T. K., Bayani, F., Apriani, L., & Yuliana, D. (2022). Hubungan Tingkat Pengetahuan Masyarakat Terhadap Perilaku Swamedikasi. Empiricism Journal, 3(2), 288–294. <https://doi.org/10.36312/ej.v3i2.1065>
- Rachmadi, P. N. (2022). Hubungan karakteristik responden dengan pelaksanaan swamedikasi demam di rt 18 kelurahan lingkaran selatan kecamatan paal merah kota jambi tahun 2022.
- Sari, Y. (2020). Gambaran Tingkat Pengetahuan Dan Perilaku Masyarakat Tentang Swamedikasi Di Rumah Tangga Di K ecamatan Pakualaman Yogyakarta. Skripsi, 53(9), 1689–1699. <https://learn-quantum.com/EDU/index.html%0Ahttp://publications.lib.chalmers.se/record/s/fulltext/245180/245180.pdf%0Ahttps://hdl.handle.net/20.500.12380/245180%0Ahttp://dx.doi.org/10.1016/j.jsames.2011.03.003%0Ahttps://doi.org/10.1016/j.gr.2017.08.001%0Aht>
- Sayuti, N. A., Afni, N., Arini, M. I., Safitri, R. A., Nurjanah, S. F., Zanuarista, T., & Sari, W. (2022). Sosialisasi Swamedikasi Penatalaksanaan Demam Pada Ibu PKK. Jurnal Empathy Pengabdian Kepada Masyarakat, 3(1), 1–13. <https://doi.org/10.37341/jurnalempathy.v0i0.90>
- Supardi et al. (2016). Metode Penelitian.
- Ugiana, P., Rezzy, G., Caraka, E., Utami, D., Ansari, S., & Ahmar, S. (2018). Analisis Hubungan antara Variabel Kategori dengan STATCAL, SPSS dan Minitab.
- Widyaningrum, et al. (2021). Hubungan Pengetahuan Dengan Perilaku Swamedikasi Demam Menggunakan Parasetamol Pada Mahasiswa S-1 Farmasi Di Institut Ilmu Kesehatan Bhakti Wiyata Kediri Relationship of Knowledge With Fever Self-Medication Behavior Using Paracetamol in S-1 Pharmaceutical. Jurnal Pharma Bhakta, 1, 1–11.
- Wulandari, A. et al. (2016). Hubungan Tingkat Pengetahuan Mahasiswa Farmasi ISTN Terhadap Tindakan Swamedikasi Demam. Sainstech Farma, 9(2), 7–11. <https://ejournal.istn.ac.id/index.php/sainstechfarma/article/view/65>
- Zein, U. (2012). Buku Saku Demam. Cardiology Clinics, 89.

THE INFLUENCE OF HEALTH PROMOTION USING CROSSWORDS ON DHF PREVENTION KNOWLEDGE AND ATTITUDES IN CLASS IV STUDENTS OF SDN 42 JAMBI CITY

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ABSTRACT

Background: Dengue hemorrhagic fever (DHF) is a public health problem in Indonesia whose number of sufferers tends to increase and its spread becomes wider. Dengue fever is an infectious disease that mainly attacks children. Viral infections occur through mosquito bites, the virus enters the human bloodstream to then replicate (replicate itself), and can cause death. One effort to reduce the prevalence and reduce dengue fever is through health promotion media using crossword puzzles for class IV students at SDN 42/IV Jambi City. This research aims to determine the influence of health promotion media with crossword puzzles at SDN 42/IV Jambi City.

Method: This research is a non-probability research with a one group pre test post test design using simple random sampling. This research was carried out at SDN 42 Kota Jambi. Univariate descriptive analysis includes frequency and percentage distribution, bivariate test with Shapiro-Wilk and Wilcoxon signed rank test.

Result: It is known that Asymp.Sig (2-tailed) has a value of 0.001. Because the value of 0.001 is smaller than ≤ 0.05 , there is a difference in the results of health promotion using crossword puzzles for class IV students at SDN 42 Jambi City in the pretest and posttest.

Conclusion: Present the main conclusions and implications. There is an influence of health promotion using crossword puzzles on knowledge and attitudes towards preventing diabetes mellitus in class IV students at SDN 42 Jambi City

Keywords: Crossword Puzzles, Knowledge, Attitudes, Prevent DHF

INTRODUCTION

Dengue fever (DHF) is still one of the diseases that has been a concern of the Indonesian government for a long time, because every year the number of sufferers tends to increase, both the number of cases and the area affected. The course of the disease is rapid and if the case is treated late it can cause death in all age groups in a short time (Sugiyono & Darnoto, 2016); Abdullah, M., & Fadli, M. (2020).

The World Health Organization (WHO) says the number of reported dengue fever cases increased more than 8-fold over the past 4 years, from 505,000 cases to 4.2 million in 2019. The number of reported deaths has also increased from 960 to 4032 during 2015. Not

only is the number of cases increasing as the disease spreads to new regions including Asia, but explosive outbreaks are also occurring. The threat of a possible dengue outbreak is now in Asia. The Americas region reported 3.1 million cases, with more than 25,000 classified as severe. Despite this alarming number of cases, there were fewer deaths associated with dengue than the previous year. The number of dengue cases was a globally reported problem in 2019. (WHO, 2019). The rainy season usually occurs between November and January every year, during the rainy season there is a lot of mosquito breeding. so that during this period there is an increase in the number of people with dengue fever. This disease mostly affects

children aged <15 years. (Jambi Provincial Health Office, 2022). Usually the mosquitoes bite during the light from 08.00 to 10.00 in the morning and in the afternoon from 15.00 to 17.00, at that time the mosquitoes are most effective in biting. (Karyanti, 2023). Therefore, it is necessary to increase knowledge for the prevention of DHF in school-age children. (Santosa, A., & Budianto, E. (2019)).

For the characteristics of children at school age that teachers need to know, in order to better know the situation of students, especially at the elementary school level. As a teacher must be able to apply teaching methods that are in accordance with the circumstances of his students, it is very important for an educator to know the characteristics of his students. as for the characteristics as follows. the first characteristic of school-age children is play, the second characteristic is happy to move. the third characteristic is working in groups, the fourth characteristic is happy to feel or do / demonstrate something directly. (Nursidik Kurniawan, 2007)

Therefore, one of the learning methods in this study is the crossword puzzle game method. with the crossword puzzle game learning method, it can improve student learning outcomes, the learning process becomes more enjoyable, can increase interest and motivation to learn, and can make students more actively involved in learning. This encourages researchers to find out how the influence of school children's knowledge before and after being given education related to dengue fever prevention using the crossword puzzle game learning method. (Dewi, R., & Nurul, A. (2019)).

Based on the description above, the incidence of DHF continues to increase every year, so the authors are interested in conducting research with the crossword game method. about "The Effect of Health Promotion About DHF Disease Through Crossword Games on Knowledge and Prevention of DHF Disease

in Students of SDN 42 in Jambi City in 2024".

METHODS

Sampling in this study is Purposive sampling is a data source sampling technique with certain considerations. The population in this study were grade IV students of SDN 42 Jambi City, totaling 45 respondents. The intervention carried out was health promotion in the prevention of DHF disease in class IV students of SDN 42 Jambi City which was carried out on Wednesday, May 15, 2024 in classroom IV. Based on the description above, the incidence of DHF continues to increase every year, so the authors are interested in conducting research with the crossword game method. about "The Effect of Health Promotion About DHF Disease Through Crossword Games on Knowledge and Prevention of DHF Disease in Students of SDN 42 in Jambi City in 2024."

The independent variable in this study is the use of crossword puzzle game media regarding dengue disease, while the dependent variable is knowledge and attitudes in preventing dengue disease which has a ratio data scale. The data collection method in this study is a questionnaire that has been tested for validity and reliability at SDN 93 Jambi City on 30 students and declared feasible to use. Data processing in this study is Editing, Coding, Scoring, Tabulating, and Cleaning. Data were analyzed using Univariate Analysis and Bivariate Analysis. Univariate analysis was conducted to determine the frequency distribution of knowledge and attitudes about the prevention of dengue disease. Bivariate analysis to determine the effect of health promotion using crossword puzzle game media to improve the knowledge and attitudes of grade IV students in preventing dengue disease at SDN 42 Jambi City. Statistical tests for bivariate analysis are using Shapiro-Wilk and Wilcoxon signed rank tests using the SPSS

application tool at the 95% confidence level ($\alpha = 0.05$). Hypothesis testing was carried out by comparing the P value at the 95% confidence level with the following criteria; if normally distributed ($P \geq 0.05$) then the analysis used was Paired T - Test. If the normality test is not ($P \leq 0.05$) if it is not normally distributed, then the Wilcoxon test is carried out if the P-value $P \leq 0.05$ then H_a is accepted. Data is presented in tabular and textual form.

RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents

Karakteristik Siswa	f	%
Umur		
9 tahun	9	20,0%
10 tahun	35	77,8%
11 tahun	1	2,2%
Jenis Kelamin		
Laki-laki	25	55,6%
Perempuan	20	44,4%

Based on Table 1, it is known that the respondents were 25 students (55.6%) male and 20 students (44.4%) female and respondents aged 9 years were 9 students (20.0%), respondents aged 10 were 35 (77.8%), and respondents aged 11 were 1 students (2.2%).

Tabel 2. Knowledge and attitudes towards preventing DHF using Crossword Puzzle

Variabel	Mean±SD	Mean Different±SD	Min- Max	95%CI Lower- Upper	P-value
Knowledge					
Before	4.44±0.967	3.56±0,010	3-6	4.15-4.73	$P \leq 0.001$
After	8.00±0.977		6-10	7.71-8.29	
Attitude					
Before	5.02±0.839	3,11±0,003	3-6	4.77-5.27	$P \leq 0.001$
After	8.13±0.842		7-10	7.88-8.39	

The effect of health promotion on grade IV students of SDN 42 Jambi City using crossword puzzle game media to improve knowledge and attitudes is presented in Table 2. These results have shown that health promotion in the prevention of dengue disease on improving knowledge and attitudes in grade IV students of SDN 42 Jambi City.

The results of the statistical data analysis show that there is a difference in average knowledge (difference of 3.56) and average

attitude (difference of 3.11) between before being given health education and after being given health education using the Crossword puzzle game media. Therefore, it can be concluded that health promotion using Crossword Puzzle games can significantly ($p \leq 0.05$) improve the knowledge and attitudes of fourth grade students of SDN 42 Jambi City.

The results of this study indicate that there is an effect of counseling using crossword puzzle game media on the knowledge and attitudes of elementary school children about efforts to prevent dengue disease. These results are in accordance with previous research with the title "The effect of crossword media on balanced nutrition knowledge in elementary school children". The results showed that there was an effect of nutrition education using TTS media and lecture media on balanced nutritional knowledge in elementary school children. (Umi mahmudah (2019))

The results of this study are in line with the research of Mia Valentina (2022), namely learning with crossword puzzle game media there is a significant difference in knowledge and before and after counseling with TTS media on RW 04 Pudukpayung adolescents, Kec. Banyumanik Semarang.

Crossword (TTS) is a form of learning with language games by filling in boxes with letters to form words that can be read, both vertically and horizontally (Kurniawan (2017)& Susanto, H., & Setiawan,A. (2023).

Increased knowledge of primary school students must also be accompanied by changes in their behavior. To support this process, incentives are needed that can improve the attitudes of primary school students through efforts that can encourage them to apply healthy behaviors in their daily lives.

In this study, researchers used Edgar

Dale Skinner's modification. This is because this theory shows that learning media is an educational tool that can be used as an intermediary in the learning process to increase effectiveness and efficiency in achieving teaching goals. Based on some of these opinions, learning media is a human extension that is used as an intermediary in conveying educational messages or information and is usually presented using equipment to increase effectiveness and efficiency in achieving teaching goals (Sanaky, 2009).

CONCLUSION

There is a difference in the average knowledge and attitude of diabetes mellitus prevention in class IV students of SDN 42 Jambi City between before and after being given health education using crossword puzzles. Based on the results of the study, it was found that knowledge and attitudes were significant. So it can be concluded "there is an effect of health promotion using crossword puzzles on the knowledge and attitude of preventing dengue fever in grade IV students of SDN 42 Jambi City".

Thus, it is necessary to disseminate information related to dengue disease prevention through interesting and creative health promotion methods and media in schools as a support for the success of prevention efforts and continue to implement dengue disease prevention by implementing 3M plus to avoid disease.

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CONFLICT OF INTEREST

The author has stated that in this article there is no or potential conflict of interest from either the author or the agency in connection with the research that has been conducted, both based on authorship and publication.

REFERENCES

- Abdullah, M., & Fadli, M. (2020). The effectiveness of educational games on increasing knowledge and attitudes toward dengue fever prevention among elementary school students. *International Journal of Environmental Research and Public Health*, 17(9), 3155. doi:10.3390/ijerph17093155.
- Dewi, R., & Nurul, A. (2019). Using crosswords as a method for enhancing health education in primary school children: A case study on dengue fever. *Indonesian Journal of Public Health*, 11(3), 150-160. doi:10.1177/2345678920191103.
- Knowledge in elementary school children. *Nutrition Science Indonesia*, 02(02), 107-114.
- Kurniawan, N. (2007). Characteristics and Educational Needs of Elementary School-Age Children.
- Mahmudah, U. (2019). The effect of crossword puzzle media on balanced nutrition knowledge
- Policies Development, B., Ministry, K., & Ri, K. (n.d.). IN FIGURES TEAM DRAFTING TEAM SKI 2023 IN FIGURES MINISTRY OF HEALTH REPUBLIC OF INDONESIA.
- Sanaky, H. A. (2009). Learning Media. Safiria Insania Press.
- Santosa, A., & Budianto, E. (2019). Educational interventions for dengue

fever prevention: A review of interactive learning tools in Indonesian schools. *Journal of Community Health*, 44(6), 796-805. doi:10.1007/s10900-019-00729-6.

Susanto, H., & Setiawan, A. (2023). Crosswords as an educational tool for health promotion: A study on dengue fever prevention among children. *Journal of Health Education Research & Development*, 41(1), 45-54. doi:10.1007/s12160-023-00357-5.

Valentina,W. M. (2022). THE EFFECT OF CROSSWORD MEDIA COUNSELING (KAKI SI GOGI) ON TOOTH BRUSHING SKILLS IN ADOLESCENTS RW 04 PUDAKPAYUNG, KEC. BANYUMANIK SEMARANG.

DIFFERENCES IN OHI-S IN CHILDREN WITH MENTAL DISABILITIES AT SLBN 2 JAMBI CITY WITH CHILDREN WITH MENTAL DISABILITIES AT SLBN SUNGAI PENUH

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ABSTRACT

Background: Children with Special Needs (ABK) are at high risk who have chronic physical, developmental, behavioral or emotional conditions that require assistance in maintaining dental and oral hygiene. Indicators of the degree of maintaining dental and oral hygiene with an average Oral Hygiene Index Simplified (OHI-S) <1.2 which is obtained by adding the debris index and calculus index numbers. The purpose of this study was to determine the difference in OHI-S in mentally retarded children at SLB N 2 Jambi City and mentally retarded children at SLB N Sungai Penuh in 2024.

Method: This study design used a cross-sectional method. Data were obtained from 32 mentally retarded students at SLB N 2 Jambi City and 30 mentally retarded students at SLB N Sungai Penuh. Univariate data were analyzed descriptively and bivariate with the Man Withney test.

Result: The results of the study obtained data that the OHI-S description of mentally retarded children at SLB N 2 Jambi City was mostly good criteria (68.8%), moderate criteria (28.1%) and poor criteria (3.1%), while at SLB N Sungai Penuh the most were moderate criteria (73.3%), poor criteria (16.7%) and good criteria (10.0%). There was a significant difference between the OHI-S of mentally retarded children at SLB N 2 Jambi City and mentally retarded children at SLB N Sungai Penuh in 2024.

Conclusion: There is a significant difference between the OHI-S of mentally retarded children at SLB N 2 Jambi City and mentally retarded children at SLB N Sungai Penuh in 2024.

Keywords: OHI-S, SLB, Mentally Disabled

INTRODUCTION

National health development aims to improve the health of the community and is also determined by various factors such as population, environment, community behavior and health services. One part of national development is development in the field of dental health. Development in the field of dental health is an integral part of national health development. To get the best results in dental health efforts, it is necessary to know the problems related to tooth decay (Suwelo, 1992).

Oral hygiene in dental and oral health is very important. Some problems that occur in the teeth and mouth occur due to lack of maintaining dental and oral hygiene.

Brushing your teeth properly and brushing your teeth regularly, as well as choosing the right toothpaste is one of the effective ways to maintain oral hygiene (Ekoningtyas, 2021).

Dental and oral health is an important part of overall body health. Children with special needs (ABK) are at high risk who have chronic conditions physically, developmentally, behaviorally or emotionally so they need help in maintaining dental and oral hygiene. Degree indicator in maintaining dental and oral hygiene with an average Oral Hygiene Index Smplicated (OHI-S) <1.2 which is obtained by adding the debris index and calculus index numbers (Motto, et al., 2017). The mouth is an ideal place for bacterial growth, because of the temperature, humidity and sufficient food available there. These

bacteria greatly affect dental and oral health. Dental and oral hygiene is determined by food debris, plaque, calculus alba material, and stains on the tooth surface (Gopdianto, et al., 2014).

Children with special needs are children who have mental, physical and emotional limitations that are different from normal children. Children with special needs experience developmental disorders, both physically and mentally, and require specific services. Unlike children in general, they experience permanent or temporary obstacles in learning and development caused by environmental factors, factors within the child themselves, or a combination of both (Indahwati, 2015).

Children with Mental Disabilities are part of children with special needs. Children with Mental Disabilities experience limitations in adaptive behavior such as interacting with others and are manifested during their development period. The term adaptive behavior is defined as a person's ability to bear social responsibility according to certain social norms and is in accordance with their stage of development. Children with Mental Disabilities have difficulty understanding and interpreting environmental norms (Switri, 2022).

To achieve success in overseeing the development of children with special needs, the role of parents is very significant. Parents have the task of facilitating and supporting during the process of growth and development of the body and mindset of their children. This is because parents are the closest people to the child and the people who are always with the child. So it is said that parental involvement is very important to realize optimal learning during childhood. Parental participation is one of the important factors that determine the development of children with special needs (Ekoningtyas, 2021).

The education received at SLB is made so that children with special needs can carry out

their daily activities well even though they are limited by their shortcomings, for example in terms of maintaining dental and oral hygiene. Children with special needs are given education so that they can carry out activities that maintain their physical health (Indahwati, 2015).

Maintaining dental and oral hygiene is very important for dental and oral health, because poor dental and oral hygiene can cause various diseases, both local and systemic. The index of debris and calculus attached to the teeth can be used as an indicator of dental and oral hygiene (Ekoningtyas, 2021).

The results of the study showed that the oral hygiene index (OHI-S) at SLB-B GMIM Damai Tomohon with good criteria was 22 people (36.1%), moderate criteria was 39 people (63.9%), and poor criteria was 0 people (0.0%). While the oral hygiene index (OHI-S) at SLB-C Catholic Santa Anna Tomohon with good criteria was 6 people (15%), moderate criteria was 21 people (52.5%), and poor criteria was 13 people (32.5%).

There was a significant difference between the oral hygiene status of children with special needs at SLB-B GMIM Damai Tomohon and SLB-C Catholic Santa Anna Tomohon, and oral hygiene in children with special needs at SLB-B GMIM Damai Tomohon was classified as moderate and SLB-C Catholic Santa Anna Tomohon was classified as poor (Indahwati, 2015).

Based on the background above, the author wants to conduct a study that aims to determine whether there is a difference in OHI-S in mentally retarded children at SLB N 2 Jambi City with mentally retarded children at SLB N Sungai Penuh City in 2024.

METHODS

The research design used in this study is quantitative, with a cross-sectional study design, namely research to study risk factors

by means of an approach or data collection at once in a particular place only, which aims to see the difference in OHI-S in children with intellectual disabilities at SLB N 2 Jambi City with children with intellectual disabilities at SLB N Sungai Penuh in 2024.

The population in this study were children with intellectual disabilities at SLB N 02 Jambi City totaling 37 populations, and children with intellectual disabilities at SLB N Sungai Penuh totaling 47 populations. The sample used in this study were children with intellectual disabilities at SLB N 2 Jambi City and SLB N Sungai Penuh in 2024. The sample collection technique for this study was carried out using the Total Sampling technique. Total Sampling is a sampling technique involving all population numbers (Sugiyono, 2018).

This study was conducted using total sampling by taking all populations with consideration of several criteria. The inclusion criteria in this study are as follows: Children with Mental Disability who are willing to participate / become research samples, Children who are given permission from the school and parents to undergo examination, Children with mild and moderate Mental Disability and Children with Mental Disability aged 8-12 years. Children who meet the inclusion criteria above are 32 samples of children with Mental Disability at SLB N 2 Jambi City and 30 samples of children with Mental Disability at SLB N Sungai Penuh.

The research instrument is the OHIS form with the following implementation stages:

- The first and second days on Tuesday and Wednesday, March 19 and 20, the researcher conducted an OHI-S examination on mentally retarded children at SLB N Sungai Penuh.
- The second day on Thursday, April 25, the researcher conducted an OHI-S examination on mentally retarded children at SLB N 2 Kota Jambi.
- Inform the school that the research has been completed and express gratitude.

Data processing techniques consist of editing, coding, data entry, cleaning, scoring and tabulating stages with data analysis techniques consisting of univariate analysis to determine the average OHI-S score and bivariate analysis through the Mann-Whitney test.

RESULTS AND DISCUSSION

Mean Score OHIS Chldrem

Table 1. Average OHIS of Children with Mental Disabilities at SLB N 2 Jambi City and SLB N Sungai Penuh in 2024

SLBN	Mean	Std. Dev	Min	Max
SLB N 2 Jambi City	1,3	0,8	0,5	4,0
SLB N Sungai Penuh	2,2	0,9	0,4	4,9

Based on table 1 above, it can be seen that respondents at SLB N 2 Jambi City have an average OHIS of 1.3 with a standard deviation of 0.8, a minimum score of 0.8 and a maximum of 4.0. Respondents at SLB N Sungai Penuh have an average OHIS of 2.2 with a standard deviation of 0.9, a minimum score of 0.4 and a maximum of 4.9.

This bivariate analysis uses the Man Withney test to determine the difference in OHI-S of mentally retarded children at SLB N 2 Jambi City and SLB N Sungai Penuh in 2024. The results of the analysis that have been carried out are as follows:

Shapiro Wilk normality test was conducted, it turned out that the OHI-S values in the two SLBs were not normally distributed where the p-value <0.05. To find out the difference, the Man Withney test was conducted if the p-value <0.05 stated that the 2 groups were significantly different.

Table 2. Results of Mann Whitney Test on OHI-S Values of Mentally Disabled Children at SLB N 2 Jambi City and SLB N Sungai Penuh in 2024

SLBN	Mean	SD	Min	Max	p
SLB N 2 Jambi City	1,3	0,8	0,5	4,0	0,000
SLB N Sungai Penuh	2,2	0,9	0,5	4,9	

Based on table 2 above, it can be seen that the results of the Man Withney test with

a p-value <0.05, it is stated that H₀ is rejected and it is concluded that there is a significant difference between the OHI-S of mentally retarded children at SLB N 2 Jambi City and mentally retarded children at SLB N Sungai Penuh in 2024.

In this study, it was measured through direct examination including OHI-S examination. After the examination, the data obtained showed that the average OHI-S value in mentally retarded children at SLB N 2 Jambi City was 1.297 with a minimum OHI-S value of 0.5 and a maximum OHI-S value of 4.0. This could be due to a lack of knowledge about dental and oral hygiene such as the right time and technique for brushing teeth, this is also influenced by the limitations of having mentally retarded children. Lack of knowledge can cause dental and oral health problems. Conversely, lack of knowledge can cause dental and oral health problems (Pontonuwu, J. 2013).

Based on the results of research conducted at SLB N Sungai Penuh in 2024, the respondents in this study were 30 mentally retarded children aged 8-12 years. The majority of respondents were male (73.3%) while female (26.7%).

In this study, it was measured through direct examination including the OHI-S examination. After the examination, the data obtained showed that the average OHI-S value in mentally retarded children at SLB N Sungai Penuh was 2.233 with a minimum OHI-S value of 0.5 and a maximum OHI-S value of 4.9.

The large number of poor dental and oral hygiene statuses is due to inappropriate brushing time and suboptimal brushing techniques, low oral hygiene is due to inappropriate dental and oral hygiene behavior (Imran, H. 2020).

This is in line with Blum's theory in Notoadmojo explaining that there are several factors that influence the health status and oral hygiene of teeth and mouth, namely

hereditary factors, environment, behavior and health services (Notoadmojo, 2007).

Therefore, behavioral factors or habits taught by parents or teachers have a more dominant influence on the OHI-S status of children with intellectual disabilities due to the limitations of the individual himself.

CONCLUSION

There is a significant difference between the OHI-S of mentally retarded children at SLB N 2 Jambi City and mentally retarded children at SLB N Sungai Penuh in 2024.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

- Ardyan, G.R. 2010. *Serba-Serbi Kesehatan Gigi & Mulut*. Jakarta : Bukune.
- Ekoningtyas, E. A., Fatmasari, D., Subekti, A., Utami, W. J. D., & Wiradana, I. (2021). Peran Keterlibatan Orang Tua Melalui PosKesGi Dalam Komunitas Keluarga Terhadap Perubahan Nilai OHI-S Anak Berkebutuhan Khusus. *Jurnal Kesehatan Gigi*, 8(1).
- Gopdianto, Randy, A. J. M Rattu, and Ni Wayan Mariati. 2014. "Status Kebersihan Mulut dan Perilaku Menyikat Gigi Anak SD Negeri 1 Malalayang." *e-GIGI* 3(1).
- Imran, H., & Wati, N.K. (2020). Hubungan Tindakan Pemeliharaan Kesehatan Gigi dengan Status Kebersihan Gigi dan Mulut Pada Murid Kelas VII Madrasah Tsanawiyah Negeri 8

- Kabupaten Aceh Besar. *Jurnal Online Keperawatan Indonesia*, 3(2), 58-64.
- Indahwati, V., Mantik, M. F., & Gunawan, P. N. (2015). Perbandingan Status Kebersihan Gigi Dan Mulut pada Anak Berkebutuhan Khusus Slb-B dan Slb-C Kota Tomohon. *e-GIGI*, 3(2).
- Juwono, T.P. 2018 *Aktivitas Untuk Anak Berkebutuhan Khusus*. Millineal Reader : Yogyakarta.
- Motto, Christavia J., Christy N. mintjelungan, and Shane H.R. Ticoalu. 2017. "Gambaran Kebersihan Gigi dan Mulut Pada Siswa Berkebutuhan Khusus di SLB YPAC Manado." *e-GIGI* 5 (1).
- Notoadmodjo, S. 2007. *Pendidikan dan Perilaku Kesehatan*. Jakarta : Rineka Cipta
- Notoatmodjo, S. 1997, *Ilmu Kesehatan Masyarakat*, Penerbit Rineka Cipta, Jakarta
- Pontonuwu, J. (2013). Gambaran Status Karies Anak Sekolah Dasar di Kelurahan Knilow 1 Kecamatan Tomohon Utara. *E-GiGi*, 1(2).
- Pratiwi., 2007, *Gigi Sehat : Merawat Gigi sehari-hari*. Jakarta : PT. Buku Kompas Nusantara
- Putri, M. H., 2011, *Ilmu Pencegahan Penyakit Jaringan Keras dan Jaringan Pendukung Gigi*, Penerbit Buku Kedokteran EGC, Jakarta.
- Rochyadi, E. 2005. *Karakteristik dan Pendidikan Anak Tunagrahita*. Departemen Pendidikan Nasional : Jakarta
- Setiawan, I , *A to Z Anak Berkebutuhan Khusus*, (CV jejak, 2020).
- Somantri, S. 2012 *Psikolog Anak Luar Biasa*. Bandung : PT Revika Aditama
- Sugiyono, 2018. *Metode Penelitian Kuantitatif*. Bandung: Alfabeta, 2018
- Suwelo, I , S ., 1992, *Karies Gigi pada Anak dengan Pelbagai Faktor Etiologi*, Jakarta.
- Switri, E , *Pendidikan Anak Berkebutuhan Khusus*, (Penerbit Qiara Media, 2022).
- Tuhuteru, D., 2014, Status Kebersihan Gigi dan Mulut Poliklinik Gigi Puskesmas Paniki Bawah Manado. *Jurnal Fakultas Kedokteran Universitas Sam Ratulangi Volume 2 Edisi Desember*. Manado.
- Wardani, K , D ., 2020, *Pengujian Hipotesis (Deskriptif, Komparatif dan Asosiatif)*. (LPPM Universitas KH. A. Wahab Hasbullah).
- Yohanes, I.G., Pandelaki, K., & Mariati, N.W. (2013). Hubungan Pengetahuan Kebersihan Gigi dan Mulut dengan Status Kebersihan Gigi dan Mulut Pada Siswa SMA Negeri 9 Manado. *e-GiGi*, 1(2).
- Yosiani, N. 2014. Relasi karakteristik anak Tunagrahita dengan pola tata ruang belajar di sekolah luar biasa. *E-Journal Graduate Unpar*, 1(2), 111-124.

NUTRITION EDUCATION FOR PARENTS OF ATHLETES THROUGH SMARTWEBCALC TECHNOLOGY APPLICATION

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ABSTRACT

Background: As many as 50% of adolescent athletes still have insufficient nutritional intake. It can hinder the optimal performance of athletes. Food intake in adolescent athletes still depends on the family diet prepared by parents. Many parents of athletes still don't know and practice good menus. Information technology is very possible to use for educational media. Smartwebcalc is one of the academic media that facilitates parents of athletes in calculating nutritional needs and the application of the right menu according to the age category, gender, and activity of athletes.

Methods: Education was conducted on 27 parents of Maguwoharjo Football Academy athletes. Education was held in June 2024 at Maguwoharjo Football Park. The educational material provided is education on the urgency of fulfilling balanced nutrition for youth soccer athletes, estimating the nutritional and fluid needs of youth soccer athletes, setting a balanced menu based on training periodization, and using smartwebcalc in setting a balanced menu. Data were analyzed using statistical software with the Wilcoxon sign rank test.

Results: The pretest score was 95 (80-100) with a maximum score of 100 as many as two people (7.4%). The posttest score is 95 (80-100) with the number of respondents who have a score of 100 being as many as ten people (37%). There was an effect of education through the smartwebcalc technology application on increasing knowledge in parents of athletes ($p=0.026$).

Conclusion: Education using smartwebcalc technology can effectively increase knowledge in parents of Maguwoharjo Football Academy athletes.

Keywords: Nutrition education; Parents of athletes; Soccer; Smartwebcalc

INTRODUCTION

Soccer is a stop-and-go sport that requires high enough intensity for good physical performance, technique, and tactics (Bhagascara et al., 2022). The level of ability of most soccer athletes is still in the low category, whereas soccer needs a good VO2 max score (Hardinata et al., 2023). To optimal performance, a synergistic and continuous construction of the entire supporting element is required. Athlete's physical and physiological factors have a strong influence on performance. To achieve optimal performance, an athlete needs proper intake support based on the amount, type, and time (Kementerian Kesehatan RI, 2013).

About half of the athletes have less energy intake than they need. Besides, the fat and carbohydrate intake is still less than 80% of the total requirement. The highest number of cases of anemia in adolescent athletes was demonstrated by an athlete's low hemoglobin of 16.67%, which was shown by iron and vitamin C intake of about 20% and 37% of the requirements (Afriani & Puspaningtyas, 2019; Puspaningtyas et al., 2019).

In addition, according to an athlete's fluid intake survey at one of the soccer clubs in Yogyakarta, 96% of athletes consume less fluid than they need daily. The total amount of fluid is about $2,797,61 \pm 1,100,64$ ml (Afriani et al., 2022). During the competition phase, the fluid intake to be consumed is

2,400 ± 3,400 ml. On the contrary, if the Athlete consumes as much fluid as 5,700 to 6,700 ml in one day, there will be a fluid balance in the body (Ozolina et al., 2013).

Not all athletes realize the importance of balanced nutrition and the fulfillment of fluid requirements to improve their performance. One of the efforts that can enhance the knowledge of athletes is nutrition education (Puspaningtyas et al., 2019). Proper nutritional intake can boost performance. Accurate nutritional information will support athlete performance achievement, unfortunately, adolescent athletes have been unable to regulate proper dietary choices independently. Parents play an important role in the dietary setting of athletes. Inadequate nutritional intake will hinder athletes from reaching their best levels of performance. The role of parents is enormous in providing support for the best nutritional intake. It will have an impact on the growth of the baby optimally. Athlete parents have not yet been able to implement a suitable menu before, when, and after the game. Many parents are unfamiliar with the nutritional content of foods, eating habits in their neighborhood, and limited time in preparing foods (Sari et al., 2020).

In helping athletes understand the proper distribution of food, previous studies have developed educational media such as the Athlete's Food and Fluid Intake Chakra (CAMCA). One of the CAMCAs that have been developed is a medium that calculates the nutritional needs of the athlete based on age and level of activity, as well as the portions of food (Afriani et al., 2022). An application that can be installed on the athlete's mobile will make it easier for athletes to access information. A web-based application is one type of application that can be created and easily accessed. According to some studies, web-based applications have a significant influence on students' knowledge, attitudes, and practices about nutrition. Web-based nutritional intake can be given

gradually and continuously to cultivate positive eating behavior and prevent a decrease in eating behavior in students, so it can be sustainably applied in everyday life (Lathifa & Mahmudiono, 2020). Technological advances have made a shift in lifestyle, especially among teenagers. The ease of access to online information in the teenage years makes it one of the things that can be used in today's era (Budiati et al., 2018).

Previous studies showed that the use of smartphones affects adolescent health behavior, especially diet and exercise (Hoogstins, 2017). "Teen Athlete Nutrition Calculator" Smartwebcalc, CAMCA's educational media innovation, is a web application that has been developed. The app is on the smartphone, so it's easy to access and very attractive to the user. These media provide easier-to-understand information on how to calculate the nutritional needs and nutritional satisfaction of athletes based on their age, gender, and activity status. Athlete parents also need to know what athletes need to maintain their health (Lestari, 2017).

One of the soccer academies in Yogyakarta is the Maguwoharjo Football Academy. This soccer school is located in Maguwoharjo Football Park and has 30 to 50 students. Currently, the Maguwoharjo Football Academy seeks to become a professional soccer school to produce skilled soccer athletes who can compete nationally and internationally. Many athletes are not in ideal nutritional condition and do not know the importance of proper nutritional intake to the best levels of performance. At this age, menus are still prepared by parents. Parents play a role in providing adequate food intake in supporting the growth and development of children. In addition, the role of parents can also affect the child's nutritional status (Lestari, 2017; Qomariah et al., 2021). Information media constraints have become one of the major problems in the non-optimal dietary settings of athletes. Therefore, efforts

are needed to improve the knowledge and understanding of the parents of soccer athletes at the Maguwoharjo Football Academy. The smartwebcalc technology application can help athletes' parents accompany their eating settings.

METHODS

This study is quasi-experimental. The study was conducted in June 2024 at the Kartini Building, Maguwoharjo Football Park. The respondents were the parents of soccer athletes at the Maguwoharjo Football Academy of 27 people. The research was started with the filling of pretests by the athlete's parents. The education is divided into four educational materials: the urgency of achieving balanced nutrition for juvenile soccer athletes, the estimation of nutritional and fluid needs of juveniles, the setting of balanced menus based on the periodization of exercises, and the use of smartwebcalc in balanced menu settings. Smartwebcalc media can be accessed through the link <https://smartwebcalc.com/>. The "SmartwebCalc" medium is an accessible and easy-to-use youth athlete educational media, without having to be installed on a mobile phone. This teenage athlete nutrition calculator media contains nutritional requirements calculations, nutritional descriptions, as well as examples of daily menus for athletes aged 12-20 years. After the education was provided, it was continued with the filling out of the posttest and discussion session by the parents of the athletes which took place very enthusiastically.

The instruments used in the study are laptops, LCDs, microphones, speakers, and a knowledge questionnaire that contains 20 questions about the urgency of balanced nutrition, nutritional requirements estimate, menu settings, and the use of smartwebcalc for menu setting. The data measured is the knowledge score before and after giving education. The data was analyzed with

statistical software using the Wilcoxon signed rank test because the data was not normally distributed.

RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents

Characteristics of Parents	n	%
Age		
Adults (19-44 years)	20	74,07
Pre-Elderly (45-59 years)	7	25,93
Gender		
Men	9	33,33
Women	18	66,67

Based on Table 1, it was found that the majority of the elderly were 19-44 years of age, while those present in this study were mostly female at 66.67%.

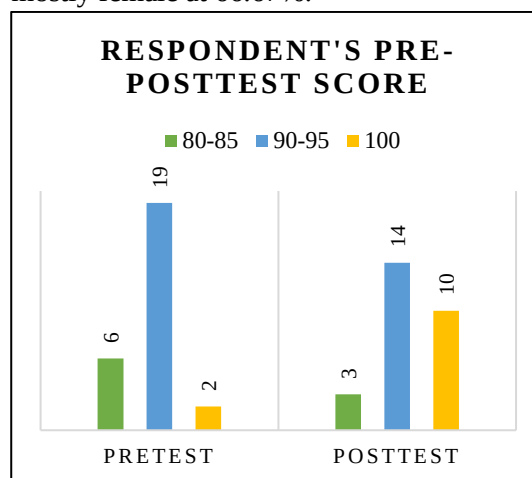


Figure 1. Pre-Post Test Respondent's Score

Table 2. The Effect of Nutrition Education with Smartwebcalc on Knowledge Scores

Variable	Mean	Median (Min-Max)	P value
Pretest Score	91,48	95 (80-100)	0,026*
Posttest Score	94,63	95 (80-100)	

Description: *significant ($p < 0,05$)

Education using smartwebcalc media has been shown to significantly improve the knowledge score of parents of soccer athletes at the Maguwoharjo Football Academy by 3.15 points ($p = 0,026$).

An athlete needs a balanced nutritional intake to maintain stamina during training and competition (Kementerian Kesehatan RI, 2013). Athlete's lack of understanding of food and drink consumption will affect athlete performance decline (Merawati et al., 2019).

Athletes can improve their knowledge of balanced nutrition through nutritional education (Waryana dan Wijanarka, 2013). There is evidence that health education about eating and physical activity can significantly improve one's knowledge (Oliveira et al., 2022). The educational media also influenced increased knowledge and understanding of nutrition (Lazzeri et al., 2013; Fitriani, 2011).

Nutrition education through smartwebcalc media performed on parents of athletes can significantly improve knowledge scores. The results of the study show that some information is not much known by athlete parents, among other things, on the statement item **"Carbohydrates are stored in the body in the form of glycogen"** As much as 30% of athletes' parents have not known before giving education. After the education was given, there was an increase in knowledge, only 5% of the athletes' parents did not understand.

In addition to the statement **"2-3 hours before the match, athletes are obliged to have a simple carbohydrate-rich snack like syrup water, candy, and chocolate"** 60% of the athlete's parents answered "right" while the answer should be "wrong".

Then on the statement **"Smartwebcalc can only be used for adult athletes and not suitable for adolescent athletes"** as many as 20% of the parents answered "wrong" while the Smartwebcalc application can be applied for teen sportsmen.

"Smartwebcalc can only be used on computers and can't be accessed via mobile phones," 20% of respondents said, "Right". However, there is an increasing knowledge among parents so that only 10% of parents still don't understand.

Parents are one of the keys to the success of setting up menus for children and adolescents. To support the growth and development of children, parents are responsible for providing healthy food intake. The role of parents can also affect the child's nutritional level (Lestari, 2017; Qomariah et

al., 2021). The dietary settings of parents influence how children grow up optimally. The results of the study show that most athlete parents are unable to prepare proper meals before, when, and after a game. Many parents do not realize the importance of nutrients in food, eating habits outside, and limited time to prepare food (Sari et al., 2020).

Smartwebcalc medium is a very decent and interactive medium to be applied as an educational medium to teenage athletes because of its easy access, usability, and practicality. This medium can easily calculate athlete's dietary and fluid intake based on an estimate of athletes' nutritional needs (Afriani et al., 2023). Other studies also show that web-based educational medium is easy to develop because it is accessible through computers, laptops, smartphones, or other devices. Web media makes learning time more efficient. The web has many benefits as it helps learning, especially distance learning, such as comment columns and discussion forums (Faradayanti, 2020). Previous research has shown that internet-based learning can increase interest as a motivation-supporting situation factor (Priyambodo, 2012). The use of web-based learning media also has an impact on learning outcomes. Therefore, the use of these media can be applied in an effective learning process and is better than conventional learning because it is more fun and interactive (Rahman, 2014; Firmansyah, 2023; Meduri, 2022).

CONCLUSION

Educational media for parents of soccer athletes at Maguwoharjo Football Academy using smartwebcalc medium has been shown to significantly improve knowledge scores. Smartwebcalc educational media can be developed and applied as an educational medium for athletes aged 12-20 in various sports to support a balanced menu setting and optimum performance. It is necessary to provide support to the athlete's parents in

applying a proper and balanced diet to improve performance.

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CONFLICT OF INTEREST

All authors declared no conflict of interest with those involved in this study.

REFERENCES

- Afriani, Y., & Puspaningtyas, D.E. (2019). Hemoglobin levels and nutrients intake on young soccer athletes in Yogyakarta. *Journal of Physical Education, Sport, Health and Recreations*, 8(3), 107-112.
- Afriani, Y., Sari, S. P., & Puspaningtyas, D. E. (2022). 48 Jurnal Gizi 11 (2) 2022 Analisis Ahli Cakram Asupan Makan dan Cairan Atlet: Studi Awal Pengembangan Media Edukasi Atlet Remaja. *Jurnal Gizi*, 11(2), 48-59.
- Afriani, Y., Sari, S.P., Sucipto, A., Puspaningtyas, D.E. (2022). Optimalisasi Asupan Cairan dengan Tekanan Darah dan Denyut Nadi pada Atlet PS Sleman Development Center. *Jurnal Pengabdian pada Masyarakat*, 7(1), 80-86. Retrived from <http://jurnal.unmabanten.ac.id/index.php/jppm/article/view/28/20>
- Afriani, Y., Puspaningtyas, D.E., Sari, S.P., Sugiarto, N.W. (2023). Studi Pengembangan SMART WebCalc "Calculator Gizi Atlet Remaja" sebagai Media Edukasi bagi Atlet Remaja. Laporan Akhir Pengabdian Masyarakat. Yogyakarta: Universitas Respati Yogyakarta.
- Budiati, I., dkk. 2018. Profil Generasi Milenial Indonesia. Jakarta: Kementerian Pemberdayaan Perempuan dan Perlindungan Anak.
- Bhagascara, C., Nidomuddin, M., Pamungkas, H., Yusuf, H., & Lufthansa, L. (2022). Kontribusi Panjang Langkah Terhadap Kecepatan Maksimal Pada Pemain Profesional Sepakbola. *Bravo's: Jurnal Program Studi Pendidikan Jasmani Dan Kesehatan*, 10(3), 186. <https://doi.org/10.32682/bravos.v10i3.2607>
- Faradayanti, K. A., Endryansyah, J., & Agung, A. I. (2020). Kepraktisan Media Pembelajaran Berbasis Web Untuk Menunjang E-Learning Pada Matapelajaran Instalasi Motor Listrik Di SMK. *Jurnal Pendidikan Elektro*, 9(3).
- Firmansyah, Y., Sudarman, S., & Partha, M. N. (2023). Pengembangan Media Pembelajaran Berbasis Web Google Sites Pada Mata Pelajaran Ekonomi. *Jurnal Prospek: Pendidikan Ilmu Sosial dan Ekonomi*, 5(1), 11-20.
- Fitriani S. 2011. Promosi Kesehatan. Yogyakarta: Graha Ilmu.
- Hardinata, R., Putra Sastaman B., Okilanda, A., Prabowo, T.A., Tjahyanto, T., Rozi, M.F., Suganda, M.A., Suryadi, D. (2023). Analysis of the physical condition of soccer athletes through the yo-yo test: a survey study on preparation for the provincial sports week, Retos, 50: 1091-1097.
- Hoogstins, E.S. 2017. Modelling on Social Media: Influencing Young Adults' Food Choices. Tesis tidak diterbitkan. Swedia: Pps Lunds Universitet.
- Kementerian Kesehatan RI. (2013). Pedoman Gizi Olahraga Prestasi. Jakarta: Kementerian Kesehatan RI
- Lathifa, S., & Mahmudiono, T. (2020). Pengaruh Media Edukasi Gizi Berbasis Web Terhadap Perilaku Makan Gizi Seimbang Remaja SMA Surabaya (the

- Effect of Web-Based Nutrition Education Media Toward Balanced Nutritional Eating Behavior on High School Student). *Media Gizi Kesmas*, 9(2), 48-56.
- Lazzeri G, Pammolli A, Azzolini E, Simi R, Meoni V, De Wet DR, et al. 2013. Association between fruits and vegetables intake and frequency of breakfast and snacks consumption: A cross-sectional study. *Nutr J* [Internet].12(1):1 – 26.
- Lestari. (2017). Pemahaman Orangtua Tentang Pemenuhan Gizi Anak Melalui Luch Box (Bekal Makanan) di Kelompok Bermain IT Sekargading Semarang. (Unpublished Thesis of Pendidikan Guru Pendidikan Anak Usia Dini). Universitas Negeri Semarang, Semarang, Indonesia.
- Meduri, N. R. H., Firdaus, R., & Fitriawan, H. (2022). Efektifitas aplikasi website dalam pembelajaran untuk meningkatkan minat belajar peserta didik. *Akademika: Jurnal Teknologi Pendidikan*, 11(02), 283-294.
- Merawati, D., Sugiharto, Andiana, O., Susanto, H., Taufiq, A. (2019). The Influence of Nutritional Knowledge on Nutritional Status and Physical Performance in Young Female Athletes. *IOP Conf. Series: Earth and Environmental Science* 276: 1-9.
- Oliveira, M.L.d.; Castagnoli, J.d.L.; Machado, K.M.C.; Soares, J.M.; Teixeira, F.; Schiessel, D.L.; Santos, E.F.d.; Novello, D. 2022. Interdisciplinary Educational Interventions Improve Knowledge of Eating, Nutrition, and Physical Activity of Elementary Students. *Nutrients* 14, 2827.
- Ozoliņa, L., Pontaga, I., & Strēle, M. (2013). Body Hydration Degree Changes During Training in Football Players in Winter Conditions. *Lase Journal of Sport Science*, 4 (2): 139-146.
- Priyambodo, E., Wiyarsi, A., & Permanasari, L. (2012). Pengaruh media pembelajaran interaktif berbasis web terhadap motivasi belajar mahasiswa. *Jurnal Kependidikan Penelitian Inovasi Pembelajaran*, 42(2).
- Puspaningtyas, D. E., Sari, S. P., Afriani, Y., & Mukarromah, N. (2019). Edukasi Gizi Efektif Meningkatkan Pengetahuan Atlet Mengenai Gizi Seimbang dan Pemenuhan Kebutuhan Cairan. *Jurnal Pengabdian Dharma Bakti*, 2(2), 34-38.
- Qomariah, S., Herlina, S., Sartika, W., Juwita, S. (2021). Pengaruh Peran Orang Tua Terhadap Kejadian Gizi Lebih pada Remaja di Era Pandemi Covid 19 di Pekanbaru. *Jurnal Ilmiah Umum dan Kesehatan Aisyiyah*, 6 (2): 76-82.
- Rahman, S., Munawar, W., & Berman, E. T. (2014). Pemanfaatan media pembelajaran berbasis website pada proses pembelajaran produktif di SMK. *Journal of Mechanical Engineering Education*, 1(1).
- Sari, S. P., Afriani, Y., Puspaningtyas, D. E., & Sari, J. N. (2020). Gambaran Pengetahuan Orang Tua tentang Pengaturan Menu Makan Atlet SSB Melalui Fokus Grup Diskusi. *Jurnal Pengabdian Dharma Bakti*, 3(1), 66-74.
- Waryana and Wijanarka, A. (2013) *Dasar-dasar Ilmu Komunikasi Gizi*. Yogyakarta: Penerbit Fitramaya.

SIMPLICIA CHARACTERIZATION, SPECIFIC AND NON-SPECIFIC PARAMETERS OF MAHKOTA DEWA FRUIT (*Phaleria macrocarpa* (Scheff) Boerl)

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ABSTRACT

Background: *P. macrocarpa* (*Phaleria macrocarpa* (Scheff) Boerl) is known to contain various secondary metabolites, including alkaloids, tannins, terpenoids, saponins, flavonoids, and polyphenols. This study aims to evaluate the simplicia characterization and the specific and non-specific parameters of *P. macrocarpa* fruit (*Phaleria macrocarpa* (Scheff) Boerl).

Method: The simplicia characterization, along with specific and non-specific parameters, were determined according to the standards outlined in the Indonesian Herbal Pharmacopeia.

Results: The simplicia exhibited the following characteristics: form—transverse slices of the fruit with a semi-spherical shape, smooth surface, grooved texture, fibrous and rough inner surface, with remnants of thick and rigid endocarp, irregularly curved; color—yellowish-white to brownish flesh with dark purple edges; odor—distinctive; and taste—bitter. The infusa showed the following characteristics: form—infusion liquid; color—milky brown; odor—distinctive; and taste—bitter. The drying shrinkage test yielded a result of 1.51%. The total ash content, was 2.97%. The findings indicate that the specific and non-specific parameters of *P. macrocarpa* fruit (*Phaleria macrocarpa* (Scheff) Boerl) comply with the standards set by the Indonesian Herbal Pharmacopeia. In phytochemical screening, *P. macrocarpa* extracts are reported to contain flavonoids, alkaloids and saponins.

Conclusion: The study concluded that the specific and non-specific parameters of *P. macrocarpa* fruit (*Phaleria macrocarpa* (Scheff) Boerl) meet the requirements of the Indonesian Herbal Pharmacopeia.

Keywords: *P. macrocarpa*, SCOPY, simplicia characterization, specific parameter, non specific parameter

INTRODUCTION

Kombucha is a well-known fermented beverage made from green or black tea leaves, sucrose, and a Symbiotic Culture of Bacteria and Yeasts (SCOBY) (Barakat et al., 2022). It ferments over 7-21 days and is rich in polyphenols, organic acids, vitamins, minerals, and sugars. The drink is recognized for its strong antioxidant effects and other health benefits, including antibacterial, antihyperglycemic, antiproliferative, immune-modulatory, antihypercholesterolemia, and antihypertensive properties (Júnior et al., 2022).

Recent research has increasingly focused on producing kombucha using alternative substrates, such as herbal infusions, fruits, and vegetables. These alternative substrates have been found to produce kombucha with unique bioactive compounds and distinct pharmacological effects. This has led to the development of what is now referred to as "kombucha analogs," expanding the potential applications and health benefits of this traditional beverage (Barakat et al., 2022; Villarreal-Soto et al., 2018).

P. macrocarpa (*Phaleria macrocarpa*) is a medicinal plant native to Papua, Indonesia, widely used in traditional medicine across Asia. The plant, particularly its fruit and

leaves, is employed in various forms—such as infusions, extracts, or boiled simplicia—for its numerous health benefits (Altaf et al., 2013). *P. macrocarpa* is known to possess antimicrobial, antihyperglycemic (Ali et al., 2012), cytotoxic and antioxidant (Lay et al., 2014), analgesic, antihypercholesterolemic, anti-inflammatory, and antihypertensive activities (Ahmad et al., 2023). Its rich phytochemical profile includes xanthenes, flavonoids, terpenoids, and benzophenone derivatives (Lay et al., 2014).

Despite its medicinal potential, the use of *P. macrocarpa* as an alternative substrate in kombucha production remains unexplored. This study aims to address this gap by standardizing the use of *P. macrocarpa* in kombucha and investigating specific and non-specific parameters for its development. By integrating traditional medicinal plants like *P. macrocarpa* into kombucha production, this research seeks to advance the creation of functional fermented beverages with enhanced health benefits.

METHODS

Research instrument and material

The instrument used in this study includes a knife, basin, basket, oven, infusion pot, analytical balance (Mettler Toledo), thermometer (Yuwell), stirring rod, Erlenmeyer flask (Pyrex), beaker (Pyrex), volumetric flask (Pyrex), water bath, glass container, flannel cloth, drying tray, gas stove (Rinnai), flask (Iwaki), micropipette, desiccator, and furnace (Neycraft).

The materials used in this study include *P. macrocarpa* fruit sourced from Desa Bahar Mulya, Unit 16, RT.02, Kec. Bahar Utara, Muaro Jambi (specimen number: 48/HB/06/2023). The chemicals used are distilled water, commercial SCOBY, reagent for phytochemical screening.

Sample Collection and Preparation

The extraction yield of *P. macrocarpa* fruit simplicia was 75.65%, obtained from 10

kg of fresh fruit, yielding 756.5 grams of dried simplicia. Wet sorting was conducted to clean and separate fresh, high-quality fruit. The fruit was sliced transversely and dried on large trays under sunlight for four days. Once dried, the samples were finely ground and stored in airtight containers.

The *P. macrocarpa* fruit extract was prepared using infusion. For the non-SCOBY infusion, 10 grams of simplicia were mixed with 100 ml of water, heated for 15 minutes at 90°C, and filtered through flannel while hot. For the SCOBY-fermented infusion, 20 grams of simplicia were mixed with 200 ml of water, heated similarly, filtered, and then 10% sugar was added while still hot. After cooling to $\pm 25^{\circ}\text{C}$, 3 grams of SCOBY were added. The mixture was transferred to a glass container, covered with a clean cloth, and fermented at room temperature (25°C) for 14 days (Antolak et al., 2021).

Simplicia Characterization

Characterization of the extract included organoleptic assessments and physicochemical analyses, such as measurements of dry loss and total ash content

1. Organoleptic Assessment

The organoleptic test was conducted to observe the extract's shape, color, odor and taste as per Indonesian Herbal Pharmacopeia (Ministry of Health Indonesia, 2017)

2. Physicochemical Analysis

Physicochemical parameters involved determining the water content, total ash content, and acid-insoluble ash content.

a. Loss on drying (LOD)

Weigh 1 to 2 grams of simplicia in a shallow weighing bottle with a lid that has been pre-heated and tared. Spread the material evenly by shaking the bottle, creating a layer about 5 to 10 mm thick. Place it in the drying chamber, remove the lid, and dry at 105°C in 5 hours or until a constant weight is achieved. Before

each drying, allow the bottle to cool in a desiccator to room temperature with the lid closed. Loss on drying can be calculated using the formula (Ministry of Health Indonesia, 2017):

$$\% \text{ LOD} = \frac{\text{initial sample weight} - \text{final sample weight}}{\text{initial sample weight}} \times 100\%$$

b. Determination of Total Ash Content

A one-gram sample was placed in a silicate crucible, evenly distributed, and gradually heated to $800 \pm 25^\circ\text{C}$ until complete carbon combustion. After cooling in a desiccator, the crucible was reweighed, repeating the process until a stable weight was achieved (Ministry of Health Indonesia, 2017).

$$\% \text{ total ash content} = \frac{W_2 - W_1}{W_2} \times 100\%$$

Phytochemical Screening

1. Test for Alkaloids

Each extract (0.5 g) was stirred with 5 ml of 2 N sulfuric acid on a steam bath and then filtered. A few drops of Mayer's reagent (potassium mercuric iodide) were added to 1 ml of the filtrate. The presence of alkaloids was indicated by the formation of turbidity and/or white-colored precipitation (Meneses et al., 2013).

2. Test for Flavonoids

Each extract (0.5 g) was dissolved in aquabidest and then filtered. A few drops of the filtrate were treated with concentrated hydrochloric acid and magnesium powder. The formation of a red or orange color indicated the presence of flavonoids (Efendi et al., 2024)

3. Test for Saponins

Each extract (0.5 g) was dissolved in distilled water in a test tube and mixed vigorously. The presence of saponins was indicated by the formation of a frothy layer that persisted upon heating (Harborne, 1984)

RESULTS AND DISCUSSION

The identification of the *P. macrocarpa* fruit plant was conducted at Padjadjaran University, yielding identification results documented under no. specimen: No. 48/HB/06/2023. The determination confirmed that the plant is a species of *Phaleria macrocarpa* (Scheff.) Boerl:

Kingdom : Plantae
Division : Magnoliophyta
Class : Magnoliopsida
Order : Malvales
Family : Thymelaeaceae
Genus : Phaleria
Species : *Phaleria macrocarpa* (Scheff.) Boerl.

Standardization of *P. macrocarpa* fruit

1. Specific Parameter Results (Organoleptic)

Table 1. Organoleptic result

Characterization	Simplicia	Non-Fermented Infusion	Kombucha <i>P. macrocarpa</i> fruit
Shape	Transverse fruit slices, half-spherical with a smooth, grooved surface; the inner surface was fibrous, rough, with thick, stiff endocarp remains, and irregularly curved	liquid	liquid
Color	yellowish-white to brownish with dark purple edges	Milky brown	Milky brown
Odor	Distinctive	Distinctive	Distinctive with a slight sour smell like fermented casava
Taste	Bitter	Bitter	Bitter and slightly sour

This study was conducted to produce both fermented and non-fermented *P. macrocarpa* fruit infusions. The method involved physical quality testing through several parameters, including organoleptic tests for shape, color, odor, and taste. The results for simplicia were as follows: shape—transverse fruit slices,

half-spherical with a smooth, grooved surface; the inner surface was fibrous, rough, with thick, stiff endocarp remains, and irregularly curved; color—yellowish-white to brownish with dark purple edges; odor—distinctive; taste—bitter. For the infusion, the results were: form—liquid, color—milky brown, odor—distinctive, taste—bitter. The results refer to Indonesian Herbal Pharmacopeia (Ministry of Health Indonesia, 2017).

2. Non-Specific Parameter Results

a. Loss on drying Results

Table 2. Loss on drying results

Repeti tion	Empty crucible (g)	Crucible + sample (g)	(crucible + sample) – empty crucible (g)	Percentage (%)	Mean (%)	Requirements according FHI
1	67.34	68.24	0.9	1.1	1.51	no more than 10%
2	64.95	65.83	0.88	0.75		
3	65.69	66.65	0.96	2.7		

The Loss on drying parameter measures the remaining substance after drying at 105°C for 5 hours or until a constant weight is achieved, expressed as a percentage. This measure provides a maximum limit (range) for the amount of compound lost during the drying process (Ahn et al., 2014). Compounds lost during drying typically include volatile substances such as essential oils and water. The loss on drying test result obtained was 1.51%. Loss on drying should not exceed 10%. It also represents the amount of water evaporated (Ministry of Health Indonesia, 2017)

The Loss on drying parameter is crucial for assessing the quality and stability of dried substances. A low Loss on drying, such as 1.51% in this case, indicates that only a minimal number of volatile components and moisture were lost during the drying process (Department of Health of Republic Indonesia, 2000). This suggests that the sample retains most of its essential constituents and has been dried efficiently. High loss on drying can indicate excessive removal of volatile compounds or water, which might affect the stability and efficacy of the extract. Thus, maintaining loss on drying below 10%

ensures that the product remains within acceptable limits for quality control, preserving its intended properties and effectiveness (Sutomo et al., 2019).

b. Total ash content

Ash content determination provides insight into the internal and external mineral content from the initial processing of simplicia to the formation of the extract (Department of Health of Republic Indonesia, 2000). The purpose is to assess the mineral content resulting from the entire process, from simplicia to the final extract. During this stage, simplicia is heated until organic compounds and their derivatives are destroyed and evaporated, leaving only the mineral and inorganic components. The total ash content measured using a furnace at 800°C for 8 hours was 2.97%. According to (Ministry of Health Indonesia, 2017), the total ash content should not exceed 5.6%. A lower ash content is desirable because this parameter indicates the presence of heavy metal contaminants that persist at high temperatures. The determination of ash content is essential for evaluating the purity and quality of the extract. A total ash content of 2.97% suggests that the extract contains a relatively low number of inorganic residues, indicating good quality and minimal contamination. High ash content may indicate the presence of impurities or heavy metals, which can affect the safety and efficacy of the extract (Prakash et al., 2019). Therefore, maintaining ash content below 5.6% is crucial to ensure the extract's quality and safety, as it reflects the minimal presence of undesirable inorganic residues (Ministry of Health Indonesia, 2017).

Table 3. Total ash content results

Repeti tion	Empty crucible (g)	Crucible + sample (g)	Initial sample weight (g)	Final sample weight (g)	Percen tage (%)	Mean (%)	Requirements according FHI
1	65.79	67.91	65.85	63.71	3.25	2.97	no more than 2.97
2	65.46	67.62	65.62	63.66	2.99		
3	67.40	69.44	67.69	65.88	2.68		

Phytochemical Screening

Table 4. Phytochemical screening

Secondary metabolites	Results
Flavonoid	+
Saponin	+
Alkaloid	+

In this study, a phytochemical screening of *Phaleria macrocarpa* (*P. macrocarpa*) was conducted, identifying the presence of several key bioactive compounds: flavonoids, saponins, alkaloids, and tannin. It is consistent with the findings of a previous study by (Lay et al., 2014) which reported that the fruits of *P. macrocarpa* are rich in phytochemicals such as flavonoids (the primary component), glycosides, saponin glycosides, phenolic compounds, tannins, and terpenoids, all of which may contribute to the plant's bioactive properties, including antioxidant and cytotoxic activities. The study also noted the presence of moderate amounts of carbohydrates, steroids, and terpenoids in the fruits of *P. macrocarpa*.

P. macrocarpa extracts are reported to contain alkaloids and saponins as well. However, there is a need for a thorough investigation of these extracts to identify the specific alkaloids and saponins present and to correlate them with the reported biological properties of *P. macrocarpa* extracts(Altaf et al., 2013).

These screening results demonstrate that *P. macrocarpa* contains compounds with scientifically proven beneficial biological activities, further supporting the plant's potential in health and medicinal applications.

CONCLUSION

The study successfully evaluated the physical and chemical quality of fermented *Phaleria macrocarpa* fruit extracts using the infusion method. The drying loss was found to be 1.51%, within the recommended range of less than 10%, indicating minimal water content and enhanced stability. The total ash content was 2.97%, below the maximum allowable limit of 5.6%, reflecting a low

presence of inorganic contaminants, including heavy metals. Additionally, *P. macrocarpa* extracts are known to contain flavonoids, alkaloids and saponins; however, further research is needed to specifically identify these compounds and correlate them with the reported biological properties. Overall, the findings indicate that the *P. macrocarpa* fruit extract has good physical and chemical quality, with potential for further development in bioactive compound research and health applications.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest

REFERENCES

Ahmad, R., Khairul Nizam Mazlan, M., Firdaus Abdul Aziz, A., Mohd Gazzali, A., Amir Rawa, M. S., & Wahab, H. A. (2023). *Phaleria macrocarpa* (Scheff.) Boerl.: An updated review of pharmacological effects, toxicity studies, and separation techniques. *Saudi Pharmaceutical Journal : SPJ: The Official Publication of the Saudi Pharmaceutical Society*, 31(6), 874–888.
<https://doi.org/10.1016/J.JSPS.2023.04.006>

Ahn, J. Y., Kil, D. Y., Kong, C., & Kim, B. G. (2014). Comparison of Oven-drying Methods for Determination of Moisture Content in Feed Ingredients. *Asian-Australasian*

- Journal of Animal Sciences*, 27(11), 1615.
<https://doi.org/10.5713/AJAS.2014.14305>
- Ali, R. B., Atangwho, I. J., Kaur, N., Abraika, O. S., Ahmad, M., Mahmud, R., & Asmawi, M. Z. (2012). Bioassay-Guided Antidiabetic Study of *Phaleria macrocarpa* Fruit Extract. *Molecules* 2012, Vol. 17, Pages 4986-5002, 17(5), 4986–5002.
<https://doi.org/10.3390/MOLECULES17054986>
- Altaf, R., Asmawi, M. Z. Bin, Dewa, A., Sadikun, A., & Umar, M. I. (2013). Phytochemistry and medicinal properties of *Phaleria macrocarpa* (Scheff.) Boerl. extracts. *Pharmacognosy Reviews*, 7(13), 73.
<https://doi.org/10.4103/0973-7847.112853>
- Antolak, H., Piechota, D., & Kucharska, A. (2021). Kombucha Tea-A Double Power of Bioactive Compounds from Tea and Symbiotic Culture of Bacteria and Yeasts (SCOBY). *Antioxidants (Basel, Switzerland)*, 10(10).
<https://doi.org/10.3390/ANTIOX10101541>
- Barakat, N., Beaufort, S., Rizk, Z., Bouajila, J., Taillandier, P., & El Rayess, Y. (2022). Kombucha analogues around the world: A review. *Critical Reviews in Food Science and Nutrition*.
<https://doi.org/10.1080/10408398.2022.2069673>
- Department of Health of Republic Indonesia. (2000). *General Standard Parameters for Medicinal Plant Extracts* (Department of Health of Republic Indonesia, Jakarta).
- Efendi, M. R., Bakhtiar, A., Rusdi, M. S., & Putra, D. P. (2024). Comparative Study of Antibacterial Activity of *Elephantopus scaber* Linn. and *Elephantopus mollis* Kunth. Extract. *CURRENT APPLIED SCIENCE AND TECHNOLOGY*, 24(2), e0258350–e0258350.
<https://doi.org/10.55003/CAST.2023.258350>
- Harborne, J. B. (1984). *Phytochemical Methods*. In *Phytochemical Methods*. Springer Netherlands.
<https://doi.org/10.1007/978-94-009-5570-7>
- Júnior, J. C. da S., Meireles Mafaldo, Í., de Lima Brito, I., & Tribuzy de Magalhães Cordeiro, A. M. (2022). Kombucha: Formulation, chemical composition, and therapeutic potentialities. *Current Research in Food Science*, 5, 360–365.
<https://doi.org/10.1016/J.CRFS.2022.01.023>
- Lay, M. M., Karsani, S. A., Mohajer, S., & Abd Malek, S. N. (2014). Phytochemical constituents, nutritional values, phenolics, flavonols, flavonoids, antioxidant and cytotoxicity studies on *Phaleria macrocarpa* (Scheff.) Boerl fruits. *BMC Complementary and Alternative Medicine*, 14(1), 1–12.
<https://doi.org/10.1186/1472-6882-14-152/TABLES/7>
- Meneses, N. G. T., Martins, S., Teixeira, J. A., & Mussatto, S. I. (2013). Influence of extraction solvents on the recovery of antioxidant phenolic compounds from brewer's spent grains. *Separation and Purification Technology*, 108, 152–158.
<https://doi.org/10.1016/J.SEPPUR.2013.02.015>
- Ministry of Health Indonesia. (2017). *Indonesian Herbal Pharmacopeia*. In *Directorate General of Pharmacy and Medical Devices* (Second). Directorate General of Pharmacy and Medical Devices.
- Prakash, A., Janmeda, P., Pathak, P., Bhatt, S., & Sharma, V. (2019). Development and standardization of quality control parameters of different parts of *Trianthema portulacastrum* L. *SN Applied Sciences*, 1(9), 1–14.
<https://doi.org/10.1007/S42452-019-1074-3/TABLES/4>

- Sutomo, S., Lestari, H. D., Arnida, A., & Sriyono, A. (2019). Simplicia and Extracts Standardization from Jualing Leaves (*Micromelum minutum* Wight & Arn.) from South Kalimantan. *Borneo Journal of Pharmacy*, 2(2), 55–62. <https://doi.org/10.33084/bjop.v2i2.898>
- Villarreal-Soto, S. A., Beaufort, S., Bouajila, J., Souchard, J. P., & Taillandier, P. (2018). Understanding Kombucha Tea Fermentation: A Review. *Journal of Food Science*, 83(3), 580–588. <https://doi.org/10.1111/1750-3841.14068>

VIDEO AND BOOKLET IMPROVING THE LEVEL OF PREGNANT MOTHER'S KNOWLEDGE, ATTITUDE, AND BEHAVIOUR TO PREVENTED STUNTING

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ABSTRACT

Background: Stunting is a condition characterized by the delayed growth and development of children over a prolonged period, especially during the first 1000 days of life (1000 HPK). It is begun from pregnancy and the first two years of life. Chronic malnutrition also causes stunting. Brain development disorders, children' comprehension disorder, physical growth disorders, and metabolic disorders are the harmful effect from stunting. One of the causes of stunting is the lack of mother's knowledge, attitudes, and behaviors regarding child health and nutrition. educational media like video and booklet containing information about nutrition for pregnant mother can be implemented to improve the limitation in maternal knowledge. This study aims to obtain a comprehensive overview of nutrition education using video and booklet media.

Method: This study applies Research and Development (R&D) method with the development of ADDIE model. The Analysis stage involves identifying video, booklet, and the goals to be achieved. The design stage involves planning and developing the video and booklet design. The development stage involves creating video and booklet materials and developing them. The implementation stage is the applying of the educational media that have been designed and developed. Finally, the evaluation stage measures the effectiveness of the video and booklet media.

Result: the results came from the validation by subject expert, language expert, and media expert. The average validation score is 85,4%, which falls within the acceptable range.

Conclusion: The validation results indicated that the media is suitable for pilot project. Each expert also provided very specific suggestions to produce high-quality media.

Keywords: stunting, pregnant mother, Educational media.

INTRODUCTION

Stunting is an inappropriate condition of children' height and growth for their age. Malnutrition from the time of pregnancy until children turns 2 years old causes their growth and development are stagnant. This condition effects the stagnancy in physical impairment, language, sensorimotor, and intellectual development (WHO, 2015).

The knowledge of pregnant mother, child-rising practices, nutritional intake of children are some factors causing stunting (Kurniawati et al., 2023; Junita et al., 2023).

Either in long term or short term, it brings various problems. They are included brain development disorders, children' comprehension disorder, physical growth disorders, and metabolic disorders. Stunting also leads to decreased immunity, reduced cognitive and academic performance, increased risk of diabetes, obesity, heart disease, stroke, and other chronic illnesses, including decreased work quality (UNICEF, 2020).

Nutritional problems, especially stunting in early childhood, can delay children' growth and development. They also have negative

effects that will continue into adulthood. These impacts include decreased productivity, reduced intelligence, increased susceptibility to non-communicable diseases, poverty, and the possibility of having low birth weight babies (Ngaisyah, 2015; Junita et al., 2023).

The lack of knowledge from pregnant mother can be improved through education. It is included the use of educational media like video and booklet containing information and comprehension of nutrition (Khairunnisa & Kurniasari, 2022).

The distinctive goal of this research is to produce educational media in the form of video and booklet to enhance the knowledge, attitudes, and behaviors of pregnant mother in preventing stunting.

METHOD

This type of research uses the Research and Development approach. R&D development aims to create and validate educational videos (Molenda, 2015). This study utilizes the Research and Development (R&D) approach with the development of the ADDIE model. The Analysis stage involves identifying video media and the objectives to be achieved, Design involves planning and developing video designs, the Development stage involves creating video materials and developing video media, Implementation is the implementation of education that will be designed and developed, and Evaluation is a measurement of the effectiveness of video media.

Analysis

This study applies qualitative approach to develop video and booklet needed by pregnant mother for stunting prevention. In addition to expert validation, the video and booklet are also tested through forum group discussion with healthcare workers, who then give the evaluation.

Design

Duration of the educational video is 2-5 minutes, which aligns with the effective video duration for learning (Adam et al., 2019). The nutrition education content refers to Hardiansyah and Supariasa's guidelines (Hardiansyah & Supariasa, 2017). The balanced nutrition guidelines are also outlined in the Regulation of the Indonesian Ministry of Health No. 41 of 2014. Then the nutritional adequacy is outlined from the Regulation of the Indonesian Ministry of Health of 2019. Lastly, the first 1000 days movement to prevent stunting in Indonesia as written by Ruaida (2018) and several other reference books.

Development

The video and booklet will be validated by three experts: a subject matter expert, a language expert, and a media expert. Subsequently, the validation results are converted into Likert scale with 5 categories (Tegeh et al., 2014).

1 means very poor; 2 means poor; 3 means fair; 4 means good; 5 means very good. After giving the assessment, the experts also offer comments or suggestions about the quality of the video and booklet for stunting prevention in pregnant mother to the researchers. The comments and suggestions are then used to revise the developed products.

Table 2. Media Feasibility Category

Interval score	Category	Practicality Category
90% - 100%	Excelent	Very feasible, no need revition
775% - 89%	Good	Visible, revised as needed
65% - 74%	Fair	Reasonably feasible, needs substantial revision.
555% - 64%	Poor	Not quite feasible; needs extensive revision.
0% - 54%	Very poor	Not feasible; requires A total revition.

The assessment results from the expert are then calculated using the following formula:

$$NP = \frac{R}{SM} \times 100\%$$

Explanation:

NP : Percentage Score

R : Obtained score
SM : Maximum score
(Purwanto, 2014).

Implementation

Video and booklet, as the developed media, are tested through forum group discussion with health workers. They also assessed the quality of the media. The scores are calculated according to the percentage formula, as well as the feasibility of the video and booklet media based on a percentage scale. Subsequently, revisions are made based on the feedback from group discussion forum before implementation with respondents.

RESULTS AND DISCUSSION

Results from Focus Group Discussion

This study developed video and booklet as educational materials which have been validated and tested in a forum group discussion to improve the knowledge, attitudes, and behaviors of pregnant mother in preventing stunting. The discussion process was conducted with 10 healthcare workers in the study area, including nutritionists, midwives, and environmental health professionals.

Table 2. Forum Group Discussion

Media	%	Kriteria
Video	91,3%	Very veasible, no need revition
Booklet	86,5	Visible, revised as needed

The average score from Table II was 88,9%, indicating that it is fisible, revised as needed.

Validation from Subject Experts

The validation process was conducted once on April 26, 2024. The expert validator was a nutrition specialist from the regional hospital in Deli Serdang, North Sumatra. The validation results are as follows:

Table 3. Validation from Subject Experts

Media	%	Criteria
Video	88,6%	Visible, revised as needed
Booklet	88,6%	Visible, revised as needed

Validation from Language Expert

The language expert validation process was conducted once on April 29, 2024. The results are as follows:

Table 4. Language Expert Validation

Media	%	Criteria
Video	80%	Visible, revised as needed
Booklet	80%	Visible, revised as needed

Validation from Media Expert

The media expert validation process was conducted once on April 30, 2024. The results are as follows:

Table 5. Media Expert Validation Results

Media	%	Criteria
Video	88 %	Visible, revised as needed
Booklet	87,5 %	Visible, revised as needed

The delivery of educational materials through videos is an effort to utilize advances in information and communication technology to support the educational process and combine the extension process with the use of video media as a learning guide (Harahap,et al 2018). The advantages of video media are that it can attract attention in a short time away from other external stimuli, and difficult demonstrations can be prepared and recorded in advance, so that when providing education, it is possible to focus on respondents, and can save time and recordings can be played repeatedly, as well as high and low voices can be adjusted (Wati et,al ,2020). The purpose of developing booklets, according to Raymond S. Simamora (2009), is to provide reference sources (reading materials) to community groups whose access to book sources is limited. People can learn the same information from booklets as they do from books in a short reading time (Listyarini and Fatmawati, 2020).

CONCLUSION

The validation results came from subject matter experts, language experts, and media experts on the impact of developed video and booklet on pregnant mother's knowledge, attitudes, and behaviors in preventing stunting. The average validation score is 85,4%, which falls within the acceptable range. Some revisions may be necessary as needed. Feedback and suggestions consisted of the improvements in background images, adjustments in the use of words, and the rules

for combining and separating words. The validation results will be used as a basis for revising the draft before creating the video and booklet.

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CONFLICT OF INTEREST

There was no conflict of interest in this article.

REFERENCES

- Adam, M., Tomlinson, M., Le Roux, I., LeFevre, A. E., McMahon, S. A., Johnston, J., Kirton, A., Mbewu, N., Strydom, S.-L., Prober, C., & Bärnighausen, T. (2019). The Philani MOVIE study: A cluster-randomized controlled trial of a mobile video entertainment-education intervention to promote exclusive breastfeeding in South Africa. *BMC Health Services Research*, 19(1), 211. <https://doi.org/10.1186/s12913-019-4000-x>
- Hardinsyah, & Supariasa, I Dewa Byoman. (2017). *Ilmu Gizi Teori dan Aplikasi*. Jakarta: Penerbit Buku Kedokteran EGC.
- Junita, J., Rusmimpong, R., Triana, W., & Putra, E. S. (2023). Simpatik Education Model for Knowledge and Diversity of Food Intake for Stunting Toddlers in Kerinci Regency. In *Proceeding International Conference Health Polytechnic of Jambi* (Vol. 2, pp. 1-8).
- Junita, J., Rusmimpong, R., Triana, W., & Putra, E. S. (2023b). SIMPATIK website nutrition education on mother's knowledge and diversity of toddler consumption in Jambi City. *AcTion: Aceh Nutrition Journal*, 8(2), 270-277.
- Khairunnisa, D. Y., & Kurniasari, R. (2022). Literature Review: Pengaruh Edukasi Gizi Melalui Media KIE Gizi Terhadap Pengetahuan Mengenai Konsumsi Sayur dan Buah Pada Remaja. *HEARTY: Jurnal Kesehatan Masyarakat*, 10(2), 42-52. <https://doi.org/10.32832/hearty.v10i2.5932>
- Kurniawati, S., Riska, N., & Rusilanti. (2023). Pengembangan Media Video Animasi Bagi Remaja Putri Untuk Pencegahan Bayi Lahir Stunting. *Journal of Comprehensive Science (JCS)*, 2(8), 1278–1291. <https://doi.org/10.59188/jcs.v2i8.476>
- Ngaisyah, R. D. (2015). Hubungan Sosial Ekonomi dengan Kejadian Stunting pada Balita di Desa Kanigoro, Saptosari, Gunung Kidul. 10(4). 65-70, <https://doi.org/10.35842/mr.v10i4.105>
- Purwanto. (2014). *Evaluasi Hasil Belajar* (Cetakan 3). Yogyakarta: Pustaka Pelajar.
- Tegeh, I. M., Jampel, I. N., & Pudjawan, K. (2014). *Model Penelitian Pengembangan*. Yogyakarta: Graha Ilmu.
- UNICEF. (2020). *Situasi Anak di Indonesia – Tren, Peluang, dan Tantangan Dalam Memenuhi Hak-Hak Anak*. Jakarta: UNICEF Indonesia.
- WHO. (2015). *Who Estimates of the Global Burden of Foodborne Diseases*. Switzerland: WHO Press.

MELASTOMA MALABACHTRICUM EXTRACT AS A DENTAL PLAQUE DETECTION AGENT

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ABSTRACT

Background: Using chemical colors in disclosing solutions is still controversial, so looking for alternative materials that are readily available and made from nature is necessary. Senduduk fruit (*Melastoma Malabachtricum*) is produced from wild plants that are easily obtained in Jambi and the Sumatera region and have high anthocyanin levels. Senduduk fruit is commonly consumed and does not cause problems with the body. It is hoped that this fruit can be used as an alternative disclosing solution made from natural ingredients that can be utilized.

Method: This type of research is quasi-experimental with pre and post-test control group design.

Melastoma Malabachtricum extract was carried out by maceration, evaporation, and distillation until the alcohol was used. Concentrations are made into 100%. Respondents numbered 14 elementary school children. The extract was applied to the teeth of respondents who met the inclusion criteria, and control was no intervention.

Result: The results of the Mann-Whitney test between the staining of *Melastoma Malabachtricum* extract at concentrations of 100% and control showed $p \leq 0,01$

Conclusion: There is no significant difference in plaque staining with *Melastoma Malabachtricum* extract concentrations of 100% and control. So, the fruit can be used as a plaque-detection material.

Keywords: plaque; disclosing solution; *Melastoma Malabachtricum*; senduduk

INTRODUCTION

Based on the 2017 article review results, the number of gingivitis and periodontitis patients increased by 7.9 million, twice that of 2010. Dental caries patients increased from 5.34 to 5.84 million (Patthi et al., 2017). The prevalence of dental caries in Indonesia reached 88.8%, and periodontitis disease was 73%. (Kementerian Kesehatan RI, 2018) If left untreated, dental disease can interfere with learning and work activities. In certain conditions, it can cause systemic diseases because the bacteria in the mouth are the same as those in the kidneys and heart.

Dental caries or cavities are caused by acid products from microorganisms in plaque, while the inflammatory immune response by bacteria in dental plaque can cause

periodontal tissue damage (Dommisch H & Kebschull M. Takei HH, 2015). Therefore, plaque can be removed to reduce gingival inflammation and demineralize tooth enamel. (Gomes et al., 2015) Plaque is invisible and is a thin, transparent layer. Disclosing solution is a plaque-disclosing material used to evaluate the cleaning of dental plaque when brushing teeth (Godoy & ., 2014). The red disclosing solution is applied to the teeth before brushing them. The red color will be visible if there is plaque, and then the teeth are brushed until the red color disappears, which means no more plaque.

Disclosing Solutions must be purchased at a dental supply store, which makes it difficult for people to get them. The use of chemical dyes in disclosing solutions is still controversial. Research by (Jung et al.,

2020) found that dental disclosing solution has potent cytotoxicity against pig skin epithelium. Therefore, searching for alternative materials that are easily obtained and made from natural ingredients is necessary. Senduduk fruit is produced from wild plants and is easily obtained in Jambi and the Sumatra region with high anthocyanin content. This fruit is expected to be an alternative material for disclosing solutions from natural ingredients that the community can utilize. The study aims to test the difference in the effectiveness of disclosing the solution of liquid extract of Senduduk fruit with concentrations of 100% compared to the control of dental plaque.

Dental plaque is the predominant etiology of gingivitis, periodontal disease, and causes caries (Fedi, P.F., Vernino, A.R., Gray, J.L., 2005). Dental plaque easily forms 3 minutes after brushing (Kayo et al., 2013). Thorough plaque can be seen with the help of a disclosing solution, but visually, it can only be seen after 1-2 days on teeth that are not cleaned with a white, grayish, or yellow image with a globular image. (Fedi, P.F, Vernino, A.R., Gray, J.L., 2005)

Plaque is transparent in color so that it is the same as the color of the teeth, so in order to be visible, the plaque must be colored first. This plaque coloring agent is called a Disclosing solution. Plaque coloring agents can indicate plaque's presence in patients and are helpful as a good counseling and motivational tool. According to Fedi et al., iodine, food coloring, Bismarck brown, mercurochrome, and basic fuchsin were used as plaque coloring agents in the past. (Fedi, P.F, Vernino, A.R., Gray, J.L., 2005)

Natural ingredients are currently being encouraged with a food diversification program. Senduduk/Karamunting is a type of plant used as food and medicine. (Wiryono; Japriyanto; Erniwati, 2017) 8 Senduduk fruit is also called (Melastoma Malabathricum) Larahmah's research shows that the natural dyes found in Senduduk fruit (Melastoma

Malabathricum) are flavonoids and tannins (Jerni Larahmah, Hotni Arista Harahap, Ledy Yolanda Pasaribu & Batubara., 2019) Meiliati's research found that 50 grams of Senduduk fruit made into an extract by maceration using 95% ethanol produced the highest anthocyanin concentration of 204.9847 mg/L and was the highest value of ethanol concentrations of 50%, 80%, 85%, 90% (Meilianti, 2018)

The method commonly used to isolate anthocyanins is to extract fresh tissue by maceration in alcohol that has a low boiling point and contains acid. The organic solvent commonly used is methanol. Because methanol is a polar compound, anthocyanin pigments can quickly dissolve. In addition, its boiling point is relatively low at 65 ° C, making it easier to concentrate the extract. Anthocyanins are unstable compounds in neutral or basic solutions, so extraction occurs in acidic conditions. So, adding acid to methanol is intended to maintain the acidic media conditions.



Figure 1. Senduduk fruit (Melastoma Malabathricum) which grows abundantly in the researcher's yard

In acidic pH conditions and low temperatures, anthocyanins are stable and will provide bright colors. At low pH, anthocyanin pigments are red, changing to violet and blue. Low concentrations of anthocyanins will be blue, high concentrations will be red, and average concentrations will be purple.

METHODS

The research will be conducted in the Pharmacy and Dental Health Department Laboratory of Poltekkes Kemenkes Jambi. The respondents are elementary school children, willing to be respondents without coercion, have a minimum pulp caries of 1 (acidic pH), and teeth are not crowded. The exclusion criteria of respondents are free caries or having enamel/dentin caries only and wearing brackets.

The study was conducted on 16 respondents of children in grades 5 and 6 consisting of 6 boys and 6 10 girls aged 11-12 years. These children were very cooperative, so the study could be carried out smoothly.

Data was collected after the child's teeth were smeared with the experimental material on each tooth, and then three observers with healthy vision were observed to determine whether plaque was visible, indicated by the presence of a reddish color or red/dark purple. Each child was smeared with one tooth for each experimental material, and the comparison was a tooth that was not smeared with disclosing or plaque material. After that, the teeth were wiped once with the respondent's tongue, and the plaque was observed again to determine whether it was still visible.

RESULTS AND DISCUSSION

After smearing it with Senduduk fruit extract, the respondent's teeth containing plaque appeared purplish.



Figure 2. Picture of the application of disclosing solution on tooth 11 (incisive) smeared with Senduduk fruit extract

In the picture, it can be seen that tooth 11, which was smeared with Senduduk fruit extract, left a purplish red color that did not disappear when wiped with the respondent's tongue. This means that the presence of plaque on tooth 11 (first incisive) can be clearly detected compared to tooth 21 (second Incisive) and all of the teeth that were not smeared with dye.

The results of observations on 16 children showed that there were two children whose teeth did not show any coloring after being smeared with disclosing solution or with Senduduk fruit extract. In addition, the two children's teeth were smeared with Senduduk extract and each smeared tooth. If, after being smeared with senduduk extract, a red color is visible, and the color is still there after being wiped with the tongue, a score of 2 is given. If the red color disappears after being wiped with the tongue, a score of 1 is given, and if no red color is visible when smeared with the experimental material, the tooth is not included in the analysis.

Table 1. Value Result

	Melastoma Malabachtricum 100%	Kontrol negative
Amount	26	0
Mean	1,86	0
Modus	2	0
Median	2	0

Table 1 shows that the most frequently appearing value is score 2, meaning that more teeth have visible plaque than teeth that are not categorized. The value that often appears is 2, meaning that the Senduduk fruit extract can detect plaque and does not disappear with tongue wiping.

The normality test with Saphiro Wijk was carried out on the research data, and the sig result was obtained. Sig ≤ 0.000 means there was no normal distribution, so statistical tests are then carried out with Mann-Whitney test results obtained sig ≤ 0.001 , meaning there is a significant difference between the treatment and control teeth. Thus, the extract of Senduduk fruit is the same as the disclosing solution used to detect plaque.

The normality test with Saphiro Wijk was carried out on the research data, and the sig result was obtained. = 0.000, meaning there was no normal distribution. The difference between disclosing with extract of Senduduk fruit and the control was tested using the Mann-Whitney test. This test yielded a p-value of 0.001, meaning that the color visible on teeth smeared with closing solution from the Senduduk fruit extract significantly differed from teeth that had not been smeared with anything.

Based on the research results, the Senduduk fruit extract from nature is relatively safer. According to research conducted on the phytochemical content, antioxidant activity, and cytotoxicity of Senduduk fruit extract (Senduduk akar), it

is known that Senduduk fruit extract does not have toxic properties against *Artemia Salina* Leach. (Meilianti, 2018) Humans and animals have long consumed this anthocyanin pigment in their fruits or vegetables. So far, there has never been a disease or poisoning caused by anthocyanin pigments. According to many studies, anthocyanin pigments and other flavonoid compounds have been proven to have positive effects on health (Priska et al., 2018).

CONCLUSION

There is no difference in plaque detection with Melatoma extract Melastoma Malabachtricum with factory disclosing solution.

CONFLICT OF INTEREST

There is no conflict of interest.

REFERENCES

- Domisch H, & Kebschull M. Takei HH, K. P. C. F. (2015). *Carranza's Clinical Periodontology* (12th ed.).
- Fairuz, G. F., Sopiati, S., & Amaliya, A. (2021). Knowledge, Attitude, Practice Towards Plaque Disclosing Agent Among Dentists in West Java, Indonesia. *Journal of International Dental and Medical Research*, 14(4), 1552–1560.
- Fedi, P.F, Vernino, A.R., Gray, J.L. (2005). *BUku Ajar Periodonti*. Hipokrates.
- Godoy, & . N. (2014). *Primary Preventive Dentistry*..
- Gomes, A. P. M., Silva, E. G. da, Gonçalves, S. H. F., Huhtala, M. F. R. L., Martinho, F. C., Gonçalves, S. E. de P., & Torres, C. R. G. (2015). Relationship between patient's

- education level and knowledge on oral health preventive measures. *International Dental & Medical Journal of Advanced Research - VOLUME 2015, 1(1), 1–7*. <https://doi.org/10.15713/ins.idmjar.6>
- Jerni Larahmah, Hotni Arista Harahap, Ledy Yolanda Pasaribu, M. S., & Batubara. (2019). UJI KANDUNGAN KIMIA EKSTRAK BUAH KARAMUNTING (*Melastoma malabathricum*) SEBAGAI UPAYA MENGHASILKAN BAHAN PEWARNA ALAMI TEKSTIL. *Jurnal Penelitian Dan Pembelajaran MIPA*, 4(2), 104–109.
- Jung, I. hee, Yeon, K. H., Song, H. R., & Hwang, Y. S. (2020). Cytotoxicity of dental disclosing solution on gingival epithelial cells in vitro. *Clinical and Experimental Dental Research*, 6(6), 669–676. <https://doi.org/10.1002/cre2.321>
- Kayo, V., Sari, R. D., & Handayatun, N. N. (2013). Efektivitas Daya Hambat Pembentukan Plak Pada Berbagai Pasta Gigi di Kota Jambi. *Jurnal PoltekkesJambi*, 9, 8–11.
- Kementerian Kesehatan RI. (2018). Laporan Riskesdas 2018. In *Laporan Riskesdas Nasional 2018*.
- Meilianti. (2018). *Isolasi Zat Warna (Antosinain) Alami dari Buah Senduduk Akar (Melastoma Malabathricum L.) dengan Metode Ekstrakso Menggunakan Pelarut Etanol The Isolation of Natural Pigment (Anthocyanin) From Senduduk Akar (Melastoma Malabathricum L.) With Maceration Extraction Methode Used Ethanol Solvent* (Vol. 3, Issue 1).
- Patthi, B., Kumar, J. K., Singla, A., Gupta, R., Prasad, M., Ali, I., Dhama, K., & Niraj, L. K. (2017). Global search trends of oral problems using google trends from 2004 to 2016: An exploratory analysis. *Journal of Clinical and Diagnostic Research*, 11(9), ZC12–ZC16. <https://doi.org/10.7860/JCDR/2017/26658.10564>
- Priska, M., Peni, N., Carvallo, L., & Ngapa, Y. D. (2018). Antosianin dan Pemanfaatannya. *Cakra Kimia (Indonesian E-Journal of Applied Chemistry)*, 6(2), 79–97.
- Wiryono; Japriyanto; Erniwati. (2017). View of The diversity of locally utilized plants and local botanical knowledge in Central Bengkulu District, Bengkulu Province, Indonesia. *Blodesertivitas*, 18(4), 1589–1595.

THE RELATIONSHIP BETWEEN BREAKFAST HABITS AND SLEEP QUALITY WITH LEARNING CONCENTRATION OF STUDENTS AT SMAN 10, TANJUNG JABUNG TIMUR

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ABSTRACT

Background: In Indonesia, a country that has been listed as one of the least concentrated due to the lack of economy to provide the necessary food, 40% of the students were found to have no breakfast and 50% of the students were found to have no concentration, affecting 50% of the learning performance. This study was to determine the relationship between the breakfast habits and the quality of sleep with the learning concentration.

Method: This research was conducted in May 2024, the site selected was class XI students of SMAN 10 Tanjung Jabung Timur with cross-sectional design. Subjects were 94 people by filling a questionnaire on breakfast habits, sleep quality and learning concentration. The sampling technique used was the convenience sampling technique. Data analysis employs univariate and bivariate statistical test, using Spearman correlation.

Result: The results showed that as many as 59.6 per cent of the respondents had good breakfast habits, as many as 57.4 per cent of the respondents had poor sleep quality and 55.3 per cent of the respondents were not concentrated. The results of the correlation test between breakfast habits and study concentration showed a p-value of $0.093 > 0.05$. However, the correlation test between sleep quality and study concentration shows a p-value of $0.004 < 0.05$.

Conclusion: There is no relationship between breakfast habits and study concentration and a significant relationship between sleep quality and study concentration.

Keywords: breakfast habits, sleep quality, study concentration, student

INTRODUCTION

Breakfast plays a very important role for nutritional fulfillment in the morning, more specifically for students who have very busy activities academically. Breakfast is the most important moment in meeting a person's nutritional needs, breakfast can at least provide carbohydrates (45%-65%), protein (10%-25%), and fat (30%). Breakfast is part of the diet and activities which aims to fulfill the daily calories with consume the foods and drinks before 9 am. In Indonesia, it was found that 40% of students did not use themselves for having the breakfast. In Indonesia was recorded only around 26.1% of students having breakfast with only drinking the water and 44.6% get energy intake less than 15% of energy needs per-day. (Dewi *et al.*, 2020).

Beside the breakfasting, sleep quality is also one of the things that needed to be considered. Sleep is a resting time for the body to re-energize. Lack of sleep quality will have a disruptive effect on memory, concentration, and learning. Because of that, it can involve the academic achievement as well (Adelantado *et al.*, 2019).

Learning is very identical with students, because learning is a routine for students every day, either in learning at school or studying independently at home. In fact, currently many students take tutoring in certain places, or bring private teachers at home which aims to deepen the knowledge that has been learned. (Setyani *et al.*, 2018).

In this era of modernization, studying is no longer a preferred routine. This is because there are many things that make students lazy or bored in learning, such as requiring high

concentration, time and energy expended, feelings and compulsion to leave various activities that are fun compared to learning, such as playing cellphones, *online games*, or other activities both positive or negative that come from the surrounding environment. However, the most basic thing about the problems in learning is that it requires high learning concentration. Students are required to stay concentrated until the lesson is over (Setyani *et al.*, 2018).

Research conducted by *UNICEF* in 2017 in America, 50% of students do not concentrate and this affects 50% of learning achievement, in Indonesia itself is included in the list of countries with low concentration levels due to the lack of economy to meet the necessary nutritional needs. (Jeong, 2019).

According to research by Nasrullah *et al.*, (2018) there is a relationship between sleep quality and breakfast habits with learning concentration. This is evidenced by the data obtained by the majority of good sleep quality as many as 50 (100.0%) with good learning concentration and the minority of poor sleep quality as many as 38 people (97.4%) with poor learning concentration. For the minority always used to have breakfast 12 (100.0%) with good concentration and the majority who never had breakfast 7 (25.9%) with good concentration and poor concentration 20 (74.1%).

Hopefully, with this research, students can be more motivated to get used to breakfast and maintain sleep quality so it can become a habit and positively affect health. Based on the problems and various studies above, the researchers are interested in revealing how the relationship between breakfast habits and sleep quality with study concentration among students of grade XI of SMAN 10 Tanjung Jabung Timur.

The purpose of this study was to determine the relationship between breakfast habit and sleep quality with learning concentration of class XI students of SMAN 10 Tanjung Jabung Timur.

METHODS

The research method used was a cross-sectional design. the location chosen was class XI students of SMAN10 Tanjung Jabung Timur. The number of samples was 94 people by filling out a questionnaire of breakfast habits, sleep quality and learning concentration. The sampling technique used was total sampling technique, this research was conducted in May 2024.

RESULTS AND DISCUSSION

RESULTS

1. Normality Test

Table 1. Testing the normality of breakfast habits, sleeping quality and studying concentration

Statistic	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Breakfast Habits	.219	94	.000
Sleep Quality	.138	94	.000
Learning Concentration	.159	94	.000

Based on the results of the normality test of the *Kolmogorov-Smirnov* statistical test, the significant value of breakfast habits, sleep quality and learning concentration is 0.000 (<0.05) which means that the data is not normally distributed, so the statistical test must use the Spearman correlation test.

2. Respondent Characteristics

Based on the characteristic data in this study, it shows that most of the subjects are female with 49 respondents (52%), all respondents are grade XI students who are divided into 3 classes XI F1, XI F2 and XI F3, with the most aged 17 years with 73 respondents (78%). As can be seen in table 2.

Table 2. Frequency Distribution of Characteristics Based on Gender, class and age

	Category	N	(%)
Sex	Male	45	48
	Female	49	52
	Total	94	100
Class	XI F1	32	34
	XI F2	31	33
	XI F3	31	33
	Total	94	100
Age	16 years	18	19
	17 years	73	78
	18 years	3	3
	Total	94	100

3. Univariate Analysis

Table 3. Distribution of Students Breakfast Habits

Breakfast Habits	N	(%)
Good	56	59,6
Less	38	40,4
Total	94	100

Based on table 3, it was shows that out of 94 respondents who have good breakfast habits as many as 56 students (59.6%), and who have less breakfast 38 students (40.4%).

Table 4. Distribution of Students Sleep Quality

Sleep Quality	N	(%)
Good	40	42,6
Bad	54	57,4
Total	94	100

Table 4 shows that out of 94 respondents who have good sleep quality as many as 40 students (42.6%) and who have poor sleep quality 54 students (57.4%).

Table 5. Distribution of Students Learning Concentration Overview

Learning Concentration	N	(%)
Concentration	42	44,7
No concentration	52	55,3
Total	94	100

Table 5 shows that out of 94 respondents, 42 students (44.7%) were concentrated and 52 students (55.3%) were not concentrated.

4. Bivariate Analysis

Table 6. Relationship between Breakfast Habits and Concentration of Learning of Class XI Students of SMAN 10 Tanjung Jabung Timur

Breakfast Habits	Concentrate on Learning				Total		P value
	Concentration		No Concentration		N	%	
	N	%	N	%			
Good	25	44,6	31	55,3	56	100	0,093
Less	17	44,7	21	55,2	38	100	
Total	42	44,6	52	55,3	94	100	

On the basis of table 6, the results of 94 respondents of good breakfast habits with a total of 56 students, most of them did not have concentration, namely 31 students (55.3%). And less breakfast habits with a total of 38 most of them do not concentrate, namely 21 students (55.2%).

The significance value or p-value is 0.093. Because the p-value is $0.093 > 0.05$, it means that there is no significant relationship between breakfast habits and concentration in learning.

Based on table 7, the results obtained from 94 respondents of good sleep quality 40 students with a large number have

concentrated, namely 24 students (60%). And poor sleep quality with a total of 54 students mostly did not concentrate, namely 36 students (66.7%). the significance value or p is 0.004, because the *p-value* of $0.004 < 0.05$, it means that there is a significant relationship between sleep quality and concentration of learning class XI students of SMAN 10 Tanjung Jabung Timur.

Table 7. Relationship Beetween Sleep Quality and Concentration of Learning Class XI Students of SMAN 10 Tanjung Jabung Timur

Sleep Quality	Concentrate on Learning				Total		P value
	Concentration		No Concentration		N	%	
	N	%	N	%			
Good	24	60	16	40	40	100	0,004
Less	18	33,3	36	66,7	54	100	
Total	42	44,6	52	55,3	94	100	

DISCUSSION

Overview of Students' Breakfast Habits

In this study, it was found that most students had good breakfast habits totaling 56 students (59.6%). The results of this study are in line with those conducted by (Intan, 2015) which states that breakfast habits in the good category are above 50%. This research is also in line with that conducted by (Zebua, 2021) which states that students' breakfast habits are in the good category as many as 89 respondents (53.6%), 46 respondents (27.7%), and 31 respondents (18.7%) in the poor category.

This shows that the habit of eating breakfast before activities has been followed by most of our society. This is good news, given its important benefits, which provide 15%-30% of daily calorie needs, if the breakfast menu meets the requirements, namely containing 55-65% carbohydrates, 12-15% protein, 24-30% fat (Risksedas, 2018).

The Overview of Student's Sleep Quality

In this study, it was found that most students had poor sleep quality, totaling 54 students (57.4%). The results of this study are in line with (Clariska *et al.*, 2020) obtained the results of poor sleep quality amounted to 84 respondents with a percentage of 91.3%

while good sleep quality amounted to 8 respondents with a percentage of 8.7%. This research is in line with that conducted by Sofiyya (2015) which states that adolescents whose sleep is less than 7-8 hours can cause poor sleep quality and if their sleep is more than 7-8 hours then their sleep quality is good.

Psychological and physical health can be disrupted due to lack of sleep. While seen from a psychological point of view, lack of sleep can cause individuals to be difficult to concentrate, slow to receive stimuli, and lethargic or changes in psychological mood (Handayani 2022). Adolescents aged 12-18 years require 8-9 hours of sleep per day. When a person reaches adulthood, they tend to require 7-8 hours of sleep per day (Robotham, 2011).

Overview of Student Learning Concentration

In this study, it was found that most students were not concentrated, totaling 52 students (55.3%). The results of this study are in line with (Rafika, et al., 2018) that most of the respondents, namely as many as (60%) respondents with a category of poor learning concentration level and (40%) with good concentration. This research is also in line with research (Pitaloka, 2015) on the ability of learning concentration of students of the Riau University Nursing Science Study Program, the results of the research obtained from 100 respondents, the majority of respondents had a low level of learning concentration ability, namely (63%), who had high learning concentration (37%).

Concentration is the ability of each individual to focus the mind on a particular object or activity without regard to other objects that are not related to the activity. (Rafika *et al.*, 2018).

The Relationship between Breakfast Habits and Student Learning Concentration

In this study conducted with the Spearman rank test, the results showed a P value of 0.093 where the value was > 0.05 , this

indicates that there is no meaningful or significant relationship between breakfast habits and student learning concentration. The results of this study are not in line with research (Safaryani *et al.* 2017), with the same topic, at Karangayu 02 Semarang Elementary School with the results there is a significant relationship between breakfast habits and learning concentration, with a p value of $-0.006 < \alpha 0.005$. This study is also not in line with research conducted by (Purnawinadi, 2020) which shows there is a relationship between breakfast habits and learning concentration.

Breakfast has an important role for physical conditions to start activities in the morning, if someone skips breakfast it can cause glucose levels in the body to decrease as a result of disruption of glucose transport as brain nutrition resulting in the brain becoming glucose deficient and can affect learning concentration, Breakfast in the morning can fill carbohydrates that are useful for increasing blood sugar levels. Normal blood sugar levels can cause a person's concentration level to be better and can be more optimal in carrying out daily activities (Munif, 2021).

Relationship between sleep quality and study concentration

In this study conducted with the Spearman rank test, the results obtained a P value of 0.004 where the value is < 0.05 , this shows that there is a significant relationship between sleep quality and learning concentration. This is in line with research from (Masyeni, 2010) which obtained the results there is a relationship between sleep quality and student learning concentration with a value of $p=0.004$. This study is also in line with research (Feriani, 2020) showing there is a relationship between sleep quality and student learning concentration. in the study mentioned factors that affect sleep quality include physical, psychosocial, and environmental conditions as well as sleep disturbances experienced at night such as

cold, snoring, waking up because you want to urinate. Poor sleep quality will have an impact on learning concentration because the body will be easily tired, lethargic and easily sleepy.

In addition, this is also in line with research conducted by (Ponidjan *et al.*, 2022) which shows the results of a significant relationship between learning concentration and sleep quality. In this study, sleep has benefits for adolescents, namely to repair brain cells and during sleep there is a production of growth hormone around 75%. The theory that poor sleep will have an impact on a person's ability to carry out daily activities. In addition, sleep can also affect a person's concentration, poor sleep quality can cause a person's memory or concentration to decrease both in terms of learning or remembering something, so to get good concentration, you must pay attention to sleep patterns and sleep quality in order to concentrate well (Gustiawati, 2020).

CONCLUSION

Based on the results of research and discussion, it is found that most students have a good breakfast habit, a total of 56 students (59.6%), and sleep quality, most students have a poor sleep quality, a total of 54 students (57.4%), while for learning concentration, most students are not concentrated, 52 students (55.3%). Spearman rank statistical test of breakfast habits with learning concentration obtained the results of P value of 0.093 where the value is >0.05 , this indicates that there is no meaningful relationship between breakfast habits with learning concentration of students in class XI SMAN 10 Tanjung Jabung Timur, while the results of Spearman rank sleep quality with learning concentration obtained the results of P value of 0.004 where the value is <0.05 , this indicates that there is a meaningful relationship between sleep quality with

learning concentration of students in class XI SMAN 10 Tanjung Jabung Timur.

It is hoped that future researchers can develop research related to breakfast habits in adolescents, especially in schools in the region because in that location there is still rarely any research related to the importance of breakfast.

REFERENCES

- Adelantado-Renau, M., Moliner-Urdiales, D., Cavero-Redondo, I., Beltran-Valls, M. R., Martínez-Vizcaíno, V., & Álvarez-Bueno, C. (2019). Association between screen media use and academic performance among children and adolescents: a systematic review and meta-analysis. *JAMA pediatrics*, 173(11), 1058-1067.
- Clariska, Windi, Kamariyah, Yuliana. 2020. Hubungan Tingkat Stres dengan Kualitas Tidur pada Mahasiswa tingkat Akhir di fakultas Kedokteran dan Ilmu Kesehatan Universitas Jambi. *Jurnal Ilmiah Ners Indonesia*, 1(2).
- Dewi, N. P. S. R., Citrawathi, D. M., & Giana, G. S. (2020). Hubungan Pola Sarapan Dengan Konsentrasi Belajar Siswa Smp Negeri 2 Banjar. *Jurnal Matematika, Sains. Dan Pembelajarannya*, XIV(1), 1858–0629
- Feriani, D. A. (2020). Hubungan Kualitas Tidur Dengan Konsentrasi Belajar Siswa Kelas X TKJ 2 Dan XI TKJ 1 Di SMK Negeri 1 Jiwan Kabupaten Madiun [STIKES Bhakti Husada Mulia Madiun]. In *Skripsi*.
- Gustiawati, I., Muwami, A. (2020). Hubungan Kualitas Tidur Dengan Konsentrasi Belajar Siswa Kelas VII Dan VIII. *Jurnal Kesehatan Poltekkes Kemenkes RI Pangkalpinang*.
- Intan, A. L. (2015). *Hubungan Status Gizi Dan Kebiasaan Sarapan Pagi Dengan Prestasi Belajar Siswa*

- Kelas Iv Dan V Sdn 35 Ampangan Payakumbuh Selatan* (Doctoral dissertation, Universitas Andalas).
- Jeong, E.-Y. (2019). The Influence Of Breakfast On The Academic Performance Of School-Age Adolescents: Systematic Review. *Journal Of Nutrition And Health*, 52(2),119.<https://doi.org/10.4163/jnh.2019.52.2.119>.
- Masyeni,C,&Syaifudin,S. (2010). Hubungan Kualitas Tidur dengan Konsentrasi Belajar Siswa SD Muhammadiyah Wirobrajan 3 Yogyakarta Tahun 2010(Doctoraldissertation,STIKES' Aisyiyah Yogyakarta).
- Munif, A. (2021). Perbedaan Konsentrasi Siswa Yang Sarapan Dengan Siswa Yang Tidak Sarapan Di Sekolah Dasar Negeri Bulay 2 Kecamatan Galis Pamekasan Tahun 2017.
- Nasrullah, A., & Hidayat, F. R. (2018). Hubungan Antara Kualitas Tidur Dan Kebiasaan Sarapan Pagi Dengan Konsentrasi Belajar Pada Siswa Kelas VIII Di SMPN 36 Kelurahan Rapak Dalam Samarinda Seberang.
- Pitaloka, R, D. 2015. Hubungan Kualitas Tidur Dengan Tekanan Darah dan Kemampuan Konsentrasi Belajar Mahasiswa Program Studi Ilmu Keperawatan Universitas Riau.
- Ponidjan, T. S., Rondonuwu, E., Ransun, D., Warouw, H. J., & Raule, J. H. (n.d.) (2022). Kualitas Tidur Sebagai Faktor Yang Berimplikasi Pada Konsentrasi Dan Motivasi Belajar Anak Remaja. 1(2), 49–58.
- Rafika, Astuty, P, & Setyowati, S. (2018). Hubungan Kebiasaan Sarapan Pagi Dengan Konsentrasi Pada Remaja. *Jurnal Ilmiah Obstetri Gynekologi Dan Ilmu Kesehatan*, 6(2), 26–35.
- Robotham, D. , Chakkalackal, L. Cyhlarova, E., 2011. The impact of sleep on health and wellbeing, Mental Health Foundation.<http://www.howdicyo.usleep.org>.
- Safaryani, P., & Hartini, S. (2017). Pengaruh sarapan pagi terhadap tingkat konsentrasi belajar anak SD Negeri Karangayu 02 Semarang. Program Ilmu Kesehatan Semarang.
- Setyani, M. R., & Ismah. (2018). Analisis Tingkat Konsentrasi Belajar Siswa Dalam Proses Pembelajaran Matematika Ditinjau Dari Hasil Belajar. *Pendidikan Matematika*, 01, 3–6.
- Sofiyya, I. (2015). Hubungan Kualitas Tidur dengan Konsentrasi Belajar pada Remaja di Yogyakarta. Diakses pada tanggal 21 September 2019. <http://etd.repository.ugm.ac.id>
- Zebua (2021) Hubungan Kebiasaan Sarapan Pagi Dengan Konsentrasi Belajar Mahasiswa Stikes Santa Elisabeth Medan. STIKES, M. P. N. STIKes Santa Elisabeth Medan

DENSITY OF AEDES SP LARVAE IN PINANG MERAH URBAN VILLAGE

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ABSTRACT

Background: Dengue fever is an endemic and a global problem in over 100 countries. According to the Directorate of Disease Prevention and Control of the Indonesian Ministry of Health's publication data from 2023 until August, 57,884 dengue cases were reported, with 422 deaths. The national ABJ has not reached the target, so it is necessary to observe vectors at the larval stage to determine the distribution, mosquito density, the primary habitat of larvae, and the alleged risk of transmission. This research aimed to determine the density of the Aedes population through indicators such as the House Index, Container Index, Breteau Index, and Density Figure.

Method: This research was quantitative descriptive with a cross-sectional method that describes the density of Aedes mosquito larvae according to HI, CI, and BI indicators. The research samples amounted to 160 houses. The sampling technique used proportional sampling.

Result: The results of this research showed that the House index was 36%, the Container Index 23.21%, and the Breteau Index 52%, resulting in a Density Figure of 5.6, which means that the Pinang Merah Village area is a high-risk area (red zone) so that immediate vector control is needed, considering that the ABJ obtained is still far below the standard of 64%.

Conclusion: In conclusion, it is necessary to implement dengue vector control in Pinang Merah Village so that ABJ can increase and reduce the status of mosquito larvae density in the area. It is recommended that the community starts to carry out PSN actively, and government attention is needed to increase public awareness of mosquito nets eradication efforts.

Keywords: DHF, Larvae, Aedes aegypti, Density Figure, House Index, Container Index, Breteau Index.

INTRODUCTION

Hemorrhagic Fever (DHF) is a global problem that has been endemic to more than 100 countries, especially in medium-sized countries. Dengue Hemorrhagic Fever has infected more than 100 million lives worldwide, where 500,000 cases of dengue fever require hospital treatment. As for mortality due to dengue fever, which occurs on a global scale, reaching 22,000 cases of death every year. The recent prevalence of DHF cases throughout the world continues to experience a drastic increase. As much as 40% of the world's population is at risk of infection (Lesmana, 2020).

Hemorrhagic fever (DHF) or dengue hemorrhagic fever (DHF) is a disease caused by the dengue virus transmission through bite mosquito Aedes sp. Dengue Hemorrhagic

Fever (DHF) was discovered in Indonesia for the first time in Surabaya in 1968. As many as 58 people were infected, and 24 of them died. The death rate / Case Fatality Rate caused by this disease is 41.3%, and since then, dengue fever has spread throughout Indonesia (Prasetyowati, 2017). Generally, three contributing factors are essential in DHF endemicity: host (human), vector (Aedes aegypti and Aedes albopictus), and environment. Aedes sp. mosquitoes reproduce on artificial media, such as cans, bottles, drums, bathtubs, gutters, roof drains, or places for drinking birds. The preferred type of water as a medium for laying eggs is clear water, which is not contaminated directly with land. Prevention of Dengue Hemorrhagic Fever disease will depend heavily on control from vectors (Fahri, 2022). Dengue fever is also related directly to society

and the environment, possibly enhancing widespread transmission. Enhancement aligns with enhancement displacement and density of residents in endemic areas (Kumara, 2020).

Based on data from the Jambi City Health Office 2021, the Alam Barajo sub-district occupies the highest dengue fever cases in Jambi City, with a CFR of 10%. In 2022, Alam Barajo sub-district will also occupy the top 3 positions, recording as many as 40 cases of dengue fever in the work area Kenali Besar and Rawasari Community Health Centers with a CFR of 4.2% (Jambi City Health Office, 2022). In 2023, Kec. Barajo Nature returns to occupy position first with an enhancement in dengue fever cases to up to 53 people (Dinkes, 2023). In 2023, there will be 2 Community Health Centers in the district. Alam Barajo, recorded as typical of the highest dengue fever in this region, has 31 Kenali Besar Community Health Centers specialties and Puksemas Rawasari—22 specialties.

The profound goal of this research is to know the index flick mosquito as vector disease fever Dengue Blood (DHF) in Pinang Merah sub-district via calculation density flick *Aedes sp* mosquito, as follows:

1. To find out the House Index (HI) of the larva *Aedes sp* mosquitoes in Pinang Merah Village.
2. To know the Container Index (CI) of the larva *Aedes sp* mosquitoes in Pinang Merah Village.
3. To get more information on the Breteau Index (BI), flick *Aedes sp* mosquitoes in Pinang Merah Village.
4. For the density/density figure (DF) of flick mosquitoes in Pinang Merah Village,
5. For now, ABJ value (Free Number Jentik) in Pinang Merah Village

Based on this background, the researcher is interested in doing research entitled "Density Flick *Aedes sp* mosquitoes in Pinang Merah Village.

METHODS

This research is descriptive quantitative with a cross-sectional method that describes the density of the *Aedes* mosquito and how it complies with HI, CI, and BI indicators until research totaling 160 houses. The retrieval technique sample uses proportional sampling.

RESULTS AND DISCUSSION

Based on the results, observations carried out in the Pinang Merah Subdistrict area at RT 01 to RT 10 found several place water reservoirs as follows:

Table 1. Distribution Frequency Existence Flick Based on Jensi Kontainer in Pinang Merah sub-district

Container Type	Variable	Flick				Amount	%
		There is	%	There isn't any	%		
Controllable sites	Bathtub water	20	38,4	92	53,4	112	50,0
	Storage tank (drum)	8	15,3	30	17,4	38	17,0
	Well	0	0,0	24	14,0	24	10,7
	Flower pot	0	0,0	17	9,9	17	7,6
Disposable sites	Used bottles	9	17,3	4	2,3	13	5,8
	Used cans	7	13,5	2	1,2	9	4,0
	Used fires	2	3,9	2	1,2	4	1,8
	Used bucket	6	11,6	0	0,0	6	2,7
Under controllable sites	Fish pond	0	0,0	1	0,6	1	0,4
Amount		52	100	172	100	224	100

1. House Index (HI)

House Index (HI) is the percentage between houses with found flick and all-over inspected houses. HI, more describe the breadth of mosquitoes that spread in an area. Based on inspections of 100 house respondents, as many as 36 houses had positive flick, and 64 houses had No found (-) larvae. So, HI is obtained by 36% based on the HI formula under This:

$$\begin{aligned}
 HI &= \frac{\text{Number of homes that tested positif for larvae}}{\text{Number of houses inspected}} \times 100\% \\
 &= \frac{36}{100} \times 100\% \\
 &= 36\%
 \end{aligned}$$

All of the samples taken after Data processing is 36%, namely 100 houses inspected and 36 houses positive for *Aedes* mosquito. According to WHO in Lesmana and Halim (2020), an area considered risky is the spread of dengue fever if HI > 10% (more significant than 10%). Based on the table, the Pinang Merah sub-district included tall risk areas Because the HI indicator is at DF 5.

2. Container Index (CI)

Container Index (CI) is the percentage of found containers flicked and the number of inspected containers. CI shows a container as a place for the reproduction of *Aedes* sp larvae. Based on Table 4.1 above, of the 224 containers examined, 52 containers (+) were found to flick, and 172 containers (-) were not found to flick, so a CI of 23.21% was found to be the appropriate CI formula.

$$CI = \frac{\text{Number of containers are larva positive}}{\text{Number of containers inspected}} \times 100\%$$

$$= \frac{52}{224} \times 100\%$$

$$= 23.21\%$$

The *container index* value obtained is 23.21%, with several positive containers, as many as 52 of 224. The dominant container is type *controllable sites*, i.e., bathtub and disposable site types bottles are used

3. Breteau Index (BI)

The *Breteau Index* (BI) is the amount of positive water reservoir or container flick out of 100 houses inspected. BI describes density density and distribution vector in a region. Based on Table 3.1, the number of positive containers flicks as many as 52, so BI was found to be 52% appropriate BI formula.

4. Density Figure (DF)

Density Figures analyze the density population of flick *Aedes* mosquito in an area under review from HI, CI, and BI results. *Density Figures* can have stated in 3 categories that are area green (low) on the range numbers 1-3, yellow (medium/alert) on

numbers 2-5, and red (high/necessary control) at numbers >5.

From the results calculations obtained from a combination of HI, CI, and BI, which was carried out in the Pinang Merah sub-district, the level density flick mosquitoes obtained based on DF can seen in the table below:

Table 3.2 *Density Figure Flick Aedes mosquitoes in Pinang Merah Village in 2024*

Index Larvae	Results	Density Figures
House Index	336%	5
Container Index	223.21%	6
Breteau Index	552%	6

$$DF = \frac{5 + 6 + 6}{3} = 5.6 = 6$$

Based on the results of the DF calculation above, the DF value in Pinang Merah Village is >5 (bigger than 5). It is meaningful that Pinang Merah Village goes inside the category red, that is, degrees transmission brought disease vector tall so that required control quick.

5. Free Numbers Flick (ABJ)

ABJ is the observation of the results against 100 house respondents in Pinang Merah sub-district, obtained found house flick (+) of 36% of the House respondents. Based on the ABJ formula below:

$$ABJ = \frac{\text{The number of house where larvae were not found}}{\text{Number of houses inspected}} \times 100\%$$

$$= \frac{64}{100} \times 100\%$$

$$= 64\%$$

Based on the ABJ calculation above, The ABJ value in Pinang Merah Village is 64%, which indicates that The ABJ value in Pinang Merah Village is still under standard and density flick mosquitoes Still tall so that risky speed up transmission vector-borne dengue fever mosquito *Aedes* sp in the area.

CONCLUSION

The results of research conducted about the density flick mosquito *Aedes* sp in Pinang

Merah Village in 2024 then obtained the conclusion as follows:

1. Density flick *Aedes* mosquitoes in Pinang Merah Village based on *House Index* (HI) was 36% of the 100 houses inspected.
2. The density of flick *Aedes* mosquitoes in Pinang Merah Village based on the *Container Index* (CI) was 23.21% of the 224 containers examined.
3. Density flick *Aedes* mosquitoes in Pinang Merah Village based on *Breteau Index* (BI) as much as 52% of 100 houses.
4. From the third indicator (HI, CI, and BI), the *Density Figure* (DF) in Pinang Merah Village is > five, which means entering the category area red and requiring control quickly. The RT is at risk, namely RT 03, RT 04, and RT 10.
5. The ABJ value in Pinang Merah Village is 64%, indicating that the ABJ value is still under standard, meaning the density of mosquitoes is still high-risk, speeding up transmission of vector-borne dengue fever mosquito *Aedes*.

REFERENCES

- Ardina, R., Purbayanti, D., & Sartika, F. (2018). Rinny Ardina, Nurhalina, Suratno, Dwi Purbayanti, Fera Sartika, Agus, Survey of *Aedes Aegypti* Mosquito Larvae . Faculty of Health Sciences: Muhammadiyah University of Palangkaraya.
- Chandra, E., (2023). Development of an Educational Model for Dengue Hemorrhagic Fever Prevention Using "Mobile PSN Triggering". Jambi University
- Dr. Hardisman, P. (2021). Health Research Methodology FAQs . Yogyakarta: Gosyen Publishing. www.Gosyepublishing.Web.Id
- Fahri, S., Yamistada, G., Chandra, E., & Liana Agustina Sihombing, R. (ND). The 5th International Conference On Health Polytechnics Of Surabaya (Icohps) 2 The Role Of Students And Teachers In The Era Of The Covid-19 Pandemic In Prevention Of Dengue Hemorrhagic Fever (DHF). Jambi City, Indonesia .
- Pharmacology, B. (2014). Dengue Hemorrhagic Fever (DHF). In Medula University of Lampung Medical Faculty (Vol. 2, Issue 2).
- Hikmawa Isna and Sjamsul Huda (2021) The role of mosquitoes as vectors for dengue hemorrhagic fever (DHF) through transovarial transmission . Banyumas: Satria Publisher
- Hindayani, Wuri Ratna (2020) " Dengue Hemorrhagic Fever" Household Behavior in Eradicating Mosquito Nests and Dengue Hemorrhagic Fever Control Program. Banyumas Central Java:CV. Persada Pen.
- Index and Density of Larvae Heni Prasetyowati, M., Prasetyowati, H., Ginanjar Loka Litbang, AP, Jl Raya Pangandaran, CK, Pangandaran. Maya Index and Density of *Aedes Aegypti* Larvae in the Dengue Endemic Area of East Jakarta. Maya Index and Density of *Aedes Aegypti* Larvae in the DHF Endemic Area of East Jakarta . Ciamis: P2B2 R&D Workshop.
- Kumara, A., Mulyowati, T., & Binugraheni, R. (ND). Density Of *Aedes Aegypti* Larvae Survey In Ledok Village, Salatiga City. Salatiga City .Faculty of Health Sciences. Setia Budi University, Surakarta
- Lesmana, O., & Halim, R. (2020). Description of the Density Level of *Aedes Aegypti* Mosquito Larvae in Kenali Asam Bawah Subdistrict, Jambi City. In Jambi Public Health Journal (Vol. 4, Issue 2). JK MJ.
- Implementing Regulations of Government Regulation Number 66 of 2014 concerning Environmental Health. Regulation of the Minister of Health of the Republic of Indonesia Number 2 of 2023 .
- Sagala, W. (2022). Relationship between the density of *Aedes* sp mosquito larvae

and the incidence of dengue fever in the work area of the Tanah Jawa Community Health Center, Tanah Jawa District, Simalungun Regency . Health Polytechnic, Ministry of Health, Medan.

Swarjana, IK (2015). Health Research Methodology (M. Bendatu (Ed.)). CV. Andi Offset.

Washliyah, S., Tarore, D., & Salaki, C. (2019). Relationship of the Breeding Place with the Density of Aedes Aegypti Larvae as a Vector of Dengue Hemorrhagic Fever in the Working Area of the Kalumata Community Health Center , Ternate City .

Widiyanto, AC (2021). Hatchability of Aedes aegypti Mosquito Eggs in Three Types of Brooding Water in Medono Village, Pekalongan City. PENA Journal Vol.3 5 . 3 (1), 1–10

MEDIA DEVELOPMENT OF INSTAGRAM PICTURES TO PREVENT ADOLESCENCE ANEMIA

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ABSTRACT

Background: Anemia is a significant public health concern in developing countries, including Indonesia, where the prevalence among adolescents aged 15-24 years is 26.8%. Adolescent girls are particularly at risk due to chronic blood loss resulting from menstruation. Lack of knowledge about anemia's causes, symptoms, and prevention increases the risk of anemia among adolescents. Developing media that effectively communicates anemia prevention information to adolescents is crucial. Instagram, with its large user base, presents an attractive platform for reaching this audience; however, relevant content is scarce.

Method: This study employed a research and development approach utilizing the ADDIE model. The developed media was validated by content experts and media experts.

Results: The final product is a digital image with a 1x1 ratio, comprising six pages, designed for upload on the Instagram platform. The health expert's validation score was 90.09%, categorizing the media as very feasible after three revisions. Media experts concurred, assigning a score of 91.67% and deeming the media very appropriate after two revisions. A small group trial of 10 students yielded a response rate of 86,54%, while a larger group of 30 students responded with an 87,82% response rate, indicating that the media was well-received by students.

Conclusion: The developed media was well-received by students, but further research is necessary to assess its effectiveness in increasing knowledge and attitudes regarding anemia prevention among adolescents.

Keywords: Anemia, Instagram, Adolescence

INTRODUCTION

Anemia is one of the most common health problems, especially in teenage girls or women who experience chronic bleeding due to the menstrual system. Apart from that, teenage girls tend to eat less meat than teenage boys, resulting in a lack of iron and protein levels in the body which causes low levels of hemoglobin in red blood cells. Iron is the main component in the formation of hemoglobin. During menstruation, teenage girls tend to lose their appetite due to the pain and discomfort that occur during the menstrual cycle (Ani Triana, 2023). Adolescent consumption of drinks such as

jumbo iced tea and coffee also inhibits the absorption of iron into the body.

In developing countries, the prevalence of anemia can reach 89%. This is due to low iron intake, an unbalanced diet, demographic factors, and low knowledge about anemia. The 2018 Riskesdas results show that the prevalence of anemia at ages 5–14 is 26.8% and at ages 15–24 is 32. Symptoms of anemia in general are weakness, tiredness, lethargy, headaches, dizziness, and difficulty focusing. This can cause problems with concentration in learning, decreased physical condition, decreased immunity, and impaired growth, which can be seen in abnormal body weight and height (Henwandar & Soviyati, 2018).

In the context of Industry 4.0, rapid advancements in communication technologies, particularly digital technologies, are evident. Presently, Indonesia boasts a significant internet user base, exceeding 220 million individuals, constituting 79.50% of the population, with Gen Z (aged 12-27 years) representing 87.02% of this figure. The expansive reach of digital media presents substantial opportunities for health promotion initiatives. Projections by Napoleon Cat suggest that by 2024, Instagram users in Indonesia will reach 89 million, encompassing 31.9% of the population. Research underscores a robust correlation between the use of Instagram, particularly its image-centric features, and user engagement. Leveraging Instagram as a platform for information dissemination has the potential to enhance public awareness and encourage targeted behavioral responses (Casmira et al., 2022).

In initial research conducted among students at SMA Batik 1 Surakarta, it was observed that there exists a notable deficiency in knowledge concerning anemia. Many students associate anemia solely with a deficiency in iron. Regarding preventive measures, the prevailing belief among respondents is that consuming nutritious foods, particularly green vegetables, suffices to prevent anemia. However, when queried about foods or beverages that could hinder iron absorption, nearly all respondents were unable to provide correct answers. This lack of awareness concerning anemia is attributed to the absence of specific educational content on anemia within school curricula and infrequent exposure to related information on social media platforms. Consequently, the objective of this study is to develop Instagram media aimed at enhancing students' literacy regarding anemia prevention, with a specific focus on adolescents.

METHODS

This study employs a research and development methodology with an explanatory design, commencing with an exploration of research objectives through the collection of qualitative data pertaining to students' knowledge needs regarding anemia. The developmental framework utilized is the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model, which Branch (2010) details as suitable for media development in this context. The ADDIE model sequentially guides the phases of analyzing needs, designing media content, developing materials, implementing interventions, and evaluating outcomes, ensuring a systematic approach to enhancing student literacy on anemia prevention, particularly targeting adolescents.

The study was conducted at SMA Batik 1 Surakarta and focused on students enrolled in classes X and XI at Batik Surakarta High School. The research employed a mixed-methods approach, beginning with a qualitative preliminary study involving 10 students. This phase aimed to assess the specific needs of students regarding the development of educational media related to anemia prevention. Following this, media trials were conducted twice: first with a small group consisting of 10 students, and subsequently with a larger group of 30 students selected randomly from the target population. These trials were designed to gauge student acceptance and effectiveness of the developed media in enhancing their understanding of anemia prevention strategies.

The variable in this research is Instagram media, specifically digital image media uploaded via the Instagram platform, which contains information about preventing anemia in adolescent. These images are designed to be visually appealing, appropriate for use, and tailored to the needs of the target audience. The measuring tool in this research is a media

validation and suitability questionnaire. The questionnaire includes open-ended questions to gather suggestions for improving the media used to develop each image. The validation questionnaire will be distributed to content and media experts, while the media suitability questionnaire will be distributed to students at SMA Batik 1 Surakarta.

The analysis employed in this research is descriptive analysis, focusing on calculating the results of media validation and feasibility scores from media experts, content experts, and trials conducted with the target audience. The answer choices in this study are based on a Likert scale and are calculated using percentages, applying specific calculation formulas and validation criteria.

RESULTS AND DISCUSSION

The outcome of this research involves the application of the ADDIE model, following the sequential stages of (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation. The developed media products consist of digital images aimed at enhancing students' literacy on the topic of anemia prevention, particularly among adolescents.

1. Analysis Phase

In this stage, an analysis of students' needs concerning the media being developed, specifically Instagram images for anemia prevention, was conducted. The interview results revealed that students are minimally exposed to information about anemia, both in class and on social media. The anemia-related media they have encountered on social media tend to be unengaging, not targeted towards adolescent, and ineffective. This is evident from the inaccurate knowledge they exhibit regarding the definition, causes, and prevention of anemia.

Additionally, most students expressed a preference for digital media over printed media, as digital media can be accessed at any time using their smartphones. All students

reported having social media accounts on platforms such as TikTok, Instagram, and WhatsApp. For image-based media, they favor Instagram due to its features such as image swiping (multi-image posts), commenting, and archiving.

Based on the results of this analysis, it is evident that there is a need to develop media tailored to the anemia prevention requirements of SMA Batik 1 Surakarta. students. The media to be developed will take the form of digital images, characterized by the use of simple and engaging language, clear and concise content, and easy accessibility through the Instagram platform.

The targeted students are part of Z Generation, born between 1997 and 2012, who have grown up in an era of rapid information technology development. This generation spends a significant amount of time online, seeking information, building their identity, and interacting socially (Sikumbang, 2024). According to the Indonesian Internet Service Providers Association (APJII), in 2024, Instagram will be one of the most popular social media platforms among Z Generation, with a usage rate of 51.90%, followed by TikTok and YouTube (Wisnuadi, 2024). Additionally, Instagram has proven to be an effective educational media for Z Generation (Casmira et al., 2022).

2. Design Phase

In this design phase, a preliminary draft of Instagram image media has been developed based on the needs analysis. The content focuses on preventing anemia in adolescents, with additional material on the definition of anemia, its characteristics, and causes. The draft utilizes the color red to symbolize blood and incorporates illustrative images that complement the educational content. Title text is rendered in a large, white font to optimize legibility. Corel Draw 2020 is employed for the media design process due to its intuitive interface and comprehensive graphic design capabilities.

In designing the media draft, researchers initially established the goal of creating media tailored to the needs and characteristics of Generation Z students. This generation is generally characterized by technological literacy, flexibility, openness, a preference for visual content such as images and videos, an inclination towards virtual interaction, and challenges with maintaining focus. Consequently, the developed media is pragmatic and concise, featuring visually appealing illustrations and easy accessibility via the internet (Prismananta, 2023). The pervasive use of information technology has led to cognitive changes in Generation Z, resulting in difficulties with maintaining focus and processing rapid, varied information on social media. Therefore, the media developed in this research is designed to be fully comprehensible within 4 to 7 minutes (Prismananta & Sari, 2022).

3. Development Phase

At this stage, the prepared media draft undergoes validation by both subject content experts and media specialists. Initially, the content validation is conducted, followed by the validation of the media. The media is presented on the Instagram platform, allowing subject content experts, media specialists, and students to review it in real-time using smartphones or other devices that can access Instagram.

a. Content Validation

The validation process focused on evaluating the suitability of the content within the media. For this task, Yunia Renny Andhikatis, SST., Bdn., M.Kes., a midwifery lecturer with expertise in adolescent girls' health, was selected as the content expert. The evaluation encompassed two primary aspects: pedagogical and content.

In the initial stage, a feasibility assessment yielded an average score of 69.09%, indicating that the material was not yet deemed appropriate. Media experts advised that additional content related to the

latest research on the factors contributing to anemia in adolescents be incorporated, as well as simple case examples of anemia in adolescents. In the subsequent stage, the material received an average score of 74.54% in the appropriate category, with experts suggesting that the content be aligned with Evidence-Based Practice (EBD) principles to prevent adolescent anemia. The third stage achieved a score of 90.09% in the very appropriate category, and as such, no further input from media experts was necessary, allowing the material to proceed to the material expert validation stage.

This material validation exercise was conducted on three occasions, yielding the following outcomes:

Table 1. Table of Content Validation

Aspect	Content Validation		
	First	Second	Third
Pedagogical	66,67%	76,67%	90,00%
Content	72,00%	72,00%	92,00%
Average	69,09%	74,54%	90,09%

In the learning aspect, several indicators were examined, including relevance, systematicity, suitability of objectives, clarity of material, and language and terminology. Relevance indicators showed that the presented material is closely tied to adolescent issues and behaviors related to anemia, such as menstruation, eating patterns that can contribute to anemia, and the impact of anemia on adolescents. Systematic indicators were evident in the sequencing of the material in the media development process. The final product consists of six images, presented in a logical sequence from the cover page to understanding anemia, its causes, and tips for prevention. This media aims to enhance knowledge on anemia prevention, thereby ensuring the suitability of the objectives is correctly achieved (Fatima & Lestari, 2021). Indicators of material clarity were observed in the selection of content based on up-to-date scientific sources, the use of simple language, and the choice of informal vocabulary to facilitate student understanding (Dewi et al., 2023).

The content aspect of the media is characterized by several indicators, including presentation, correctness, suitability, and quality. Specifically, the presentation of the material is concise and straightforward, enabling students to comprehend the content quickly and efficiently. The content is grounded in trusted sources, including journals and books, ensuring its accuracy and credibility. The content is also tailored to the specific needs and concerns of adolescent, addressing issues such as menstrual problems, iron requirements during growth, and food and drink consumption patterns that impact iron absorption (Waife et al., 2023). Moreover, the inclusion of illustrations facilitates comprehension and makes the content easy to digest for adolescent (Lee & Reeves, 2018).

b. Media Validation

The media was validated to assess its suitability in terms of visual appeal. The expert chosen for this validation was Stri Agneya Dite, S.Sn., M.Sn., a lecturer at the Indonesian Arts Institute in Surakarta. The aspects evaluated in this validation included the use of images and the use of typography. This validation was conducted twice, yielding the following results:

Table 2. Table of Media Validation

Aspect	Media Validation	
	First	Second
Pictures	60,00%	91,42%
Fonts	92,00%	92,00%
Average	72,33%	91,67%

In the initial stage of media validation, the feasibility assessment yielded a score of 72.33%, with the majority falling within the less feasible category. The media expert's feedback recommended simplifying the images by reducing unnecessary design elements, such as meaningless dotted lines, to create a more minimalist and informative visual presentation. In the second stage, the feasibility score increased to 91.67%, placing it in the very feasible category and warranting further development. The expert's suggestions for improvement at this stage included maintaining consistency in the background

theme throughout the media and reducing ornate elements that are not relevant to the theme, thus enhancing overall visual coherence and effectiveness.

In the image aspect, several indicators were evaluated, including color, vector, illustration, image quality, and image order. The media employs a color scheme featuring red and yellow, with red representing healthy blood and yellow symbolizing happiness, optimism, and creativity, thus reflecting the concept of healthy students free from anemia (Nur & Paksi, 2021). Vectors and lines are used to create outlines for the character Mia, as well as dotted lines for background accents. The use of curved and straight lines serves to diagrammatically illustrate the shape and size of objects, as well as define where one object ends and another begins. This technique emphasizes Mia's character by employing a curved edge line in red (Dafri, 2011). The illustrations used are two-dimensional cartoon-style images. The image was sourced from freepix.com, with Mia's character created manually using an iPad. The character is depicted as a Muslim high school student wearing a uniform who prioritizes health, particularly anemia awareness. The character Mia is derived from the phrase "Ane-Mia," making it easier to remember her message and attract students' attention (Rory & Wahyudi).

4. Implementation and Evaluation Phase

The implementation and evaluation stages involved testing the media on target audiences, divided into smaller and larger groups. The results of the testing demonstrated the suitability of the media for its intended audience.

Table 3. Group Trial Result

Aspect	Average	
	Small Group (n = 10)	Big Group (n=30)
Language	85,25%	84,33%
Content	82,25%	84,28%
Pictures	86,00%	89,50%
Interesting	87,25%	91,34%
Understandable	86,50%	86,23%
Accessible	92,00%	91,25%
Average	86,54%	87,82%

The results of the testing revealed that the small group achieved an eligibility rating of 86.54% in the very feasible category. Within this group, students demonstrated a strong interest in the dominant character, Mia, featured in the media. In fact, most students highlighted Mia as a key aspect of the media. Following the revision of the media based on feedback from the small group, large-scale trials were conducted. The results showed a significant increase to 87.82%. Notably, all aspects of the media experienced an improvement, particularly in terms of image quality. These feasibility results suggest that the developed media possesses language and content that is easy to comprehend and visually appealing images, thereby enhancing its overall effectiveness.

The character of Mia in the media emerged as a focal point of interest for the target audience. Designed to resemble a young woman in a high school uniform, Mia's cheerful and expressive personality was intended to captivate viewers. By choosing human characters, we aimed to convey a range of emotions and poses, thereby creating a visually appealing and dynamic visual identity. A well-designed character or mascot serves as a solid foundation for effective branding, allowing for flexible implementation across various media without becoming monotonous. According to research (Kelvin and Hananto 2020), changes in posters and expressions imbue characters with a sense of life, preventing them from appearing dull or stagnant when viewed repeatedly while maintaining consistency.

One of the key factors contributing to the students' acceptance of the developed media was the use of the Instagram platform as a means of accessing it. The media was shared via links and QR codes that students could scan at their convenience, allowing for on-demand access. Furthermore, advances in technology have made it possible for students to access the internet quickly and easily from anywhere, at any time, thanks to stable and

affordable internet connectivity. As reported by Situmorang and Haryati (2023), Instagram is one of the most widely used social media platforms globally, often utilized for posting images and videos.

Students' demand for health information is driven by a desire to enhance their health literacy. Good health literacy encompasses the ability to access, process, and apply health-related information effectively. Notably, Instagram has been found to be a suitable platform for meeting students' needs in obtaining the necessary health information. Research has demonstrated that Instagram can augment an individual's capacity to acquire, comprehend, and utilize health information, thereby empowering them to make informed decisions regarding their well-being (Anisah & Kurniawan, 2021).

CONCLUSION

The Instagram-based image media underwent a development process in accordance with the ADDIE model, tailored to the characteristics and needs of students regarding anemia prevention in adolescents. The drafted media was designed to be concise, engaging, and visually appealing. Content experts deemed the media highly feasible, with a feasibility value of 90.09%, while media experts concurred, assigning a value of 91.67%. Student acceptance of the media was equally impressive, with an acceptance rate of 87.82%, indicating that the media is well-suited for its intended purpose. The media's success can be attributed to its simplicity, easy-to-understand language, attractive visuals, and user-friendly accessibility. Future research could assess the effectiveness of this media by employing quasi-experimental methods to measure its influence on students' knowledge and attitudes regarding anemia prevention in adolescents.

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REFERENCES

- Dewi, Anita Candra, et al (2023). Pengaruh Media Sosial Terhadap Pemakaian Bahasa oleh Remaja. *Jurnal Review Pendidikan Dan Pengajaran (JRPP)*, 6(4), 1550–1555.
- Yoga Prismanata, & Dewi Tanjung Sari. (2022). Formulasi Media Pembelajaran untuk Peserta Didik Generasi Z dan Generasi Alfa pada Era Society 5.0. *PISCES: Proceeding of Integrative Science Education Seminar. Proceeding of Integrative Science Education Seminar*, 2, 44–58.
- Jadha Casmira, O., Widjanarko, B., Margawati, A., Kesehatan Masyarakat, F., Diponegoro, U., & Soedarto, J. (2022). Promosi Kesehatan Melalui Media Sosial Instagram Sebagai Sarana Edukasi. *Husada Mahakam: Jurnal Kesehatan*, 12(2), 114–124.
- Yoga Prismananta. (2023). Karakteristik Media Pembelajaran untuk Generasi Z dan Alfa. *Eduprisma*. <https://www.eduprisma.com/2023/03/karakteristik-media-pembelajaran-genz-dan-alfa.html> (Accessed April 30th 2024)
- Ani Triana. (2023). Faktor Resiko Kejadian Anemia Pada Remaja Putri Di Mas PP Nuruddin. *Termometer: Jurnal Ilmiah Ilmu Kesehatan Dan Kedokteran*, 1(1), 01–07.
- Herwandar, F. R., & Soviyati, E. (2020). Perbandingan Kadar Hemoglobin Pada Remaja Premenarche Dan Ppostmenarche Di Desa Ragawacana Kecamatan Kramatmulya Kabupaten Kuningan Tahun 2018. *Jurnal Ilmu Kesehatan Bhakti Husada: Health Sciences Journal*, 11(1), 71–82.
- Branch, R. M. (2010). *Instructional design: The ADDIE approach*. Springer, New York City
- Sikumbang, K., Ramadhina, W., Yani, E. R., Arika, D., Hayati, N., Hasibuan, N. A., & Gigih Permana, B. (2024). Peranan Media Sosial Instagram terhadap Interaksi Sosial dan Etika pada Generasi Z. *Journal on Education*, 6(2), 29–37.
- Krisno Wisnuadi. (2024). Faktanya beda! Survey 2024 media sosial di Indonesia. <https://dipstrategy.co.id/blog/statistik-media-sosial-berdasarkan-generasi-di-indonesia>. (Accessed April 30th 2024)
- Nur Fatima, M., Sri Lestari, F., & Kesehatan Poltekkes Kemenkes Bandung, P. (2021). Pengembangan Media Promosi Kesehatan Merchandise Kipas Mengenai Gizi Seimbang Bagi Remaja. *Jurnal Kesehatan Siliwangi*, 2(1), 223–230.
- Wiafe, M. A., Ayenu, J., & Eli-Cophie, D. (2023). A Review of the Risk Factors for Iron Deficiency Anaemia among Adolescents in Developing Countries. *Anemia*, 2023(1), 6406286.
- Lee, S. J., & Reeves, T. C. (2018). Edgar Dale and the Cone of Experience. *Foundations of Learning and Instructional Design Technology*, 47(6), 93–101.

- Nur, D., & Paksi, F. (2021). Warna dalam Dunia Visual. IMAJI, 12(2), 90–97. <https://doi.org/10.52290/I.V12I2.49>
- Dafri, Y. (2011). Berpikir Tentang Garis, Mengolah Garis Jadi Seni. Ars: Jurnal Seni Rupa Dan Desain, 1(14).
- Rori, R. A. Y., & Wahyudi, A. T. (2022). Proses kreatif pembuatan desain karakter dalam karya ilustrasi. Jurnal DKV Adiwarna, 1, 9.
- Kelvin, K., & Hananto, B. A. (2020). Penggunaan Desain Karakter Sebagai Basis Identitas Visual Sebuah Brand. SENADA (Seminar Nasional Manajemen, Desain Dan Aplikasi Bisnis Teknologi), 3, 119–125.
- Situmorang, W. R., & Hayati, R. (2023). Media Sosial Instagram Sebagai Bentuk Validasi Dan Representasi Diri: Social Media Instagram as A Form Self Validation And Representation. Jurnal Sosiologi Nusantara, 9(1), 111–118.
- Anisah, N., Sartika, M., & Kurniawan, H. (2021). Penggunaan Media Sosial Instagram dalam Meningkatkan Literasi Kesehatan Pada Mahasiswa. *Jurnal Peurawi: Media Kajian Komunikasi Islam*, 4(2), 94–112.

PERCEPTION OF MALARIA PATIENTS ABOUT MALARIA TREATMENT IN MANOKWARI REGENCY, WEST PAPUA

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ABSTRACT

Background: Malaria still ranks first among the top 10 diseases in West Papua Province based on morbidity studies and the recording and reporting of health service facilities in districts/cities, both patients who receive treatment at health centers and hospitals. Manokwari Regency is an endemic malaria area. People's behavior in treating malaria is influenced by socioeconomic background, people with low economic levels tend to do self-medication by buying drugs at pharmacies, drug stores, and stalls, and choosing traditional medicine. The use of drugs that are not by the standards will cause plasmodium resistance,

Method: The design of this study is qualitative research using a phenomenological study approach to explore the perception of malaria patients about malaria treatment in Manokwari district, West Papua Province. The participants involved in this study were 5 people. The analysis was used using the method developed by Colaizzi.

Result: from the results of the analysis, 4 themes were obtained, namely: Perception of malaria, Perception of drug side effects, Perception of malaria treatment information from health workers

Conclusion: A good perception of malaria, treatment, drug side effects, and good information support from health workers will support the public to remain compliant and consistent in undergoing Malaria therapy.

Keywords: Patient Perception, malaria, malaria drug

INTRODUCTION

The malaria program is a global and national priority program, globally included in the Millennium Development Goals (MDGs) indicators and subsequently became an indicator of the Sustainable Development Goals (SDGs). In the National program according to the 2015-2019 National Medium-Term Development Plan (RPJMN), namely the target of districts/cities that have achieved malaria elimination, as well as the Ministry of Health's Strategic Plan (Renstra), namely the cumulative number of district cities with an *Annual Parasite Incidence* (API) of less than 1 per 1000 population (Ministry of Health, 2017).

Based on Indonesia's Health Profile in 2018, there has been a decrease in the incidence of malaria in the period 2009 to

2017, tending to decrease from 1.8 per 1000 at-risk population in 2009 to 0.99 per 1000 population in 2017. West Papua is an endemic malaria area and ranks second out of five provinces in Indonesia with the highest malaria incidence, namely the *Annual Parasite Incident* (API) rate of 14.97. In West Papua Province 90% of villages are malaria endemic areas which are generally regions. remoteness, limited transportation and communication, minimal economic and educational level, poor environment, and still lack of healthy behavior in the community (West Papua Provincial Health Office, 2017).

Malaria still ranks first among the 10 most common diseases in West Papua Province based on morbidity studies as well as recording and reporting from health service facilities in districts/cities, both patients who were treated at health centers and hospitals in

2017. The number of Malaria Patients in 2017 based on blood samples examined with positive results for malaria amounted to 14,181 (West Papua Provincial Health Office, 2017).

Malaria control towards a malaria-free Indonesia by 2030 is carried out with a strategy to strengthen stakeholder commitment to maintain malaria-free areas, strengthen the surveillance system, strengthen the management network to ensure the ability to diagnose early and treat appropriately, strengthen community independence in preventing the emergence of new cases of malaria, and strengthen partnership networks in the context of malaria prevention by functioning a monitoring team (Ministry of Health, 2018).

Efforts that have been carried out by West Papua province are carried out by the National Strategic Plan, namely by disseminating information about malaria, socialization, distribution of mosquito nets, and spraying insecticides (Paul, 2019). Another effort made to support Malaria elimination in West Papua in 2030 is the Collaboration between 2 Provinces, namely Papua and West Papua which is focused on strengthening community independence in preventing malaria the Malaria Free Family Program (Malaria Numbness), Village Malaria Free (Village Defense), Larval Detective (Seconds) and also Malaria Elimination by the Community (Gold). This program is the result of a short course Alumni project financed by the Australia Awards Scholarship (Australia Awards Indonesia, 2019).

This malaria eradication and prevention program has been carried out to achieve the target of malaria elimination. However, the rate of malaria illness and transmission is still high in the eastern region, especially West Papua. The active participation of the community to behave in a healthy life, healthy living behavior is an individual's response to something closely related to illness or disease, the health service system, and the

environment. Individual behavior toward illness or disease is how individuals respond, either passively or actively to the disease (Margaretha & Yenny, 2016).

According to Honrado in Khairi & Muna (2019) there are three behavioral factors associated with the incidence of malaria infection, namely: 1) behavioral and social factors that increase the spread and incidence of malaria, 2) behavioral predisposition factors that cause mild severity and complications, 3) behavioral risk factors that cause resistance to malaria treatment.

Research on the variation of household malaria treatment in six malaria-endemic provinces in Indonesia shows that the behavior of patients in households is very varied and tends to be influenced by socioeconomic background, people with low economic levels tend to do self-medication by buying drugs at pharmacies, drug stores, stalls and choosing traditional medicines, The use of drugs that are not by standards will cause plasmodium resistance, And in malaria-endemic areas, it is one of the causes of the high morbidity and mortality rate of malaria. The results of this study show that there are still problems in the administration and provision of malaria drugs, one of which is public behavior and knowledge about malaria treatment, (Ipa & Dhewantara, 2015).

METHOD

Qualitative Research Design uses a descriptive phenomenology study approach that aims to gain experience and perception of the perception of malaria patients about malaria treatment.

The population in this study is people who visit the Health Center and are diagnosed with Malaria Positive the **sampling** method uses *Purposive Sampling* and is based on data saturation or saturation. Data collection was carried out using *in-depth interviews* using interview guidelines, field notes, and recording tools. For **data analysis** in this

study, using an analysis developed by Colaizzi, and to ensure the validity of the data (Truthworthiness), the researcher will carry out *credibility, Dependability, Confirmability, and Transferability*.

RESULTS AND DISCUSSION

In the results of this study, there are main themes that describe the experience of malaria patients about malaria and malaria treatment, the participants involved in this research are 5 people. g based on the results of the analysis found 4 themes, namely:

1. Perception of malaria

Perception is a process that is preceded by sensing that causes stimuli to the process of being aware of what is seen, heard, and based on experience (Fitriyah & Jauhar, 2014). Views or perceptions about malaria that are not correct in the community such as the assumption that malaria is harmless (Suharjo, 2015). The public perception is also that malaria is not dangerous if the patient can still work so that there is no need to go to the health center or health services for treatment, this view can make it difficult to eradicate and treat malaria which eventually becomes severe and subsequently there will be malaria transmission in the surrounding residential environment. The participant's experience that described the perception of malaria was in the participant's

"My body is hot, dizzy, but I can still walk, I can still work, I can still go shopping" (P1)
mer" At first I felt a bit dizzy, but I thought yes it was a regular headache.. the second day I still felt dizzy but I still ignored it, ... on the third day he said why he still had a headache, this may be a wind" (P2)

"First I felt a headache and aches, so I thought I had a cold... but in the morning I defecated and finally I went to the health center" (P3).

The results of this study are in line with research conducted by Gamalia & Wijayati (2013) on perceptions, opportunities, actions,

and information as well as malaria prevention behaviors at the Sumpiuh Banyumas Health Center, showing that people feel that malaria does not cause health problems, does not cause death or impairs a person's physical function, and is even considered not to cause financial impact. The malaria crisis is not a concern of the community, so it affects the community not to take preventive measures. Perception of the severity of a disease is also related to beliefs that affect people in carrying out preventive behaviors.

2. Perception of malaria treatment

One of the best steps to prevent malaria is to take anti-malarial drugs. Malaria treatment should be started as soon as possible, the treatment of malaria in the patient, which drug regimen to treat the patient with malaria depends on the patient's clinical status, the type (species) of the infecting parasite, the area where the infection was acquired, and the status of drug resistance, pregnancy status, and finally the history of the drug. allergies, or other medications that the patient is taking (CDC, 2020). Participants expressed the following perceptions about malaria treatment:

"When we are sick, we go to the health center, but the medicine from the health center has no results... He wastes water,.. Finally, we dropped to the hospital early in the morning, we did not progress for a few days or how we finally went home and went to the doctor who gave medicine and immediately recovered" (P3)

"If you have malaria, buy 1 quinine drug with 12 strips, drink it until it runs out, and don't check your blood anymore because your body already feels good, if you are still sick, then check your blood (P5).

One of the biggest challenges in malaria treatment efforts in Indonesia is the occurrence of relapse or recurrence, besides that malaria treatment is also imperfect and also causes other problems, namely drug resistance (Safira & Krisanti, 2019). Since 1990, there has been reported resistance to

chloroquine drugs in all provinces in Indonesia and there has also been reported resistance of *Plasmodium Falsifarum* to sulfadoxin-Piramehanin (SP) in several places in Indonesia (Ministry of Health of the Republic of Indonesia, 2017).

This research is in line with research conducted by Wuryanto 2008 on the compliance of vivax malaria patients in taking medication and the factors that affect it. Malaria patients often do not comply with the rules of taking medication according to the treatment schedule, taking medication incorrectly according to the rules will cause drug levels in the blood that are no longer suitable to kill plasmodium, and plasmodium will be able to adapt which can eventually lead to cases of drug resistance. Non-compliance with treatment and not taking medication according to the rules is one of the factors that increase malaria prevention and result in the failure of malaria elimination programs, as well as the number of relapse cases in the community.

3. Perception of drug side effects

The World Health Organization (WHO) in 2001 recommended that all malaria-endemic countries switch to artemisinin-based combination therapy (ACT) for malaria treatment, There are several drug reactions experienced such as body weakness, abdominal pain, vomiting, ear and eye disorders, and dizziness (Adisa, Fakaye, Dike, 2018). In this study, participants expressed the perception of drug side effects as follows:

"After taking this medicine ... I was squeamish... berate may be the effect of a drug (chili sauce shows DHP wrappers)" (P1)

"I have taken this medicine the first day, the second day, the day but I still feel dizzy and still vomit" (P4).

The side effects of the drug disclosed by the participants in this study are in line with a qualitative study conducted by Catio, et al in northern Ghana on factors influencing the reporting of healthcare systems in cases of

side effects of Artemicin-based drugs. Participants who used artesunate-amodiaquine in treating malaria reported experiencing most of the side effects, The most common side effects experienced were weakness and dizziness, and some participants associated it with a poor diet before taking the drug.

4. Perception of malaria treatment information from health workers

Research conducted by Shafira and Krisanti in 2019 on drug adherence factors in vivax malaria patients shows that one of the factors that affect patients who comply with medication in health services is poor relationships with health workers, lack of communication skills from health workers, and no positive encouragement from health workers that leads to low medication adherence. The perceptions expressed by the participants were as follows:

"I have never received information about this malaria treatment from the health center officer. or they conduct counseling on malaria treatment" (P4).

"There has never been direct counseling from health workers, both from the health center about malaria treatment. I only got information from my aunt who is a sister" (P5).

The perceptions and experiences expressed by the participants in this study are in line with the research conducted by Rosita (2017) which shows that most of the respondents think that the efforts of health workers to prevent malaria in relapse patients in the Sawang sub-district, South Aceh regency are in the poor category because health workers rarely conduct counseling. One of the reinforcing factors in preventing malaria in relapsed sufferers is the effort of health workers such as providing counseling so that recurrence does not occur.

CONCLUSION AND SUGGESTION

Conclusion: A good perception of malaria, treatment, drug side effects, and good information support from health workers will support the public to remain compliant and consistent in undergoing Malaria therapy.

Suggestion: For the Health Office in malaria eradication, should coordinate across sectors in conducting continuous surveillance, establish village malaria posts, carry out cadre training related to early detection and prevention of malaria, and increase counseling programs on malaria treatment periodically.

REFERENCES

- Adisa, R., Fakeye, T.O. & Dike, D. (2008). Evaluation of Adverse Drug Reaction to Artemisin-based combination therapy in a Nigeria University Community. *Tropical Journal of Pharmaceutical Research* 7(2): 937-944.
- Australia Award Indonesia (2019). *Banding together to eradicate malaria in Papua and West Papua*. Retrieved 3 April 2019. <https://www.australiaawardsindonesia.org/index.php/news/detail/192/banding-together-to-eradicate-malaria-in-papua-and-west-pa>
- Catio, S. et al (2016). Factor influencing adverse event reporting within the health care system: the case of artemisin-based combination treatments in northern Ghana. *Malaria Journal*. 15:125.
- Central for Disease Control and Prevention (CDC). CDC and Malaria. Accessed April 30, 2020. <https://www.cdc.gov/malaria/about/activities.html>
- West Papua Provincial Health Office. (2018). Health Profile of West Papua Province in 2017. Manokwari, West Papua Provincial Health Office.
- Gamelia, E., & Wijayanti, S.P.M (2013). perceptions, opportunities, actions, and information as well as malaria prevention behaviors. *Journal of Public Health*. Vol 7 (8): 349 -353.
- Ipa, M., & Dhewantara, P.W. (2015). Variations in household malaria treatment in six malaria-endemic provinces in Indonesia. *Aspirator* 7(1):13 – 22.
- Ministry of Health of the Republic of Indonesia. (2017). Pocket Book on Malaria Case Management. Jakarta: Ministry of Health of the Republic of Indonesia
- Khariri., & Muna, F. (2019). The proportion of parasite species that cause malaria infection in Indonesia is based on the results of basic health research (Risksedas). *Pros Sem Nas Masy Biodiv Indon*. 5 (1):38-41.
- Margaretha, I. & Yenni, A. (2016). The Role of the Social Environment in Malaria Prevention in Kisam Tinggi District in Ogan Komerung Regency, South Ulu. *Spirakel* 8 (1): 1-10.
- Paul, 2019. *Manokwari City ranks first in malaria cases in West Papua*. Retrieved 23 March 2019. <https://kumparan.com/balleonews/ko-ta-manokwari-peringkat-satu-kasus-malaria-di-papua-barat-1550580196250284578>
- Rosita, S. (2017). Factors affecting malaria prevention in relapse patients in Sawang District, South Aceh Regency. Thesis. Repository.usu.ac.id/bitstream/handle/123456789/20041/157032117.pdf?sequence=1&isAllowed=y
- Shafira, I.D & Krisanti, I.G. (2019). Factors of medication adherence in patients with vivax malaria at the Hanura Health Center, Pesarawan Regency. *Journal of Health Analysts* Vol. 8 (2){ 53-57.
- Suharjo (2015). Knowledge, attitudes and behaviors, people about malaria in endemic areas of South Kalimantan. *Media R&D*. Vol 25 (1): 23-32.

Wuryanto, M.A. (2008). The level of compliance of vivax malaria patients in taking medication and the factors that affect it. *Journal of Indonesia Health Promotion* Vol.3(1):24-30.

ACCEPTANCE TEST OF COOKIES MOERHI AS SUPPLEMENTARY FOOD FOR UNDERNUTRITION ADOLESCENT GIRLS

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ABSTRACT

Background: Due to rapid physical growth and development, adolescents are nutritionally vulnerable. One nutritional problem that occurs in adolescents is undernutrition. Undernutrition is handled by nutrition education and the provision of supplementary food. Sweet potato can be used as an ingredient for making supplementary food because it contains carbohydrates, and tempeh flour can be used as a source of protein. Cookies Moerhi are made using white sweet potato flour and tempeh flour. This study aims to determine the best formulation, acceptability, and nutritional content of Cookies Moerhi.

Methods: This study used a completely randomized design (CRD) with three formulation of white sweet potato flour and tempeh flour: F1 (15%: 15%), F2 (20%: 10%), and F3 (10%: 20%). The panelists were 25 semi-trained panelists. Test parameters include color, taste, aroma, texture, aftertaste, and overall testing using 9 hedonic scales.

Results: The hedonic test showed that F2 was the best formulation favored by panelists on all parameters (color, taste, aroma, texture, aftertaste, and overall). The nutritional content test of treatment F2: energy 516,61 kcal, protein 18.87 g, fat 28.93 g, and carbohydrates 45.19 g.

Conclusion Based on all parameters (color, taste, aroma, texture, aftertaste, and overall), the best formulation for Cookies Moerhi is treatment F2 (20% white sweet potato flour, 10% tempeh flour). Cookies Moerhi can be an alternative supplementary food for adolescent girls with undernutrition because its nutritional content meets 15% of the RDA for adolescents aged 13-15 years.

Keywords: adolescents, undernutrition, sweet potato, tempeh, cookies

INTRODUCTION

Adolescence is a transitional period in the human life cycle because it is a period of physiological, psychological, and social development that marks the transition from childhood to adulthood (Thalib et al., 2021). Due to rapid physical growth and development, adolescents are nutritionally vulnerable. One nutritional problem that occurs in adolescents is undernutrition.

Based on the 2023 Indonesian Health Survey (IHS), the prevalence of undernutrition (thinness) among adolescents aged 13-15 in West Nusa Tenggara Province

was 7.6%, higher than the national prevalence of 5.7% (Ministry of Health, 2023).

Adolescents require more nutrients than children, but adolescents tend to adopt poor consumption patterns (Widnatusifa et al., 2021). Poor nutritional behavior is the cause of nutritional problems in adolescents, such as the imbalance between the intake of nutrients consumed and the nutrients needed (Hafiza et al., 2021). Lack of carbohydrates causes a decrease in energy produced by glucagon, so when this happens, fat reserves will be used to produce energy (Reynolds et al., 2019). Body fat reserves that continue to decrease can lead to underweight (Rarastiti, 2023).

Decreased body mass and problems with absorption of fat-soluble vitamins may also occur due to insufficient fat intake (Rohmah et al., 2023).

One way to overcome undernutrition is by providing supplementary food. In general, supplementary food is given in the form of biscuits. Cookies are a type of biscuit made from soft, crunchy dough. When broken, they have a less dense cross-section (BSN, 2011). Cookies Moerhi are made using white sweet potato flour and tempeh flour.

A literature review conducted in 2022 showed that sweet potatoes can be used as a primary ingredient for making supplementary food for adolescents (Setyawati et al., 2022). White sweet potato made into flour contains 84.83% carbohydrates (Santosa et al., 2019), which can be a source of energy. In addition, a source of protein, which functions as a building substance, is also needed. Tempeh flour is made into flour and contains 45.69% protein (Seveline et al., 2019). Previous research on providing soybean tempeh yellow sweet potato biscuits showed an average increase in the body weight of children who experienced wasting (Farihani et al., 2022).

Before being given to teenagers, a hedonic test must be conducted to determine the formulation of Cookies Moerhi that can be accepted by panelists. In hedonic tests, panelists use the five senses to assess the level of liking of a product. The objective of this study is to determine the formulation, acceptability, and nutritional value of Cookies Moerhi as an alternative supplementary food for undernutrition adolescent girls.

METHODS

This study used a Completely Randomized Design (CRD) with 3 different formulation of white sweet potato flour and tempeh flour, namely F1 (15%: 15%), F2 (20%: 10%), and F3 (10%: 20%) which can be seen in Table 1.

Table 1. Formulation of Cookies Moerhi

Material	F1	F2	F3
White sweet potato flour (g)	15	20	10
Tempeh flour (g)	15	10	20
Wheat flour (g)	5	5	5
Egg yolk (g)	15	15	15
Skim milk (g)	5	5	5
Margarine (g)	25	25	25
Sugar (g)	20	20	20
Total	100	100	100

The Hedonic test, or liking level test, was conducted in March 2024; the parameters tested included color, taste, aroma, texture, aftertaste, and overall. The hedonic test was conducted at the Taste Test Laboratory of the Poltekkes Kemenkes Mataram by 25 semi-trained panelists who were 6th Semester Nutrition Department students. The requirements for determining semi-trained panelists are Nutrition Students of the Poltekkes Kemenkes Mataram, have received lecture material on organoleptic tests, and have become panelists in organoleptic tests. The scale used in the test is a scale of 1-9 with details: 1) dislike extremely, 2) dislike very much, 3) dislike moderately, 4) dislike slightly, 5) neither like nor dislike, 6) like slightly, 7) like moderately, 8) like very much, and 9) like extremely.

The nutrient content test on Cookies Moerhi was conducted at the Chemistry and Biochemistry Laboratory of the Faculty of Food Technology and Agroindustry, Mataram University, in April 2024. Determination of carbohydrate content using the By Difference method, protein content using the Kjeldahl method, and fat content using the Soxhlet method.

Before the statistical test, a normality test was carried out to determine whether the data was normally distributed. Then, the Kruskal-Wallis Test was carried out because the data was not normally distributed.

RESULTS AND DISCUSSION

1. Descriptive Statistics

Table 3. displays the color parameter's lowest value of 2, maximum value of 9, average value of 6.16, and a standard

deviation of 1.763. The taste parameter has a minimum value of 2, a maximum value of 9, an average value of 6.07, and a standard deviation of 1.898. The aroma parameter has a minimum value of 3, a maximum value of 9, an average value of 6.39, and a standard deviation of 1.541. The texture parameter has a minimum value of 1, a maximum value of 9, an average value of 5.57, and a standard deviation of 2.001. The aftertaste parameter has a minimum value of 2, a maximum value of 9, an average value of 5.71, and a standard deviation of 1.761. Moreover, overall has the minimum value is 2, the maximum value is 9, the average value is 6.08, and the standard deviation is 1.730.

Table 3. Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
Color	75	2	9	6.16	1.763
Taste	75	2	9	6.07	1.898
Aroma	75	3	9	6.39	1.541
Texture	75	1	9	5.57	2.001
Aftertaste	75	2	9	5.71	1.761
Overall	75	2	9	6.08	1.730
Valid N (listwise)	75				

2. Normality Test

The results of the normality test in Table 4. indicate that the p-values for all parameters (color, taste, aroma, texture, aftertaste, and overall) are < 0.05 , indicating that the data is not normally distributed. Subsequently, further tests were conducted with the Kruskal-Wallis test.

Table 4. Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Color	.203	75	.000	.914	75	.000
Taste	.126	75	.005	.948	75	.004
Aroma	.188	75	.000	.932	75	.001
Texture	.149	75	.000	.954	75	.009
Aftertaste	.115	75	.015	.952	75	.006
Overall	.196	75	.000	.930	75	.000

a. Lilliefors Significance Correction

3. Kruskal Wallis Test

The Kruskal-Wallis test was conducted to see the difference between treatments.

a. The Color difference in each treatment

The data shown in Table 5. indicates that Treatment F2 has the greatest color rating of 52.70, whilst Treatment F3 has the lowest rating of 29.14.

Furthermore, the Kruskal-Wallis test was carried out in Table 6. The results showed an asymp significance value of 0.000, smaller than 0.05, meaning there is a significant color difference between the F1, F2, and F3 treatments.

The most preferred color of Cookies Moerhi by panelists is formulation F2 with 20% white sweet potato flour and 10% tempeh flour treatment with a scale of 7.36 (like moderately). F1 treatment uses 15% white sweet potato flour and 15% tempeh flour with a hedonic scale of 5.72 (neither like nor dislike). Treatment F3 used 10% white sweet potato flour and 20% tempeh flour with a hedonic scale of 5.4 (neither like nor dislike).

Color plays an important role in determining the acceptance quality of an ingredient because it is the first thing that individuals will judge (Aprita, 2022). The color of the flour used influences the color of cookies. White sweet potato flour is pure white, while tempeh flour is not completely bright white but yellowish-white, so the more tempeh flour is used, the browner the color of the cookies becomes. This aligns with research by Kristanti et al. (2020), which shows that the more temperature flour is added to mocap cookies, the more color changes (brown).

Table 5. Average color in treatments

	Ranks		
	Treatment	N	Mean Rank
Color	F1	25	32.16
	F2	25	52.70
	F3	25	29.14
	Total	75	

Table 6. Kruskal-Wallis Test on Color Difference

Test Statistics ^{a,b}	
	Color
Kruskal-Wallis H	18.114
Df	2
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

b. Taste differences in each treatment

Table 7. shows that Treatment F2 had the highest average flavor rating, at 50.40, while F3 had the lowest rating, at 31.20.

Table 7. The average flavor of each treatment

Ranks			
	Treatment	N	Mean Rank
Taste	F1	25	32.40
	F2	25	50.40
	F3	25	31.20
	Total	75	

Furthermore, the Kruskal-Wallis test was carried out in Table 8. with results showing an asymp significance value of 0.002, smaller than 0.05, meaning that there is a significant difference in taste between the three treatments F1, F2, and F3.

Table 8. Kruskal-Wallis Test of Taste Differences

Test Statistics ^b	
	Taste
Kruskal-Wallis H	12.471
Df	2
Asymp. Sig.	.002

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

The most preferred taste of Cookies Moerhi by panelists is formulation F2 with 20% white sweet potato flour and 10% tempeh flour treatment with a scale of 7.16 (like moderately). F1 treatment uses 15% white sweet potato flour and 15% tempeh flour with a hedonic scale of 5.56 (neither like nor dislike). Treatment F3 used 10% white sweet potato flour and 20% tempeh flour with a hedonic scale of 5.48 (neither like nor dislike).

Cookies Moerhi with more tempeh flour produced a slightly more bitter taste. This aligns with research by Kiswati and Prijatni (2023), which shows that adding tempeh flour makes cookies taste bitter and is not liked by panelists. Formulation F2 is most preferred due to the use of more white sweet potato flour than tempeh flour. Research conducted by Kurniawati (2021) showed that the total sugar content in cookies made with white sweet potato flour was higher than that of other tuber flours, so this caused the taste of the cookies to be preferred because the taste of tempeh flour could be covered.

c. Differences in aroma in each treatment

Table 9. shows that Treatment F2 has the highest average aroma rating, at 45.58, while F3 has the lowest rating, at 29.58.

Table 9. The average aroma in treatments

Ranks			
	Treatment	N	Mean Rank
Aroma	F1	25	38.84
	F2	25	45.58
	F3	25	29.58
	Total	75	

Furthermore, the Kruskal-Wallis test was carried out in Table 10. with results showing an asymp significance value of 0.029, smaller than 0.05. This means there is a significant difference in aroma between the three treatments, F1, F2, and F3.

Table 10. Kruskal Test for Difference in Aroma

Test Statistics ^{a,b}	
	Aroma
Kruskal-Wallis H	7.060
Df	2
Asymp. Sig.	.029

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

The aroma of Cookies Moerhi most favored by panelists is formulation F2 with 20% white sweet potato flour and 10% tempeh flour treatment with a scale of 6.96 (like slightly). F1 treatment uses 15% white sweet potato flour and 15% tempeh flour with a hedonic scale of 6.48 (like slightly). Treatment F3 used 10% white sweet potato flour and 20% tempeh flour with a hedonic scale of 5.72 (neither like nor dislike).

The aroma of cookies is influenced by the margarine used in making cookies, which is 25%, so the aroma of sweet potato flour and tempeh flour does not affect the aroma of cookies. Fat is important in making cookies because it functions as an aroma addition that can eliminate the aroma of sweet potato flour (Oktaviana et al., 2017).

d. Texture differences in each treatment

Table 11. shows that Treatment F2 has the highest average texture rating, at 50.88, while F3 has the lowest rating, at 27.66.

Table 11. Mean texture in treatments

Ranks			
	Treatment	N	Mean Rank
Texture	F1	25	35.46
	F2	25	50.88
	F3	25	27.66
	Total	75	

Furthermore, the Kruskal-Wallis test was carried out in Table 12. The results showed an asymp significance value of 0.001, smaller

than 0.05, meaning there is a significant difference in texture between the three treatments, F1, F2, and F3.

Table 12. Kruskal-Wallis Test of Texture Differences

Test Statistics ^{a,b}	
	Texture
Kruskal-Wallis H	15.023
Df	2
Asymp. Sig.	.001

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

The most preferred texture of Cookies Moerhi by panelists is formulation F2 with 20% white sweet potato flour and 10% tempeh flour treatment with a scale of 6.76 (like slightly). F1 treatment uses 15% white sweet potato flour and 15% tempeh flour with a hedonic scale of 5.36 (neither like nor dislike). Treatment F3 used 10% white sweet potato flour and 20% tempeh flour with a hedonic scale of 4.6 (dislike slightly).

An increase in the percentage of tempeh flour used decreases the level of crispness, making it the least preferred cookie by panelists. This study's results align with Kristanti et al.'s (2020) research, which suggests that cookies' texture becomes hard due to denaturation during the baking process. This is because tempeh flour contains high protein, 45.69% (Seveline et al., 2020).

e. Aftertaste differences in each treatment

Table 13. shows that treatment F2 has the highest average aftertaste rating, 49.12, while treatment F3 has the lowest rating, 31.40.

Table 13. Mean aftertaste in treatments

Ranks			
	Treatment	N	Mean Rank
After taste	F1	25	33.48
	F2	25	49.12
	F3	25	31.40
	Total	75	

Table 14. Kruskal-Wallis Test for Difference in Aftertaste

Test Statistics ^{a,b}	
	Aftertaste
Kruskal-Wallis H	10.152
Df	2
Asymp. Sig.	.006

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

Furthermore, the Kruskal-Wallis test was carried out in Table 14. with results showing an asymp significance value of 0.006, smaller

than 0.05. This means there is a significant difference in aftertaste between the three treatments, F1, F2, and F3.

Treatment F2 has the most favorable aftertaste by panelists, with a scale of 6.6 (like slightly). Treatment F1 has an aftertaste with a hedonic scale of 5.32 (neither like nor dislike), and the F3 treatment with a hedonic scale of 5.2 (neither like nor dislike). The aftertaste refers to the lingering sensation in the mouth that persists even after the stimulus has been removed (Dinata et al., 2022). The preferred aftertaste is F2 due to the use of sweet potato flour more than tempeh flour, which has a bitter taste when tempeh flour is more widely used in making cookies.

f. The overall difference in each treatment

Table 15. shows that Treatment F2 has the highest average overall rating, at 48.74, while F3 has the lowest rating, at 29.28.

Table 15. Mean overall in the treatment

Ranks			
	Treatment	N	Mean Rank
Taste	F1	25	35.98
	F2	25	48.74
	F3	25	29.28
	Total	75	

Furthermore, the Kruskal-Wallis test was carried out in Table 16. with results showing an asymp significance value of 0.005, smaller than 0.05, meaning there is a significant difference in overall parameters between the three treatments, F1, F2, and F3.

Table 16. Kruskal Test of Overall Difference

Test Statistics ^{a,b}	
	Overall
Kruskal-Wallis H	10.666
Df	2
Asymp. Sig.	.005

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

The overall assessment is a test of previous parameters such as color, taste, aroma, texture, and aftertaste. (Dinata et al., 2022). Panelists favored treatment F2, with a scale of 6.92 (like slightly), followed by treatment F1, with a hedonic scale of 5.92 (neither like nor dislike), and treatment F3, with a hedonic scale of 5.4 (neither like nor dislike).

4. Nutrition Content Test

Macronutrients are the main components of various tissues and constitute the total calorie intake. The body's main source of energy is carbohydrates, which can be divided into carbohydrates, proteins, and fats (Savarino et al., 2021). Based on the results of the hedonic test, the most preferred Cookies Moerhi by panelists is F2. The following are the results of the proximate test of Cookies Moerhi with the most favorable acGizmodoce of panelists, namely F2, which is compared with the Recommended Dietary Allowance (RDA) for adolescent girls aged 13-15 years (Table 17).

Table 17. Comparison of Nutritional Content of Moerhi Cookies and AKG

Nutritional content	F2	AKG
Energy (kcal)	516,61	2050
Protein (g)	18,87	65
Fat (g)	28,93	70
Carbohydrate (g)	45,19	300

a. Energy

The caloric value was determined by adding up the calories provided by protein, carbs, and fat using conversion factors of 4 kcal/g, 4 kcal/g, and 9 kcal/g, respectively (Infante et al., 2017). The energy content of Cookies Moerhi F2 treatment can meet the nutritional needs of 25% of the Recommended Dietary Allowance (RDA) for adolescent girls aged 13-15 years.

b. Protein

Based on proximate tests, the protein content in Cookies Moerhi F2 treatment is 18.87%, which can meet the nutritional needs of 29% of the RDA for adolescent girls aged 13 - 15. Protein from food provides essential amino acids that play a role in tissue protein synthesis (Damayanti, 2016).

c. Fat

Based on the proximate test, the fat content in the three formulation of Cookies Moerhi F2 treatment is 28.93%, which can meet the nutritional needs of 41% of the RDA for adolescent girls aged 13-15.

d. Carbohydrates

Based on the proximate test, the nutritional content of the three Cookies Moerhi F2 treatments is 45,19%, which can meet the nutritional needs of 15% of the RDA for adolescent girls aged 13-15.

CONCLUSION

Based on all parameters (color, taste, aroma, texture, aftertaste, and overall), the best formulation for Cookies Moerhi is treatment F2 (20% white sweet potato flour, 10% tempeh flour). Cookies Moerhi can be an alternative supplementary food for adolescents with undernutrition because its nutritional content meets 15% of the RDA for adolescents aged 13-15 years.

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CONFLICT OF INTEREST

All writers stated that there were no conflicts of interest.

REFERENCES

- Aprita SD (2022). Organoleptic Test of Biscuits with Tempeh Flour Substitution and Catfish Flour for Adolescents with Protein Energy Deficiency in Bengkulu City in 2022. Poltekkes Kemenkes Bengkulu.
- BSN (2011). SNI 01-2973-2011 Biscuits. National Standardization Agency, pp.: 1-5.
- Damayanti D (2016). Protein. In Hardinsyah and Supariasa, I. D. N. (eds) Nutrition Science Theory and Application. Jakarta: EGC, pp.: 37-50.

- Dinata V, Aryani K, Magna A and Nuhriawangsa P (2022). Proceedings of the International Conference on Sustainable Innovation on Health Sciences and Nursing (ICOSI-HSN 2022). Proceedings of the International Conference on Sustainable Innovation on Health Sciences and Nursing (ICOSI-HSN 2022), pp. 46-63. doi: 10.2991/978-94-6463-070-1.
- Farihani B, Podojoyo, Telisa I & Hartati Y (2022). Effect of PMT Yellow Sweet Potato Soybean Tempeh Biscuits on Weight Change of Wasting Children. *Gizmodo Journal*, 14(1), pp.: 8-14.
- Hafiza D, Utmi A and Niriyah S (2021). The Relationship between Eating Habits and Nutritional Status in Adolescents of Smp Ylpi Pekanbaru. *Al-Asalmiya Nursing Journal of Nursing Sciences*, 9(2), pp.: 86-96.
- Infante RA, Natal DIG, Moreira ME de C, Bastiani MID, Chagas CGO, Nutti MR, Queiróz VAV and Martino HSD (2017). Enriched Sorghum Cookies with Biofortified Sweet Potato Carotenoids Have Good Acceptance and High Iron Bioavailability. *Journal of Functional Foods*, 38, pp.: 89-99. doi: 10.1016/j.jff.2017.08.044.
- Ministry of Health (2023). Indonesian Health Survey (IHS). Ministry of Health of the Republic of Indonesia, pp.: 1-965.
- Kiswati and Prijatni I (2023). Views on the Addition of Catfish Flour (*Clarias Gariepinus*) and BMC Tempeh on the Characteristics of Cookies. *Midwifery Journal*.
- Kristanti D, Setiaboma W & Herminiati A (2020). Physicochemical and Organoleptic Characteristics of Mocaf Cookies with Tempeh Flour Addition. *Journal of Industrial Biopropal*, 11(1), pp.: 1-8.
- Kurniawati E (2021). Utilization of Mocaf Flour, White Sweet Potato Flour, and Taro Flour as a Substitute for Wheat Flour on Sugar Content of Cookies. Available at: <https://doi.org/10.1016/j.solener.2019.02.027> [https://www.golder.com/insights/block-caving-a-viable-alternative/%0A????](https://www.golder.com/insights/block-caving-a-viable-alternative/%0A???)
- Oktaviana AS, Hersoelisyorini W and Nurhidajah (2017). Protein content, riseability, and organoleptic properties of cookies with substitution of mocaf flour and kepok banana flour. *Journal of Food and Nutrition*, 7(2), pp.: 72-81.
- Rarastiti CN (2023). Relationship between Carbohydrate Adequacy Level and Nutritional Status in Adolescents. *Indonesian Journal of Nutrition Science and Food*, 2(1), pp.: 30-34.
- Reynolds A, Mann J, Cummings J, Winter N, Mete E & Te Morenga L (2019). Carbohydrate Quality and Human Health: A Series of Systematic Reviews and Meta-analyses. *Lancet* (London, England), 393(10170), pp.: 434-445.
- Rohmah AA, Widartika W, Pusparini P, Saleky YW, Suparman S and Rahmat M (2023). Formulation of Tempeh and Moringa Leaf Flour Cookies as a Snack Food for Underweight Adolescents. *Journal of Local Material Innovation and Community Empowerment*, 2(1), pp.: 38-46.
- Santosa I, Puspa AM, Aristianingsih D and Sulistiawati E (2019). Physico-chemical characteristics of purple sweet potato flour with soaking process using citric acid. *CHEMICA: Journal of Chemical Engineering*, 6(1), pp.: 1.
- Setyawati I, Ariendha DSR, Utami K and Handayani S (2022). Literature Review: Purple Sweet Potato as Supplementary Food for Chronic Energy Deficiency Adolescents. *Scientific Journal of STIKES Yarsi Mataram*, 7(2), pp.: 77-83.
- Seveline, Diana N and Taufik M (2019). Formulation of Cookies Fortified With Tempeh Flour and Addition of Rosele (*Hibiscus Sabdariffa* L.).

Journal of Bioindustry, 01(02), pp.:
245-260.

Talib KU, As'ad S, Hidayanti H, Ahmad M
and Usman AN (2021). Effectiveness
of Anchovy Biscuits on Increasing
Hemoglobin Levels in Adolescent
Girls. *Oxytocin: Scientific Journal of
Midwifery*, 8(1), pp.: 44-56.

Widnatusifa E, Battung SM, Bahar B, Jafar N
and Amalia M (2021). Overview of
Nutrient Intake and Nutritional Status
of Adolescents in Petobo Refugee
Camp, Palu City, 10(1), pp. 25-33:
25-33.

THE RELATIONSHIP BETWEEN SIDE EFFECTS OF ANTI-TUBERCULOSIS DRUGS (OATS) WITH DRUG COMPLIANCE IN PULMONARY TB PATIENTS AT THE PAAL V HEALTH CENTER IN JAMBI CITY IN 2024

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ABSTRACT

Background: Tuberculosis (TB) is a disease caused by Mycobacterium Tuberculosis. One of the factors causing the low cure rate is non-compliance in the treatment of TB patients. This is due to the side effects of TB drugs so some patients choose to stop taking anti-tuberculosis drugs. This study aims to analyze the relationship between the side effects of anti-tuberculosis drugs (OAT) and drug compliance in pulmonary TB patients at the Puskesmas.

Methods: Quantitative research with a cross-sectional approach. Sampling using a total sampling technique where the number of pulmonary TB patients was 30 people. The instrument used for OAT side effects was a questionnaire that had been used before and the questionnaire for drug compliance used a valid and reliable questionnaire from MMAS, then the data were analyzed univariately and bivariately with the Chi-square test and Fisher's test.

Results: Most of the respondents experienced mild side effects as much as (86.7%) and most of the respondents were compliant in taking the drug as much as (46.7%) from the results of the analysis obtained the value of the OAT side effect variable $p\text{-value} = 0.039$ (<0.05).

Conclusion: They concluded that there is a relationship between the side effects of anti-tuberculosis drugs (OAT) and adherence to taking medication in pulmonary TB patients. Respondents in this study had good compliance despite mild or severe side effects.

Keywords: Tuberculosis, Anti-Tuberculosis Drugs, Side Effects, Adherence to Taking Medicine

INTRODUCTION

Pulmonary tuberculosis (TB) is one problem in Indonesia. According to the World Health Organization (WHO), Indonesia is the country with the second highest number of tuberculosis cases in the world. In 2022, there were more than 824 thousand cases of tuberculosis, of which 34% have been successfully discovered and 74% of them have been treated. The recurrence rate is estimated at 11.8% in 2021 and decreased to 5% in 2022. Many patients are unable to tolerate the side effects of their medications, such as nausea, vomiting, red urine, and other discomforts that make them unable to comply with treatment, thus leading to the spread of

the disease. The patients also stopped their treatment, delaying the completion of treatment for up to 6 months, which led to drug resistance and facilitated the spread of the disease. Patient adherence to treatment is one of the factors that determine the success of pulmonary TB treatment. Some of the factors that affect medication adherence include patient characteristics, patient knowledge about pulmonary TB, and analysis of the relationship between medication adherence and the side effects of anti-tuberculosis drugs experienced by pulmonary TB patients.

Low levels of medication adherence can lead to therapy failure, which increases the risk of morbidity and mortality in pulmonary

TB patients. In addition, high rates of treatment failure can lead to an increase in Acid-Resistant Bacilli (BTA) in pulmonary tuberculosis patients, commonly referred to as dual drug resistance (MDR). (Kirana et al., 2016). The relationship between the patient's level of knowledge and adherence to pulmonary TB medication can also be influenced by the patient's characteristics. For example, patients with low levels of education are often less aware of the side effects of their medications and are less likely to take them as prescribed. In addition, patients' ignorance of pulmonary tuberculosis can negatively impact the prevention and treatment of the disease.

According to the research of Maulitha et al. in 2022, which researched the Analysis of Side Effects of the Use of Anti-Tuberculosis Drugs (OAT) at the Outpatient Installation of RSD BLUD Dr. H. Soemarno Sosroatmodjo Tanjung Selor, it is known that the majority of TB patients in this location have "moderate" compliance (73.08%). Among those who experienced side effects, some experienced red urine (96.63%), decreased appetite (74.51%), nausea (57.43%), itching on the skin (22.59%), heartburn (18.26%), vomiting (16.34%), fever (7.68%), and balance disorders (5.28%) (Maulitha et al., 2022). According to a different study, by Christy et al. 2022, there is a non-directional relationship between OAT side effects and medication adherence, that is, patients are less likely to take medication when the OAT side effects are severe, and more likely to take medication when the OAT side effects are mild (Christy et al., 2022).

Therefore, in an effort to assist the authorities in improving treatment standards and achieving the goal of TB elimination in Indonesia, this study aims to find out whether OAT side effect factors are related to pulmonary tuberculosis treatment compliance at the Paal V Health Center, Jambi City.

METHOD

The method of this study is cross-sectional, sampling using a total sampling technique where the number of pulmonary TB patients is 30 people. The instruments used for OAT side effects were questionnaires that had been used previously and medication adherence questionnaires using valid and reliable questionnaires from MMAS, then the data were analyzed univariate and bivariate with the Chi-square test.

RESULTS AND DISCUSSION

Description of Respondent Characteristics

The description of respondents at the Paal V Health Centers in Jambi City based on gender, age, education, and occupation was described with the results of the respondents' characteristics. The following are the results of the univariate analysis of the demographics of the respondents:

Table 1 Frequency Distribution of Respondent Characteristics

Characteristics of Respondents	Frequency (n)	Percentage (%)
Gender		
Man	18	60,0 %
Woman	12	40,0%
Total	30	100%
Age		
17-25	6	20,0%
26-35	4	13,3%
36-45	5	16,7%
46-55	5	16,7%
56-100	10	33,3%
Total	30	100%
Education		
Elementary School	1	3,3%
Junior High School	4	13,3%
Senior High School	10	33,3%
College	15	50,0%
Total	30	100%
Work		
Housewife/ Not Working	10	33,3%
Self employed	11	36,7%
Civil Servant	6	20,0%
Private employees	1	3,3%
Farmer	2	6,7%
Total	30	100%

Table 1 describes the characteristics based on the gender of the respondents. Among the 30 respondents (100%), the largest percentage was male, namely 18 respondents (60.0%). The results of the study

are in line with the research conducted (Budi et al., 2018) stated in their research that men are more likely to develop pulmonary tuberculosis because men smoke more often than women. It is known that smokers are 2.2 times more likely to develop pulmonary tuberculosis than non-smokers. While the research conducted (Oktavia et al, 2016) stated that there was no association between the incidence of pulmonary tuberculosis (TB) and sex, because TB is a contagious disease caused by germs, other risk factors for the disease include a humid atmosphere and inadequate lighting.

Meanwhile, the frequency distribution based on the age of 30 respondents showed that the highest percentage was found in the age of 56-100 as many as 10 respondents (33.3%). The proportion of pulmonary TB cases by age varies from country to country, according to WHO data. In general, pulmonary tuberculosis (TB) can affect all ages, from toddlers to adults. The majority of respondents in this study were between 56-100 years old. As they age, their immune systems weaken, making the elderly more susceptible to bacteria and viruses. Based on an article from (Sazkiah et al., 2015) It was found that the group most affected by TB at Sri Pamela Hospital was the 52-61 years old gender group.

Then, based on the level of education, the largest percentage was found at the university level, with as many as 15 respondents (50.0%). This is in accordance with the composition of the population in the working area of the Puskesmas based on the level of education, which shows that the population with a university level is the majority. This is not in line with research (Widiati & Majdi, 2021) which shows that in the working area of the Korleko Health Center, there are 39 pulmonary tuberculosis patients with low education (75.0%), while pulmonary tuberculosis patients with higher education are 13 people (25.0%).

The reason is that education is an effort that aims for society to apply the lessons learned through educational behavior. A person who is highly educated will need better medical facilities for themselves and their family to get treatment if they fall ill. Higher levels of education will make people more aware of the importance of health in life, which will encourage them to get care in better health facilities. In addition, the individual will more easily receive information and expand his knowledge, and vice versa.

Then the distribution of characteristics based on occupation from 30 respondents (100%) can be found in the highest percentage of non-working occupations/IRT as many as 10 respondents (33.3%). This is in line with the research (Siregar, 2015) The results of the study showed that the majority of case respondents were not working. If the respondents do not work, then the use of health services will have an effect. A person can also reflect the amount of information they get, which can influence their decision to use current health services.

Distribution of OAT Side Effects

Table 2 Distribution of respondents based on OAT side effects

OAT side effects	Frequency (n)	Percentage (%)
Mild Side Effects	26	86,7%
Side Effects Weight	4	13,3%
Total	30	100,0%

Table 2 above, which contains the distribution of respondents according to OAT side effects from the drugs taken and experienced by the respondents, shows that of the 30 respondents who participated in this study, 26 respondents (86.7%) experienced mild side effects, such as reddish urine, nausea, vomiting, or no appetite, while 4 respondents experienced severe side effects, such as hearing loss, visual impairment, and skin rashes.

This is consistent with the research (Abidin et al., 2022) which showed the side effects of TB drugs, especially since almost all respondents, namely 38 respondents (82.6%) felt mild side effects when using TB

drugs. Meanwhile, the research (Farhanisa et al., 2007) found that the side effects of OAT category 1 in pulmonary TB patients in UP4 West Kalimantan province were 100% with a total of 11 respondents. The side effects of OAT category 1 that are experienced are reddish urine color, nausea, weakness, vomiting, indigestion, joint pain, dizziness, itching on the skin, drowsiness, and tingling.

Distribution of Medication Compliance

Tabel 3 Distribution of respondents based on medication compliance

Medication Compliance	Frequency (n)	Percentage (%)
Low	3	10,0%
Medium	13	43,3%
High	14	46,7%
Total	30	100%

Table 3, Displays the distribution of respondents according to medication adherence shows that 14 respondents (46.7%) are the majority of participants in this study who have a high level of medication adherence.

This is in line with research (Christy et al., 2022) which shows the distribution of patients' medication adherence, with 65.71% of patients having high compliance and 34.29% having low compliance. In the research (Abidin et al., 2022) The number of respondents who adhered to taking tuberculosis medication was 45 people (97.8%), based on the results of the study on medication adherence.

The Relationship Between OAT Side Effects and Drug Adherence in Pulmonary TB Patients

Tabel 4 Adverse Reaction Relationship (OAT) with Compliance

		Chi-Square Tests				
		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square		8.207 ^a	2	.017	.039	
Likelihood Ratio		5.486	2	.064	.133	
Fisher's Exact Test		5.571			.039	
Linear-by-Linear Association		3.925 ^b	1	.048	.097	.061
N of Valid Cases		30				.051

Based on Table 4 above, because the results obtained do not meet the interpretation

requirements of the Chi-square Test results, namely there is an Expected Count (EC) value of less than 5%, the researcher uses the Fisher Test where the results obtained are p-value = 0.039 (<0.05) which means that there is a significant relationship between OAT side effects and medication adherence in pulmonary TB patients. This is in line with research (Abidin et al., 2022) where there is a relationship between drug side effects (ESO) and medication adherence in tuberculosis patients.

CONCLUSION

Based on the research that has been conducted, it can be concluded that there is a significant relationship between OAT side effects and medication adherence in pulmonary tuberculosis patients at the Paal V Health Center, Jambi City.

REFERENCES

- Abidin, Z., Yunita, R., & Annisa, S. (2022). Relationship between Drug Side Effects and Medication Compliance in Tuberculosis Patients in the Kunir Health Center Work Area. *The Indonesian Journal of Public Science*, 14(2), 198–204. <https://doi.org/10.32528/ijhs.v14i2.8917>
- Budi, I. S., Ardillah, Y., Sari, I. P., & Septiawati, D. (2018). Analysis of Risk Factors for Tuberculosis Disease Incidence for Slum Communities in Palembang City. *Indonesian Journal of Environmental Health*, 17(2), 87. <https://doi.org/10.14710/jkli.17.2.87-94>
- Christy, B. A., Susanti, R., & Nurmainah. (2022). Relationship of Medication Compliance Level of Tuberculosis Patients to Side Effects of Anti-Tuberculosis Drugs (OAT).

- Journal Syifa Sciences and Clinical Research, 4(2), 484–493.
- Farhanisa, Untari, E. K., & Nansyl, E. (2007). The incidence of side effects of OAT category 1 in pulmonary TB patients in UP4, West Kalimantan province was 100% with 11 patients as respondents. The side effects of OAT category 1 experienced were reddish urine, nausea, weakness, vomiting, and digestive disorders. 1(2004), 2234–2239.
<https://doi.org/10.16285/j.rsm.2007.10.006>
- Maulitha, F., Fitriani, N., & Rusli, R. (2022). Analysis of Side Effects of Using Anti-Tuberculosis Drugs (OAT) in the Outpatient Installation of RSD BLUD Dr. H. Soemarno Sosroatmodjo Tanjung Selor. Proceeding of Mulawarman Pharmaceuticals Conferences, 16(November), 1–8.
<https://doi.org/10.25026/mpc.v16i1.656>
- Sazkiah, E. R., Alfiera, B., Hardja, R., & Utara, S. (2015). Distribution of Tuberculosis Disease in Sri Pamela Hospital. UGM Public Health, 1(1), 61.
- Siregar, A. F. (2015). Relationship between Physical Condition of Home and Work with Pulmonary Tuberculosis. Tjyybjb.Ac.C, 3(2), 58–66.
<http://www.tjyybjb.ac.cn/CN/article/downloadArticleFile.do?attachType=PDF&id=9987>
- Surakhmi Oktavia, Rini Mutahar, S. D. (2016). ANALYSIS OF RISK FACTORS FOR PULMONARY TB INCIDENCE IN THE WORK AREA OF KERTAPATIPALEMBANG COMMUNITY HEALTH CENTER. Geneeskundige Gids, 33(17), 339–348.
- Widiati, B., & Majdi, M. (2021). Analysis of Age Factors, Education Level, Occupation and Pulmonary Tuberculosis in the Work Area of Korleko Health Center, East Lombok Regency. Journal of Sanitation and Environment, 2(2), 173–184. <https://e-journal.sttl-mataram.ac.id/>

STUDY ON WASTE MANAGEMENT AT ALAM BARAJO TYPE A TERMINAL

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ABSTRACT

Background: Alam Barajo Type A Terminal is the largest Terminal in Jambi City and one of the few terminals still operational today. Due to the high number of public vehicles, such as buses, that frequently operate around Alam Barajo Type A Terminal, there is a significant accumulation of waste at the terminal. This research aims to examine waste management at Alam Barajo Type A Terminal, including waste generation, storage, collection, transportation, the roles of managers and sanitation workers, and the involvement of the surrounding community in waste management.

Method: This research method employs interviews and observations by answering questions such as what, why, when, where, who, and how. The data analyzed using this method are in the form of texts or narratives.

Result: The research results indicate that the waste generated comes from ticket counters, offices, and restaurants, consisting of both organic and inorganic waste. There are 27 storage containers, and the waste is transported by sanitation workers in the morning, afternoon, and evening.

Keywords: Waste Management, Waste Generation, Storage, Collection, Transportation, Terminal

INTRODUCTION

The waste problem in Indonesia is a complex issue due to the lack of public understanding of the potential consequences of waste. Human activities lead to an increasing amount of waste along with population growth. The rise in population is accompanied by an increase in the activities and productivity of the people. Waste management issues have led to initiatives such as forming student mosquito larvae monitoring groups, organizing communal work efforts, implementing simultaneous PSN (Pemberantasan Sarang Nyamuk) activities, and other efforts (Chandra et al. 2023).

A terminal is a public place that provides transportation accommodation services through land vehicles such as intercity and interprovincial buses. A bus terminal is a structured building where city buses or intercity buses stop to pick up and drop off

passengers. It is a building located along the highway where buses can halt.

Alam Barajo Type A Terminal is a Service Unit managed by the Class II Jambi Land Transportation Management Office. This terminal is the largest in Jambi City and one of the few terminals still operational today. Due to the high number of public transfers, such as buses, frequently operating around Alam Barajo Terminal, there is a significant accumulation of waste A Terminal.

This research aims to examine waste management at Alam Barajo Type A Terminal with the following objectives:

1. To identify the waste generation at Alam Barajo Type A Terminal..
2. To determine the waste storage at Alam Barajo Type A Terminal.
3. To examine the waste collection at Alam Barajo Type A Terminal.
4. To investigate waste transportation at Alam Barajo Type A Terminal

Based on this background, the title "Studi Pengelolaan Sampah di Terminal Typ Barajo" (Study on Waste Management at Alam Barajo Type A Terminal) sounds appropriate and aligned with your research focus. It clearly the scope and purpose of your study.

METHODS

The title "Studi Pengelolaan Sampah di Terminal Type A Alam Barajo" (Study on Waste Management at Alam Barajo Type A Terminal) indeed captures the essence of your research focus on waste management at Alam Barajo Type A Terminal. It effectively communicates the scope and purpose of your study, emphasizing your investigation into how waste is managed within this specific terminal context.

RESULTS AND DISCUSSION

1. The waste generated originates from eateries, ticket counters, offices, and visitors. The types of waste generated include organic waste such as paper waste and food remnants, and inorganic waste such as plastic, cans, and so on
2. Based on the research conducted, there are 27 waste storage places in the Terminal, comprising 23 from kiosks, 2 from office areas, and 2 for passenger waiting areas. There are 16 waste bins without covers, mostly made from materials, and some are made from non-waterproof materials
3. According to the research, waste at the Terminal is collected daily and then burned without any management process
4. During the waste transportation process, a dump truck made of durable material that is easy to clean is used by the personnel.

CONCLUSION

Based on the research conducted at Alam Barajo Type A Terminal in 2024, the conclusions drawn are:

1. Waste at Alam Barajo Type A Terminal originates from offices, ticket counters, and eateries within the terminal. The types of waste generated include plastic waste, paper waste, and food remnants.
2. There are 27 waste storage locations at the terminal, with 16 bins having covers and 11 bins without covers. Most bins are made from waterproof materials, while some are not waterproof.
3. Waste collection at the terminal is carried out by Terminal sanitation workers. Organic waste such as paper and dry leaves is burned daily, while plastic waste and food remnants from kiosks are disposed of directly into waste collection points (TPS)
4. Waste transportation is conducted by the Environmental Services sanitation workers. Waste is collected three times a day at 6 AM, 9 AM, and 5 PM. The transportation process is done manually and loaded into dump trucks.

CONFLICT OF INTEREST

All authors declared that there was no conflict of interest.

REFERENCES

- Andriani, Tiara. 2018. Peran Pedagang Pasar Dalam Pengelolaan Sampah Di Lingkungan Pasar Ciputat. Skripsi. Fakultas Ilmu Tarbiyah dan Keguruan Universitas Islam Negri Syarif Hidayatullah Jakarta.
- Arifan, H. (2018). Pengelolaan Sampah Kecamatan Pariaman Selatan Kota Pariaman. *Menara Ilmu*, 12(8), 61–68.
- Arikunto, S. (2019). *Prosedur Penelitian*. Jakarta: Rineka cipta.

- Keputusan Peraturan Menteri Perhubungan Republik Indonesia Nomor PM 132 tahun 2015.
- Kotajambi, S. D. (2014). *Lembaran daerahkotajambi*.
- Peraturan Daerah Kota Jambi No. 5 Tahun 2020 Tentang Pengelolaan Sampah
- PP-79. (2013). Peraturan Pemerintah Republik Indonesia Nomor 79 Tahun 2013 Tentang Jaringan Lalu Lintas Dan Angkutan Jalan. *Pemerintah Republik Indonesia*, 1–97.
- PP-81. (2012) Peraturan Pemerintah Republik Indonesia Nomor 81 Tahun 2012 Tentang Pengelolaan Sampah Rumah Tangga dan Sampah Sejenis Rumah Tangga.
- Rijulvita, S., Thamrin, Suprayogi, I., & Edyanus. (2023). Strategi Pengelolaan Sampah Pelabuhan Berkelanjutan (Ecoport) Di Pelabuhan. *Jurnal Medika Utama*, 04, 3199–3207.
- Sampah, P. (2008). *Pengertian dan Definisi Sampah Pengertian dan Definisi Tempat Pengelolaan Sampah Terpadu*. 6–13.
- Slamet, juli.s.2013. Kesehatan Lingkungan. Gadjah Mada University Press, Yogyakarta
- Sugiyono. (2019). Metode Penelitian Kuantitatif, Kualitatif R&D. Bandung: Alfabeta.
- Sutrisnawati, N. K., & M.Purwahita, A. A. . R. (2018). Ni Ketut Sutrisnawati dan A . A . A Ribeka M . Purwahita Akademi Pariwisata Denpasar. *Jurnal Ilmiah Hospitality Management*, 9(1), 49–56.
- Tamba, Brayan Lisbeth. 2021. Sistem Pengelolaan Sampah Pasar Tradisional Sidikalang Kabupaten Dairi."Karya Tulis Ilmiah Diploma III Politeknik Kesehatan Medan Jurusan Kesehatan Lingkungan.
- Terminal, P. M. P. R. I. N. 132 T. 2015 T. P. (2015). Nomor 5059); 5. *Peraturan Menteri Perhubungan Republik Indonesia Nomor 132 Tahun 2015 Tentang Penyelenggaraan Terminal Angkutan Jalan*.
- Undang-undang No.18 Tahun 2008 tentang pengelolaan sampah.
- Yusna Nasution, S., Kadir, A., & Masitho Batubara, B. (2021). Peranan Dinas Kebersihan dan Pertamanan Kota Medan dalam Pengelolaan Sampah Rumah Tangga. *Jurnal Ilmiah Magister Administrasi Publik*, 3(2), 156–164.
- <https://doi.org/10.31289/strukturas.i.v3i2.745>.

THE RELATIONSHIP OF MENSTRUAL STATUS AND AGE WITH CHOLESTEROL LEVELS IN THE COMMUNITY'S BLOOD TALANG BANJAR DISTRICT, JAMBI CITY

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ABSTRACT

Background: Cholesterol levels in women and men naturally increase with age. Menopause is often associated with increased cholesterol in women. This research aimed to see the relationship between menstrual status and age on cholesterol levels in the body.

Method: This research is a quantitative study with a cross-sectional design. The population of this research were residents of Talang Banjar sub-district, especially RT 29 and 30, who took part in the weekly exercise for mothers, totaling 52 people. Sample selection using a total sampling technique. Data were processed univariately and bivariately using Simple Linear Regression statistical tests to find relationships between the variables studied. The research was conducted on a women's exercise group in Talang Banjar Village, Jambi City.

Results: The results of the research showed that in the community of Talang Banjar Village in the women's exercise group, the majority, namely 37 people (71.15%) had menopause, 32 people (61.5%) were aged < 60 years (adults), and 40 people (76.93%) have borderline high cholesterol levels (≥ 200 mg/dl).

Conclusion: There is a relationship between menstrual status and cholesterol levels with a significance value of 0.019 and an R Square of 0.106. There is a relationship between age and cholesterol levels with a significance value of 0.004 and an R Square of 0.152. It is necessary to remind every woman who is starting to enter the menopause phase and is entering pre-senior age that she must be careful in maintaining the condition of her body, especially in terms of consuming foods that contain saturated fat or trans fat and can regulate the pattern and type of food that will be consumed. Check your cholesterol levels regularly as an anticipatory measure to prevent and control cholesterol levels in the body.

Keywords: Menstrual Status, Age, Cholesterol Levels

INTRODUCTION

Currently, efforts are growing rapidly to look for various factors that play a role in the emergence of various disease problems. Bearing in mind that the factors that cause disease are more complex, so in epidemiology, we take a more risk-factor approach. Individual healthy living habits and people's beliefs about things related to health provide many risk values that often appear in epidemiological analyses of disease occurrence in society. Behavior is closely related to age, gender, ethnicity and race,

occupation, social and economic status, and various other aspects of life.

In observational activities or epidemiological research, the role of vulnerability factors plays quite an important role. Individual characteristics such as age, marital status, menstrual status, gender, and so on are often risk factors for the occurrence of certain diseases such as infectious diseases, non-communicable diseases, metabolic diseases, degenerative diseases, and others. Some conditions that occur can be bad if someone is not aware of the situation.

One of the actions chosen to improve public health to reduce morbidity and

mortality rates is to raise awareness among the public about their physioconditions. People need to be aware of the dangers that threaten their health, for example by knowing cholesterol levels in the blood, high or uncontrolled cholesterol levels can cause dangerous diseases. Starting from the age of 20, cholesterol levels tend to increase, with men at higher risk, but women's risk increases as they reach menopause. A slim or even thin body shape does not guarantee that someone has a safe cholesterol level. For this reason, make sure everyone has a good life cross-sectional body intending to be normal.

Sri Ujani's (2015) research results show that there is no significant relationship between gender and cholesterol levels, but women have a greater risk of experiencing increased cholesterol levels. Before menopause, women tend to have lower total cholesterol levels than men of the same age. Cholesterol levels in women and men naturally increase with age. Menopthis research aimed to increase cholesterol in women. In theory, age and gender factors influence blood cholesterol levels. In childhood, women have higher cholesterol values than men. Men show a significant decrease in cholesterol during adolescence, due to the influence of the hormone testosterone which increases during that time. Adult men over 20 years generally have higher cholesterol levels than women. After women reach menopause, they have higher cholesterol levels than men. This is due to reduced activity of the hormone estrogen after women experience menopause. Many other factors such as influence cholesterol levels, including exercise, smoking, drinking alcohol, and so on were not observed by researchers during the study (Ujani, 2015).

The word cholesterol is often thrown around when eating together, on food labels, or in health advertisements. Cholesterol is a lipid or fat produced by liver cells and other body cells. Cholesterol has three main functions, namely making the outer layer of

cells, helping digest food, and helping produce Vitamin D which produces sexual hormones in men and women. With this function, cholesterol is very important for our body. However, cholesterol will backfire if the levels are too high because it can cause various cardiovascular diseases such as heart disease, stroke, poor blood circulation, and so on. Blood cholesterol levels are the best indicator for determining whether someone will suffer from heart disease or not. In the blood, cholesterol is carried by protein. The combination of the two is called lipoprotein. The two main types of lipoproteins are low-density lipoproteins (LDL) which are usually called bad cholesterol and high-density lipoproteins (HDL) which are usually called good cholesterol. LDL's job is to transport cholesterol from the liver to the cells that need it. However, if the amount of cholesterol exceeds requirements, it can deposit on the walls of the arteries, causing disease (wikipedia, 2022). If the cholesterol level in the blood exceeds normal levels, then this condition is called hypercholesterolemia or high cholesterol. High cholesterol conditions can increase the risk of serious disease.

Based on the data and reasons explained above, researchers are interested in raising the research title "The Relationship between Menstrual Status and Age and Cholesterol Levels in the Blood of the Community in Talang Banjar Village, Jambi City". Researchers realize that this factor is a factor that cannot be avoided but can be prepared in good body condition so that it can anticipate uncontrolled cholesterol levels in the blood when a person gets older and enters menopause for women.

METHODS

This research is a quantitative study with a cross sectional design, with the aim of seeing the relationship between menstrual status and age with blood cholesterol levels using a simple linear regression statistical test.

The population in this study were women and mothers' exercise groups in Talang Banjar Village, Jambi City, especially those in RT 29 and 30 with a total of 52 people. The sampling technique used was total sampling.

RESULTS AND DISCUSSION

The aim of this research was to see the relationship between menstrual status and age with cholesterol levels in the blood of the people of Talang Banjar Village, Jambi City. The results obtained after conducting research in the form of collecting data directly in the community can be described as follows:

Menstrual Status, Age and Community Blood Cholesterol Levels

The menstrual status, age and cholesterol levels of the Talang Banjar Village community, especially mothers who take part in weekly exercise activities in RT 29 and 30, was data directly by the research team and the description can be seen in table 1 below

Table 1. Description of the Menstrual Status, Age and Blood Cholesterol Levels of the Community in Talang Banjar Village, Jambi City

No	Menstruation Status	n	%
1	Menstruation	15	28.85
2	Menopause	37	71.15
	Total	52	100
No	Age	n	%
1	Adult (<60 Years)	32	61.54
2	Elderly (≥ 60 years)	20	38.46
	Total	52	100
No	Blood Cholesterol Levels	n	%
1	< 200 mg/dl (still tolerable)	12	23.07
2	≥200 mg/dl (High threshold)	40	76.93
	Total	52	100

In table.1 Menstruation status can be seen that the majority of respondents, namely 37 people (71.15%) have menopause, this shows the condition of the menstrual status of the people of Talang Banjar sub-district, most of whom have entered a state of infertility. During this period, a person will usually experience hormonal changes, especially estrogen, which will also affect their physical

health. Menopause is a process that causes women to no longer experience menstruation. Although it can have a big impact on women's health, as the beginning of a new phase, menopause is not a disease (Buleleng Regional Hospital, 2019).

Age can be seen that more than half of the respondents were <60 years old (adults), namely 32 people (61.54%). This age shows the age that is still considered adult and pre-elderly. Respondents who were elderly were 20 people (38.46%). According to WHO, elderly people are 60- 74 years old. Elderly is an advanced stage of a life process characterized by a decrease in the body's ability to adapt to environmental stress. The high number of mothers entering old age certainly requires special attention in maintaining their health, because as people get older they will experience a process of decreasing ability and health, one of which is a lack of collagen production and experiencing menopause.

Blood cholesterol levels shows that there were more respondents who had high threshold cholesterol levels (≥ 200 mg/dl), namely 40 people (76.93%) compared to respondents who had cholesterol levels that were still tolerable (<200 mg/dl), namely 12 people (23.07%). This is quite worrying considering the impact that may occur due to uncontrolled cholesterol levels. These dangers can include the emergence of dangerous diseases and even loss of life (death). This data is the basis for health workers to create programs to prevent diseases that occur as a result

of uncontrolled cholesterol levels in the blood.

The relationship between Menstrual status and age with cholesterol levels in the blood and of the people of Talang Banjar Village, Jambi City

In hypothesis testing to see the relationship between the menstrual status variable and the blood cholesterol level variable, bivariate analysis was used, tested using a statistical test, namely simple linear regression. Analysis of test results can be seen in table.2 below

Table 2. The Relationship between Menstrual Status and age Cholesterol Levels in the Blood of the Community in Talang Banjar Village, Jambi City

	Col. still tolerable		High Threshold		Total		p-value	R square
	n	%	n	%	n	%		
Mens. Status								
Yes	7	46.7	8	53.3	15	100	0.019	0.106
No	5	13.5	32	86.5	37	100		
Total	12	23.1	40	76.9	52	100		
Age								
Mature	12	37.5	20	62.5	32	100	0,004	0,152
Elderly	0	0	20	100	20	100		
Total	12	23.1	40	76.9	52	100		

Table. 2 explains the relationship between the menstrual status and the age with the blood cholesterol levels. That 5 people (13.5%) of respondents who had not experienced menstruation had cholesterol levels that were still tolerable and 32 people (86.5%) who had not experienced menstruation had their cholesterol levels at the high threshold. Statistical test results using a simple linear regression correlation test. The significance value from the Coefficients table obtained a significance value of $0.019 < 0.05$, so it can be concluded that the menstrual status variable (X) is related to the cholesterol level variable (Y). The R Square coefficient of determination was obtained at 0.106, which means that the influence of the menstrual status variable on the blood cholesterol level variable is 10.6%.

Looking at the results of statistical tests which explain the relationship between the condition of a person who no longer menstruates and an increase in cholesterol

levels, it is necessary to remind every woman who is starting to enter the menopause phase that she must be careful in maintaining her body condition, especially in terms of consuming foods containing saturated fat. or trans fat. Because this can result in an increase in cholesterol levels in the blood. A low-fat diet is a good way to control blood cholesterol levels, this is something that must be instilled in society, especially in mothers who are.

The diagnosis of menopause is made after there has been amenorrhea for at least one year. Cessation of menstruation may be preceded by longer menstrual cycles, with reduced bleeding (Lubis, 2012). Every woman who experiences menopause shows almost the same reaction, both psychologically and physically. Entering menopause earlier is found in nulliparous women, women with diabetes mellitus (NIDDM), heavy smokers, malnourished women, vegetarian women, women with low socioeconomic status and women who live at an altitude of $> 4,000\text{m}$. Multiparous women and women who consume a lot of meat or drink alcohol will experience menopause more slowly (Lubis, 2012).

Cholesterol is actually beneficial for body health. Cholesterol helps the body produce vitamin D, a number of hormones, and bile acids to digest fat. Cholesterol at appropriate levels is actually needed by the body to help build new cells so that the body can continue to function normally. However, if cholesterol levels are too high, then this is dangerous for the body because it will cause various diseases and complications. Cholesterol itself is a waxy fatty compound which is mostly produced in the liver and some is obtained from food. In general, heart attacks and strokes are diseases that lurk in people with high cholesterol, which are caused by excessive cholesterol deposition in the blood vessels. The recommended blood cholesterol levels for each person vary, depending on whether each person has a higher or lower risk of developing arterial disease. As people age, cholesterol levels

tend to increase, with men at higher risk. However, women's risk increases when they reach menopause. This is in line with the results of statistical tests in this study where the results explain the relationship between menopausal conditions and cholesterol levels in the blood.

Cholesterol biosynthesis is directly regulated by existing cholesterol levels, although the Mechanism homeostasis involved is only partially understood. Higher intakes from food cause a net decrease in endogenous production, whereas lower intakes from food have the opposite effect. The main regulatory mechanism is cholesterol sensing intracellular in endoplasmic reticulum by protein SREBP (sterol regulatory element-binding protein 1 and 2).

Some foods that are on the list of types of food that have high cholesterol and are not recommended to be consumed in excess are fried foods, beef brains and innards, egg yolks, liver, butter, shrimp, fast food. However, there are also several types of food that are recommended for consumption because they can help reduce or balance cholesterol in the blood. The types of food are: wheat grains and various types of cereals with the epidermis still intact, oils derived from plants such as canola oil, sunflower and olive oil, fish (consume around 2-3 servings of fish per week), nuts such as red beans and almonds, consume apples, grapes and oranges which are rich in pectin, a soluble fiber that suppresses LDL. Eggplant also contains high levels of soluble fiber, apart from consuming avocados which are high in unsaturated fat content, then consuming soybeans and processed products from soybeans, such as tempeh, tofu and soy milk (Aulia, 2017).

This research has proven the relationship between menopausal conditions in a woman and cholesterol levels in the blood. Where someone entering menopause must be more vigilant than other women in consuming

foods identified as containing cholesterol in order to maintain their old age in a healthy condition regardless of the threat of disease that could occur if their cholesterol levels enter the high threshold.

The age variable that all elderly respondents (≥ 60 years) had cholesterol levels within the high threshold, namely 20 people (100%). Statistical test results using a simple linear regression correlation test The significance value from the Coefficients table obtained a significance value of $0.004 < 0.05$, so it can be concluded that the age variable (X) is related to the cholesterol level variable (Y). The R Square coefficient of determination was obtained at 0.152, which means that the influence of the age variable on the variable of cholesterol levels in the blood is 15.2%.

Looking at the data from statistical tests which show that there is a relationship between the variable age and cholesterol levels in the blood with a magnitude of 15.2%, it is necessary for all people who are starting to enter old age to be aware of how to regulate the pattern and type of food they will consume. If you look at the large influence of age on blood cholesterol levels, namely 15.2%, then this can be considered quite serious. For elderly people who are known to experience a decrease in cell regeneration during the aging process, they need to be selective in choosing the type of food. Because in theory it is known that cholesterol is also beneficial for body health, including regenerating cells.

Cholesterol at appropriate levels is actually needed by the body to help build new cells so that the body can continue to function normally. With this function, cholesterol is very important for our body.

However, cholesterol will backfire if the levels are too high, because it can cause various cardiovascular diseases such as heart disease, stroke, poor blood circulation, and so on. The recommended blood cholesterol levels for each person vary. It depends on

each person whether they have a higher or lower risk of developing arterial disease. When deposits occur on the artery walls due to excessive cholesterol levels, obstructions to blood flow in the heart, brain and other parts of the body can occur. High cholesterol increases a person's risk of narrowing of the arteries or atherosclerosis, blood clots in certain parts of the body, mild stroke, stroke, and heart attack.

When seniors eat together with younger groups, they should not be tempted to eat freely. Remembering that the body's abilities have changed differently from when they were young. Consuming foods that contain cholesterol can be done by remembering whether the type of cholesterol in the food is LDL or HDL. Considering this, some people consider old age to be an unpleasant time. The aging process can be seen physically by the changes that occur in the body and various organs.

An elderly person is someone who has reached the age of 60 years or above. According to Health Law no. 23 of 1992, an elderly person is someone who, due to age, experiences physical, psychological and social changes. These changes have an impact on all aspects of life, including health. The aging process is a process of gradual loss of the tissue's ability to repair itself and maintain its normal structure and function so that it cannot withstand disease (including infection) and loses the ability to repair the damage suffered.

There are several steps that can help keep cholesterol stable, namely consuming heart-friendly foods (fish, oatmeal, nuts and olive oil), exercising regularly, not smoking, losing weight, limiting alcohol consumption, reducing stress, taking appropriate medication, doctor's prescription and recommendations. One thing that should not be neglected by someone who is at risk of increasing cholesterol is having their cholesterol levels checked regularly as an anticipatory measure to prevent and control

cholesterol levels in the body. Monitoring by health workers is also needed by the community. Collaboration between community officers, sub-district officials, community leaders and the community itself will certainly be able to create an independent community, alert and concerned about the health of themselves, their families and the surrounding environment.

Regarding the influence of age on cholesterol levels in the body, it is clear that as a person gets older, there will be an increase in cholesterol levels in the body. This will of course be exacerbated if the lifestyle of the elderly is unhealthy. As is known, there are several factors that cause increased cholesterol levels in the body. Eating foods with high cholesterol content or lack of exercise can cause excess cholesterol, but heredity can also be a trigger for cholesterol. Checking cholesterol levels in the blood should be carried out if a person experiences symptoms of being overweight, high blood pressure, has diabetes, or has other diseases that can increase cholesterol levels, especially if the person has a family history of diseases resulting from high levels of cholesterol in the blood. Changing eating habits can be confusing when trying to lower high cholesterol.

CONCLUSION

Talang Banjar Village Community. In the women's exercise group, the majority, namely 37 people (71.15%) had menopause, the majority, namely 32 people (61.5%) were aged < 60 years (adults) and the majority, namely 40 people (76.93%) had borderline high cholesterol levels (≥ 200 mg/dl). There is a relationship between menstrual status and cholesterol levels, with a significance value of 0.019 and an R Square of 0.106. There is a relationship between age and cholesterol levels, with a significance value of 0.004 and an R Square of 0.152.

It is necessary to remind every woman who is starting to enter the menopause phase that she must be careful in maintaining the condition of her body, especially in terms of food consumption. It's better for the community Those who are starting to enter old age can regulate the pattern and type of food they will consume. People should have their cholesterol levels checked regularly as an anticipatory measure to prevent and control cholesterol levels in the body.

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CONFLICT OF INTEREST

All authors declared that there was no conflict of interest.

REFERENCE

- Aulia. (2017). Avoid these high cholesterol foods. Ministry of Health of the Republic of Indonesia.
- Bowers, E. S. (2017). Best and Worst Foods for People With High Cholesterol. Everyday Health.
- <https://www.everydayhealth.com/hs/healthy-living-with-high-cholesterol/best-and-worst-foods-for-high-cholesterol/>
- Lubis, N.L. (2012). Female Reproductive Psychology & Reproductive Development (1st ed.). Kencana Prenada Media Group.
- Buleleng Regional Hospital. (2019). Why Do Women Experience Menopause? Buleleng Regency Government Regional General Hospital. <https://rsud.bulelengkab.go.id/information/detail/article/mengapa-Perempuan-mengalami-menopause-92>
- Ujani, S. (2015). The Relationship Between Age and Gender and Cholesterol Levels of Obese Patients at Abdul Moeloek Hospital, Lampung Province. Lesehatan Polytechnic, Ministry of Health, Tanjung Karang, Health Journal, 6(Health).

PHYTOCHEMICAL SCREENING AND ANTIOXIDANT TESTING OF ARABICA COFFEE PULP EXTRACT (COFFEA ARABICA L) KERINCI JAMBI

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ABSTRACT

Background: Coffee husks are currently waste that has high economic value. Currently, coffee workers are still wasted by the community because they are considered waste that must be thrown away. In fact, coffee skin has many uses because of the nutritious compounds it contains. Apart from being a fertilizer, it can also be used as an ingredient in cosmetics. Arabica coffee skin is rich in secondary metabolites as nutritious compounds. one of them is antioxidant activity which can reduce many diseases associated with it. This research aims to determine the phytochemical content and antioxidant activity of Arabica coffee skin from farmers in the Kerinci area, Jambi Province

Method: Skin Coffee Powder is extracted by maceration for 5 days with ethanol. The extract obtained was then used as material for secondary metabolite tests and antioxidant activity tests. The DPPH test was used to determine antioxidant activity, while the standard Harborne method was used for phytochemical analysis

Result: The results showed that Arabica coffee skin provided the highest antioxidant activity, namely 57.04%, but the IC₅₀ was lower, namely 100.20 ppm.

Conclusion: Phytochemical research reveals that the bioactive properties of Kerinci Arabica coffee skin consist of alkaloids, flavonoids, terpenoids, saponins and tannins.

Keywords: Arabica, phytochemicals, antioxidants, DPPH method.

INTRODUCTION

Coffee is a plant that is widely consumed as a drink and this plant is widely found in various parts of the world. Arabica coffee is widely grown on the plains with an altitude of more than 500 meters above sea level (Agustiniingsih 2017). Arabica coffee will grow optimally when planted at an altitude of 1000-2000 meters above sea level. With rainfall ranging from 1200-2000 mm per year (Hiwot H, 2011). The chemical content of coffee is alkaloids, flavonoids, tannins, caffeine, and chlorogenic acid which can be used as antioxidants and anti-aging.

Antioxidants can be used to repair skin cells damaged by free radicals and ward off free radicals. Antioxidants in cosmetic ingredients can provide a moisturizing and brightening effect on the skin so that the skin

is not only kept moist but looks more radiant (Arifin 2020).

Components of phenolic compounds include catechins, epicatechins, proanthocyanidins, phenolic acids, tannins, and other flavonoids that function as antioxidants that refresh the skin and regulate the balance of free radicals that can slow down the aging process. The components of phenolic compounds in the polyphenol group are catechins, epicatechins, proanthocyanidins phenolic acids, tannins, and other flavonoids that function as antioxidants in the skin (Chaves, O.S et al. 2013). The community still cannot make full use of the skin of the fruit. Plantation development, especially in coffee processing that is currently carried out, will indirectly produce a large amount of coffee skin peel waste. The skin of this coffee fruit also contains several secondary metabolite compounds. Compounds that are

antioxidants are one of the benefits of coffee peel waste. Antioxidant is a compound that binds free radicals and highly reactive molecules by inhibiting oxidation reactions, so that cell damage will be inhibited (Winarsi 2007). The antioxidant activity on the skin of Arabica coffee fruit can be used as a good utilization of waste and can have the potential for the use of cosmetics, fertilizers, and food additives (Andriani 2007).

METHODS

Tools and materials

The tools used for the research are a glass beaker, Stemper, mortar, spoon, evaporation cup, stirring rod, measuring cup, spatula, drop pipette, meter, scale, filter paper, blender, rotary evaporator, micropipette, analytical balance, vortex, UV-Vis spectrophotometer.

The research materials used are arabica coffee husk waste, ethanol solvents, liquid paraffin, stearic acid, aquades, adeps lanae, tries-no lamin, nipagin, sodium chloride, sodium hydroxide, ammonium hydroxide, sulfuric acid, hydrochloric acid, acetic acid, iron (III) chloride, potassium hydroxide, magnesium powder, Dragendorff reagent, ascorbic acid and DPPH (1,1-diphenyl-2 picrylhydrazyl).

Making Arabica Coffee skin Peel Extract

Simplicia is weighed as much as 500 g put into a chocolate bottle and then added solvent until the sample is submerged. Arabica coffee peel mixture that has been left for 24 hours is filtered with a filter and a sterile funnel to separate the filtrate from the sediment/dregs. The rest of the Arabica coffee peel pulp is re-macerated with a new solvent. Then evaporation is carried out using a rotary evaporator with a temperature of 400C so that a thick extract is obtained. The viscous extract obtained is weighed by weight. Then the % yield is calculated (Muzdalifa D & Jamal S 2019)

Phytochemical Screening

Flavonoid Test

Arabica coffee skin peel extract is taken 1 mL then 0.5 g of Mg powder and 10 drops of concentrated HCl are added, when it reacts positively it will produce an orange, pink, or red. Tannin Arabica coffee peel extract taken 1 mL later 10 drops of FeCl solution 3 1%

when reacting positively will produce a strong green, red, purple, blue, or black color.
Saponin Test

The extract is diluted with water (1:1), and then beaten for 15 minutes vertically. If the foam is 1-10 cm high and stabilizes for 15 minutes, this indicates the presence of saponins.

Alkaloid Test

Coffee skin peel extract 1-2 mL is then mixed with 1 mL of HCl 2N and 9 mL of hot aquades. After that, it is heated for 2 minutes then cooled and strained. Then the Dragendrof reagent was added. If the sample is positive for alkaloids, it will produce a red color for the Dragendrof reagent (Wulandari & Agustin 2022)

DPPH Solution Manufacturing

DPPH was weighed at 4 mg, then put into a measuring flask of 100 mL and sufficient with methanol p.a to the mark, so that a DPPH solution with a concentration of 40 ppm was obtained

Blanking Solution Manufacturing

A 40 ppm DPPH blank solution was pipetted as much as 4 mL into the cuvette and measured with a UV-Vis spectrophotometer, then its absorption was recorded at a wavelength of 400-800 nm. From the absorption curve, the maximum wavelength is determined.

Preparation of Ascorbic Acid Solution as a Comparison Ascorbic acid was weighed as much as 100 mg, then put into a 100 mL measuring flask. After that, add the aquades solvent to the limit until a concentration of 1000 ppm is obtained, and diluted again to 100 ppm by pipetting 10 mL of ascorbic acid parent solution dissolved with aquades ad 100 mL in a squash. Then from the solution, a series of solutions with concentrations of 2 ppm, 4 ppm, 6 ppm, 8 ppm and 10 ppm are made. It is then measured by Uv-Vis spectrophotometry, reading its absorption at maximum wavelength.

Antioxidant Activity Test of Coffee skin Peel Extract by UV-Vis Spectrophotometry Antioxidant measurement with ethanol extract of Arabica coffee skin peel is the dissolution of 50 mg of coffee skin peel extract into methanol p.a so that a concentration of 1000 ppm is obtained, diluted again to 100 ppm. Then from the solution, a series of solutions with

concentrations of 20 ppm, 40 ppm, 60 ppm, 80 ppm, and 100 ppm will be made into a 5 mL measuring flask. It is then measured by Uv-Vis spectrophotometry, reading its absorption at maximum wavelength.

Test of Antioxidant Activity of Arabica Coffee Skin Peel Extract Cream and Positive Control by UV-Vis Spectrophotometry.

Antioxidant measurements of coffee peel extract and Cositive Chlorinal, namely vitamin c, into methanol p.a, then filtered with filter paper, so that a concentration of 1000 ppm was obtained, diluted again to 500 ppm. Then from the solution, a series of solutions with concentrations of 60 ppm, 80 ppm, 100 ppm, 120 ppm, and 140 ppm will be made into the measuring flask 5 mL. Then measured by Uv-Vis spectrophotometry, reading the absorption at the maximum wavelength (Yuhernita & Juniarti 2014).

Data Analysis

In this study, the analysis used is qualitative and quantitative.

RESULTS AND DISCUSSION

Results of Arabica Coffee Skin Peel Extract Yield

Simplisia Arabica Coffee Skin Peel (Coffea Arabica. L) weighed as much as 500g, then macerated using a 96% ethanol solution of 6 L and evaporated by means of a rotary evaporator, an extract of 95.05 g was obtained with yield of 19%.

Phytochemical Test Results

Table 1. Phytochemical Test Results Extract Skin Arabica Coffee and Vitamin C

Compound	Results	Information
Alkaloids	Formed red color	+
Tannins	Formed red color	+
Flavonoids	Formed red color	+
Saponins	Foam formed	+

Table 2. IC value results 50

Treatment	R2	IC50 (ppm)	P
Vitamin C	0,993	6,08	0,003
Arabica Coffee Skin Extract	0,994	72,96	0,000

Arabica coffee peel is extracted by maceration method using 96% ethanol solvent. The result of the maserate is concentrated using a rotary evaporator to remove 96% ethanol solvent used during the extraction process so that the result is a

viscous solution. The thick extract solution obtained was 95.05 g from 500 g of dried powder of Arabica coffee peel. Then the yield value was calculated and a value of 19% was obtained.

After obtaining the extract, then the chemical content of Arabica coffee peel extract (Coffea Arabica L) was identified to see whether or not there were secondary metabolites which are dissolved in the solvent used. A qualitative analysis of this chemical content was carried out to see the presence of the desired compounds, namely flavonoids, tannins, alkaloids, and saponins. The results of the phytochemical screening examination were obtained that 96% ethanol extract of coffee skin peel contained secondary metabolites, namely flavonoids, tannins, alkaloids, and saponins.

The antioxidant activity of coffee husk waste extract is compared to preparations on the market or positive controls containing vitamin C antioxidants. Positive control has an IC value of 50.

CONCLUSION

From the results of the research that has been carried out, it can be concluded that: Arabica coffee skin peel extract contains flavonoids, tannins, saponins, and alkaloids and Effective antioxidant activity has IC value 50.20 ppm.

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CONFLICT OF INTEREST

All authors declared that there was no conflict of interest.

REFERENCES

- Agustiningsih, S., 2017, 'Utilization of Coffee Grounds and Date Seeds in Making Traditional Body Care Scrubs as an Alternative to "Green Cosmetics"', Journal of Cosmetology, (Query date: 2023-05-08 14:34:05).
- Andriani, Y., 2007, 'Testing the Antioxidant Activity of Betaglucan Extract from *Saccharomyces Cerevisiae*', 3(1).
- Arifin, M., 2020, Analysis of Antioxidant Content in Coffee Skin and Beans as a Learning Resource - PhD thesis, Muhammadiyah University of Malang.
- Chaves, O.S, Ghomes RS, Claudia, A, Fernandes M. G., Leonidas, Agra F, Braga V. A & Venderlei F, 2013, 'Secondary Metabolites from *Sida rhombifolia* L. (Malvaceae) and the Vasorelaxant Activity of Cryptolepinone, Molecules', 18; 2769-2777.
- Muzdalifa D & Jamal S, 2019, 'Antioxidant Activity Test of Arabica Coffee Bean Shell Fraction Extract (*Coffea canephora* Pierre ex A. Froehner) Against DPPH Reagent (1,1-Diphenyl-2-Picrylhydrazyl). Indonesia Natural Research Pharmaceutical. Vol 4, No.2 (2019) pp.41-50.', Indonesia Natural Research Pharmaceutical. Vol 4, No.2 (2019) pp.41-50.
- Winarsi, 2007, 'Natural Antioxidants and Free Radicals: Potential and Application in Health', Yogyakarta. Canisius Spreader.
- Wulandari, S. & Agustin, Y., 2022, 'ARABICA PEABERRY GREEN BEAN COFFEE BEANS: PHYTOCHEMICAL SCREENING, HERBAL LOTION FORMULATION', Journal of Pharmaceutical And Sciences, (Query date: 2023-05-08 14:34:05).
- Yuhernita & Juniarti, 2014, 'Analysis of Secondary Metabolite Compounds from Methanol Extract of Surian Leaves Which Have Potential as Antioxidants.', Makara Sains, 15 (1): 1.

POTENTIAL STUDY OF SALIVARY TOTAL PROTEIN LEVELS IN PATIENTS WITH DIABETES MELLITUS WHO SUFFER FROM PULMONARY TUBERCULOSIS IN JAMBI CITYS

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ABSTRACT

Background: Diabetes mellitus (DM) is one of the priority non-communicable diseases in Indonesia. DM can occur due to a group of metabolic disorders characterized by hyperglycemia accompanied by metabolic disturbances. Hyperglycaemia in DM will affect total protein levels in the body. Laboratory examinations for the diagnosis of DM can be identified through blood serum. Recent studies have found that total protein can also be identified through other biological specimens, one of which is saliva. Many complications can be associated with chronic hyperglycemia one of them is Pulmonary Tuberculosis. This study aims to see the potential of salivary total protein levels as an alternative non-invasive examination in patients with DM-TB.

Method: The study used a case-control and using convenience sampling. The samples of this study were 50 people consisting of 15 DM patients, 20 DM-TB groups, and 15 control. Salivary total protein examination was carried out in Mei-Juni 2024 at Medical Laboratory Technology using a Spectrophotometer (BioSystem BTS New).

Result: The results showed the average total protein level in the three groups is 5.09 mg/dL (salivary) and 7.89 mg/dL (serum). Diagnostic tests carried out by comparing the results of salivary total protein levels in patients with DM-TB with controls showed a sensitivity value of 47% and a specificity of 50%.

Conclusion: Salivary total protein has the potential to be an alternative non-invasive test to differentiate respondents for co-morbidities that as DM-TB.

Keywords: DM, DM-TB, Salivary, Total protein levels

INTRODUCTION

Diabetes mellitus (DM) is one of the four priority non-communicable diseases in Indonesia (Kemenkes RI, 2015). DM can occur due to a group of metabolic disorders characterized by hyperglycemia accompanied by metabolic disturbances of carbohydrates, fats, and proteins caused by abnormalities in insulin secretion, insulin action, or both. DM can affect anyone regardless of age and gender (Association & Diabetes, 2014). Hyperglycaemia in DM will affect total protein levels in the body, where these changes are caused by insulin deficiency. In normal conditions, insulin inhibits protein

synthesis to prevent excessive protein breakdown in the liver cells. Whereas in patients with DM who experience insulin deficiency will cause protein synthesis to increase, this is what results in high levels of total protein in patients with DM (Abu-Lebdeh & Nair, 1996).

Laboratory examinations for the diagnosis of DM and others can be identified through blood serum by standard methods that are invasive and traumatic to the patient both physically and psychologically. However, recent studies have found that total protein can also be identified through other biological specimens that can be collected through non-invasive procedures, one of

which is saliva. DM is consistently associated with changes in salivary composition and function (Leite et al., 2013). Parotid gland basement membrane permeability is known to be higher in DM, and this leads to increased percolation of components such as glucose, amylase, and protein from the blood, thereby increasing their levels in saliva (Panchbhai et al., 2010). Total salivary protein is an important component of saliva, with salivary proteins, which consist mainly of proline-rich proteins, mucins, amylases, immunoglobulins, statherins, and antibacterial factors, being responsible for most salivary functions (Dodds & Dodds, 1997; Panchbhai et al., 2010).

Research conducted by Aziz et al (2016) stated that there was an increase in total salivary protein levels in patients with Type 1 DM (177.15 g/dL) compared to the control group (131.6 g/dL). The high level of total salivary protein compared to serum in patients with DM can occur due to additional protein added to saliva from gingival fluid due to periodontal disease activity (Malathi et al., 2013). The above research is inversely proportional to research conducted by Indira et al (2015) which found that there was a decrease in total salivary protein levels in patients with Type 2 DM (91.8 mg/dL) compared to the control group (103.1 mg/dL). This is due to the use of other biochemical metabolic pathways as an overall systemic response to glucose intolerance (Charles F et al., 1994).

Many complications can be associated with chronic hyperglycemia of DM such as organ dysfunction and differentiation failure (eyes, kidneys, nerves, heart, blood vessels) as well as Pulmonary Tuberculosis (Pulmonary TB) (Association & Diabetes, 2014). Patients with Pulmonary TB have a high risk of malnutrition. This is because *Mycobacterium tuberculosis* (M.TB) infection has an impact on the absorption of nutrients in the body which is less than optimal due to inadequate nutritional intake,

so that protein energy malnutrition can occur. Nutritional status can be seen from the measurement of total protein levels (Gupta et al., 2009; Pratomo & Burhan, 2012).

The difference in research results related to total protein levels in patients with DM and Pulmonary TB, and the absence of publications related to total protein levels in patients with DM-TB underlies the research to be carried out.

METHODS

The research to be conducted is an observational study with a case-control approach. Sampling using convenience sampling technique was conducted on 50 people consisting of 15 DM patients, 20 DM-TB groups, and 15 control groups who did not suffer or were diagnosed with DM. The population of this study were all patients with DM who suffered from Pulmonary TB, who were willing to become respondents by signing informed consent. Furthermore, venous blood sampling and saliva specimens were taken. Specimens were examined using a spectrophotometer (BioSystem BTS New). Data were statistically analyzed by the annova test and diagnostic test. This study has received ethical approval from the Ethics Committee of the Jambi Health Polytechnic.

RESULTS AND DISCUSSION

This study was conducted on patients with DM-TB with a total of 50 respondents who live in the Jambi City area. The research was conducted in April-June 2024, which observed the results of salivary total protein examination in patients with DM-TB. Respondents were then grouped based on the characteristics of the respondents sourced from the observation sheet.

Research respondents based on gender were grouped into two categories, namely male and female. The results of the analysis of respondent characteristics, namely gender,

show that the number of female respondents in the three groups of respondents is more than male respondents.

Table 1. Characteristic Respondents

Characteristic	Control		DM		DM-TB	
	n	%	n	%	n	%
Gender						
- Male	5	33,3%	9	60%	10	50%
- Female	10	66,7%	6	40%	10	50%
Age						
- 18-60 years	15	100%	9	60%	16	80%
- >60 years	0	0%	6	40%	4	20%
Smoking habit						
- Smoking	2	13,3%	5	33,3%	2	10%
- No smoking	13	86,7%	10	66,7%	18	90%

Based on age, research respondents were grouped into two categories, namely 18-65 years and >65 years. Analysis of respondent characteristics, namely age, shows that the average age of respondents is dominated by the 18-65 years' age group. Based on their smoking habits, the research respondents were divided into two categories, namely smoking and non-smoking. Analysis of smoking habits, shows the results that the average respondent is dominated by a group that does not smoke.

1. Total Protein levels in patients with DM based on respondent status

Table 1. Comparison of total protein levels based on respondent status

Total Protein (mg/dL)	Variable	n	Mean	Std. Deviation	P. value
Salivary	DM-TB	20	5,34	2,004	0,544
	DM	15	5,26	1,253	
	Control	15	4,67	2,162	
Serum	DM-TB	20	7,93	2,634	0,991
	DM	15	7,89	0,453	
	Control	15	7,85	0,610	

The table above shows that the highest average salivary total protein level was found in DM-TB respondents (5.34 mg/dL) and the lowest salivary total protein level was found in the control group (4.67 mg/dL). However, this difference was not significant as the P value was > 0.05. These results are in line with serum total protein levels where the highest average total protein level was found in DM-TB respondents (7.93 mg/dL) and the lowest protein level was found in the control group (7.85 mg/dL). This difference is also not significant because P value > 0.05.

The average salivary total protein level in the three variables was lower (5.09 mg/dL) when compared to the average serum total protein level (7.89 mg/dL). These results are in line with research conducted by Ladgotra et al, 2016 which states that there is a significant decrease in salivary total protein levels when compared to serum total protein levels.

Patients with DM experience insulin deficiency which causes high levels of total protein in the body because the process of protein synthesis is disrupted which causes excessive protein breakdown in liver cells. In line with the increase in serum total protein levels, salivary total protein levels also increase in DM cases which are related to salivary composition and function (Leite et al., 2013). The results of this study are supported by research conducted by Prathibha et al (2013) which states that there is an increase in total salivary protein levels of patients with Type 2 DM compared to the control group. The high level of total salivary protein compared to serum in patients with DM can occur due to additional protein added to saliva from gingival fluid due to periodontal disease activity (Malathi et al., 2013).

2. Potential of salivary total protein level as a marker of prognosis for patients with DM-TB

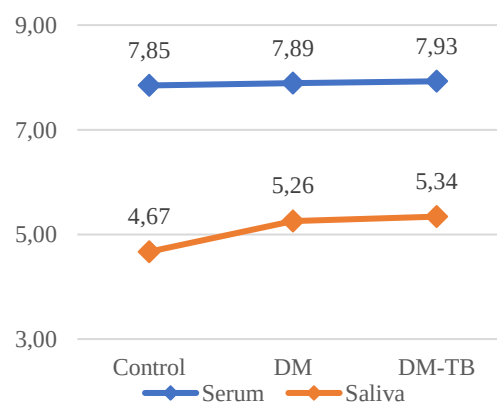


Figure 1. Mean salivary and serum total protein levels by respondent status

Salivary total protein levels can show differences between the control group and the

DM and DM-TB groups. However, salivary total protein levels cannot distinguish between the DM group and the DM-TB group. In serum specimens, total protein levels have not been able to distinguish between the control group and the disease group in this case DM and DM-TB.

Saliva can serve as a reliable diagnostic specimen that can replace blood tests in monitoring several oral and systemic diseases. Several aspects of saliva make this fluid one of the top priorities for biomedicine. Saliva has long been viewed as a unique yet complex body fluid, much like plasma or serum. Saliva is easy to collect and preservation is inexpensive. The diagnostic value of saliva lies in its components, flow, and glandular structure (Hegde et al., 2010).

To determine the potential of salivary total protein levels as an alternative non-invasive examination in patients with DM-TB, a diagnostic test was carried out and presented in an ROC (Receiver Operating Characteristic) curve. Diagnostic tests carried out by comparing the results of salivary total protein levels in patients with DM-TB with controls showed a salivary sensitivity value of 47% and a specificity of 50%.

CONCLUSION

Mean serum total protein levels were higher when compared to salivary total protein levels. Salivary total protein levels were found to be higher in the DM and DM-TB groups when compared to the control group. So, salivary total protein has the potential to be an alternative non-invasive test to differentiate respondents for co-morbidities that as DM-TB.

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CONFLICT OF INTEREST

The author declares there is no conflict of interest.

REFERENCES

- Abu-Lebdeh, H. S., & Nair, K. S. (1996). Protein metabolism in diabetes mellitus. *Baillière's Clinical Endocrinology and Metabolism*, 10(4).
- Association, A. D., & Diabetes. (2014). Standards of medical care in diabetes-2014. *Diabetes Care*, 37(SUPPL.1), 14–80. <https://doi.org/10.2337/dc14-S014>
- Aziz, R. A. A., Mahrous, D. M., Mohammed, G. B., Rehem, S. R. A. E., & El-Wahab, I. A. A. (2016). Estimation of Salivary Glucose , Total Proteins , and Albumin in Children. *Journal of Medical Science And clinical Research*, 04(10), 13163–13170
- Charles F, S., Welsh, S., Rh, B., Marcus, S., Parotid, C. G., Marcus, S., Welsh, S., & Brown, R. H. (1994). Parotid function and composition of parotid saliva among elderly edentulous African—American diabetics. *Journal of Oral Pathology & Medicine*, 277–280.
- Dodds, M. W. J., & Dodds, A. P. (1997). Effects of glycemic control on saliva flow rates and protein composition in non-insulin-dependent diabetes mellitus. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics*, 83(4), 465–470. [https://doi.org/10.1016/S1079-2104\(97\)90147-5](https://doi.org/10.1016/S1079-2104(97)90147-5)
- Gupta, K. B., Gupta, R., Atreja, A., Verma, M., & Vishvkarma, S. (2009). Tuberculosis and nutrition. *Lung India*, 26(1).

- Hegde, A., Shenoy, R., D'Mello, P., Smitha, A., Tintu, A., & Manjrekar, P. (2010). Alternative markers of glycemic status in diabetes mellitus. *Biomedical Research*, 21(3), 252–256
- Indira, M., Chandrashekar, P., Kattappagari, K. K., K. L. P. C., & Chitturi, R. T. (2015). Evaluation of salivary glucose , amylase , and total protein in Type 2 diabetes mellitus patients. *Indian Journal of Dental Research*, 26(3), 271–275. <https://doi.org/10.4103/0970-9290.162883>
- Kemenkes RI. (2015). *Diabetes Fakta dan Angka*.
- Ladgotra, A., Verma, P., & Raj, S. S. (2016). Estimation of Salivary and Serum Biomarkers in Diabetic and Non Diabetic Patients—A Comparative Study. *Journal of Clinical & Diagnostic Research* 10(6), 56–61. <https://doi.org/10.7860/JCDR/2016/19135.7995>
- Leite, R. S., Marlow, N. M., & Fernandes, J. K. (2013). Oral health and type 2 diabetes. *American Journal of the Medical Sciences*, 345(4), 271–273. <https://doi.org/10.1097/MAJ.0b013e31828bdedf>
- Malathi, L., Masthan, K. M. K., Balachander, N., Babu, N. A., & Rajesh, E. (2013). Estimation of Salivary Amylase in Diabetic Patients and Saliva as a Diagnostic Tool in Early Diabetic Patients. *Journal of Clinical & Diagnostic Research*, 7(11), 2634–2636. <https://doi.org/10.7860/JCDR/2013/7574.3634>
- Panchbhai, A. S., Degwekar, S. S., & Bhowte, R. R. (2010). Estimation of salivary glucose , salivary amylase , salivary total protein and salivary flow rate in diabetics in India. *Journal of Oral Science*, 52(3), 359–368.
- Prathibha, K. M., Johnson, P., Ganesh, M., & Subhashini, A. S. (2013). Evaluation of Salivary Profile among Adult Type 2 Diabetes Mellitus Patients in South India. *Journal of Clinical & Diagnostic Research*, 7(8), 1592–1595. <https://doi.org/10.7860/JCDR/2013/5749.3232>
- Pratomo, I. P., & Burhan, E. (2012). *Malnutrition and Tuberculosis*.

STUDY OF ALBUMIN LEVELS IN SALIVA OF DIABETES MELLITUS PATIENTS WITH PULMONARY TUBERCULOSIS

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ABSTRACT

Background: Insulin deficiency and/or insulin resistance experienced by patients with DM are known to trigger hypoalbuminemia. Studies have stated the relationship between serum albumin levels and the prediction, prognosis and complications of DM, as well as in TB where albumin is a marker of nutritional status. From the results of the study it is hoped that it will be able to see a comparison of salivary albumin levels with serum in patients with DM-TB, DM, and controls. As well as knowing whether saliva have the potential to be an alternative prognosis marker in DM patients with TB.

Method: Analytical research was designed using observational methods with a case control approach. 50 respondents who were distinguished based on the status of the respondents.

Result: The results of the examination of saliva and serum specimens showed significant differences in albumin levels from either the DM-TB, DM, or Control groups (P-Value <0.05). In contrast to serum albumin which has decreased, salivary albumin levels were identified to have increased in DM cases. Where salivary albumin levels in the DM-TB group had the largest mean value compared to the DM and Control groups. This indicates a poor prognosis in patients with DM-TB when compared to other respondent groups.

Conclusion: The mean salivary albumin level was found to be greater in the DM-TB group than the other two groups of respondents. This suggests lower salivary albumin has the potential to indicate the prognosis of DM-TB disease.

Keywords: Salivary; Albumin; DM-TB; DM

INTRODUCTION

Diabetes mellitus (DM) is a non-communicable degenerative disease that is ranked as the number one cause of death worldwide (IDF, 2021). Conditions of insulin deficiency and/or insulin resistance experienced by people with DM can result in decreased albumin synthesis and secretion, resulting in hypoalbuminemia, namely low albumin levels in the blood (Chen et al., 2016). One study found that 72.6% of respondents who were DM patients were identified as experiencing hypoalbuminemia (Gaputri & Pangalila, 2020). So that several other studies have also stated the relationship between serum albumin levels with prediction, prognosis and complications of DM.

In addition to blood, research related to the use of saliva as an alternative biological specimen for laboratory examination

continues to be developed. As a specimen that is easy to collect and non-invasive, saliva can monitor changes that occur in pathological conditions (Kasuma, 2015; Zhang et al., 2016). Therefore, it is thought that saliva can be a potential alternative specimen for protein examination including albumin levels in patients with DM. However, in contrast to blood albumin levels which were found to decrease in DM cases, albumin levels in saliva were actually identified to have increased (Fouani et al., 2021).

The facts in the field show that the high incidence of DM is in line with the increased risk of tuberculosis disease. In TB disease, albumin levels themselves are used as markers of nutritional status and are related to the prognosis and mortality of patients. The results of research by Umam et al., (2017) showed that 72% of TB patients experienced hypoalbuminemia and poor clinical improvement.

Although there are currently no publications related to albumin levels in patients with DM who experience TB infection. However, the fact is that albumin levels are related to the condition of insulin resistance of people with DM and are a marker of the nutritional status of people with TB. So in the DM-TB group, albumin levels are assumed to be a potential prognostic marker. This underlies the research designed, from the results of the study it is hoped that it will be able to see a comparison of salivary albumin levels with serum in patients with DM-TB, DM, and controls. As well as knowing whether saliva samples have the potential to be an alternative prognostic marker in DM patients with TB.

METHODS

Analytical research was designed using observational methods with a case control approach. The research was conducted in April-June 2024 with a research population of type 2 DM patients based on the status of respondents, namely DM-TB, DM, and control groups totaling 50 respondents. Sampling was carried out in the Jambi City Region using convenience sampling technique while the examination of albumin levels was carried out at the Clinical Chemistry Laboratory, Department of Medical Laboratory Technology, Health Polytechnic Jambi. The data were analyzed bivariately to analyze salivary and serum albumin levels in patients with DM based on the status of the respondent then continued with a diagnostic test to determine whether salivary albumin levels can be an alternative prognosis marker in DM patients with TB.

RESULTS AND DISCUSSION

Research on patients with type 2 diabetes mellitus was conducted in April-June 2024. The study sample size was calculated using

the OpenEpi application with an OR of 0.67 and a confidence level of 95% so that a sample size of 50 people was obtained. The research sample consisted of 20 patients with DM who suffered from pulmonary TB (DM-TB), 15 patients with diabetes mellitus (DM), and 15 healthy individuals. The characteristics of the research respondents were analyzed based on several criteria. Based on gender, the majority of research respondents were female (52%) and 58% of research respondents were identified as ≥45 years old.

Basically, gender does not affect the risk of a person suffering from DM but rather lifestyle, genetic inheritance and nutritional factors, but research states that women's body mass index, which is on average higher than men, increases the risk of DM disease (Abadi & Tahiruddin, 2020; Ciarambino et al., 2022). The majority of the study respondents were known to be ≥45 years old. At this age, the risk of DM disease is greater, this is related to an increase in glucose intolerance where there is a decrease in insulin sensitivity and body function towards glucose metabolic activity (Komariah & Rahayu, 2020; Ningsih et al., 2023).

1. Albumin levels in patients with DM based on respondent status

Normality tests were carried out on saliva and serum albumin levels in the three groups of respondents previously through the Kolmogorov-Smirnov test. From the data normality test, it was found that the data on serum and saliva levels in the three groups of respondents were normally distributed (P-value> 0.05).

Table 1. Comparison of albumin levels based on respondent status

Albumin levels (g/dL)		N	Mean	Median (IQR)	P-Value
Saliva	DM-TB	20	2,60	2,73 (1,22)	0,007
	DM	15	2,25	2,26 (1,32)	
	Kontrol	15	1,70	1,37 (1,27)	
Serum	DM-TB	20	3,22	3,38 (0,58)	<0,001
	DM	15	3,52	3,46 (0,48)	
	Kontrol	15	3,74	3,83 (0,34)	

The results of the analysis of salivary albumin levels obtained a P-Value = 0.07

while the P-Value = <0.001 was obtained from the analysis of serum albumin levels based on the respondent's status. The results of the examination of saliva and serum specimens showed significant differences in albumin levels from either the DM-TB, DM, or Control groups. The results of the examination with serum specimens showed that the average albumin level of the DM-TB group was below the normal value range. While in the DM and Control groups, serum albumin levels are still in the normal range. However, currently the albumin levels of saliva specimens cannot be classified based on the normal range of values.

Clinically, people with DM are prone to hypoalbuminemia, namely low levels of albumin in the blood. This event is related to decreased albumin synthesis and secretion due to insulin deficiency and / or insulin resistance experienced (Chen et al., 2016). (Gaputri & Pangalila (2020) found that 72.6% of DM patients in their study experienced hypoalbuminemia. Likewise, in cases of DM-TB, where inflammatory cytokines released during TB infection will reduce albumin production, triggering hypoalbuminemia (Ganesan & Gopinath, 2019).

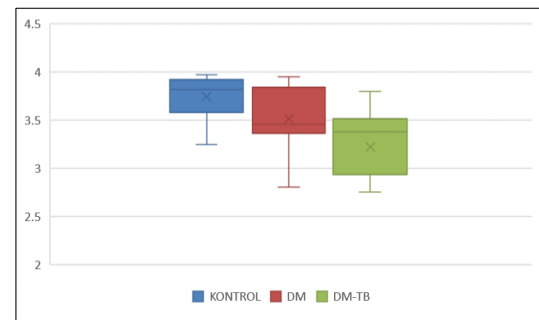
In contrast to serum albumin which has decreased, salivary albumin levels are known to increase in DM cases (Vaziri et al., 2009). The results of this study are in line with previous studies which showed a significant increase in salivary albumin levels in DM patients compared to controls (Aziz et al., 2016; Nirmala & Sultana, 2021).

2. Potential of salivary albumin level as a marker of prognosis for patients with DM-TB

Saliva is one of the potential biological markers ranging from biochemical changes, DNA, RNA, and proteins. With a safe and painless collection procedure, saliva is an alternative specimen for the diagnosis and prognosis of diseases such as diabetes

mellitus and other systemic disorders (Cenzato et al., 2023; Kasuma, 2015).

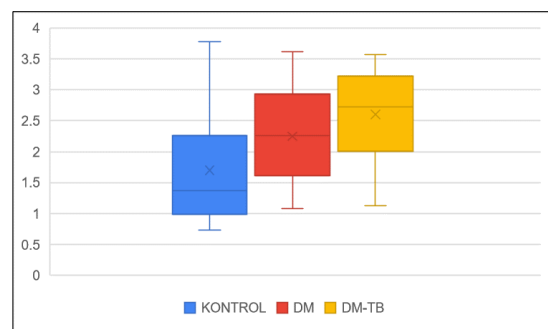
Currently, there are no publications regarding the range of normal values for saliva specimens so that the results of salivary albumin examination cannot be classified based on normal values. However, the results of the examination of saliva



specimens have significant differences in albumin levels from either the DM-TB, DM, or Control groups.

Figure 1. Serum Albumin Levels

In contrast to serum albumin which has decreased, salivary albumin levels have actually been identified as increasing in DM cases (Vaziri et al., 2009). Salivary albumin levels were found in the control and DM groups which had a smaller average value when compared to the DM-TB group which had the largest average value. This is in accordance with the theory that albumin in the oral cavity is considered an ultra-filtrate of serum into the mouth and can diffuse into



mucosal secretions.

Figure 2. Salivary Albumin Levels

Hyperglycemia that occurs can cause chronic oxidative stress which stimulates excessive production of reactive oxygen species (ROS) resulting in dysfunction in the salivary glands (Fouani et al., 2021). This

condition will cause leakage of serum proteins into the saliva so that patients with DM-TB can detect albumin levels in saliva (Andjelski-Radicevic et al., 2012; Fouani et al., 2021).

Based on this description, the results of salivary albumin examination are indeed proven to be able to distinguish research respondents based on the prognosis of the disease suffered. Where in this study salivary albumin in the DM-TB group had the largest mean value indicating a poor prognosis compared to other respondent groups. However, further research is needed to determine the potential of saliva as a marker of disease prognosis related to the sensitivity and specificity of salivary albumin in patients with DM-TB.

CONCLUSION

Salivary albumin can differentiate research respondents based on the prognosis of the disease suffered. This is supported by the average salivary albumin level found more in the DM-TB group than the other two respondent groups.

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CONFLICT OF INTEREST

The author declares there is no conflict of interest.

REFERENCES

Abadi, E., & Tahiruddin. (2020). Indeks Massa Tubuh (IMT) Penderita Diabetes Mellitus Tipe 2 di Puskesmas Poasia Kota Kendari.

Jurnal Kesehatan Masyarakat Celebes, 1(03), 1–6.

Andjelski-Radicevic, B., Dozic, R., Todorovic, T., & Dozic, I. (2012). Biochemical markers in saliva of patients with diabetes mellitus. *Stomatoloski Glasnik Srbije*, 59(4), 198–204. <https://doi.org/10.2298/sgs1204198a>

Aziz, R. A. A., Mahrous, D. M., Mohammed, G. B., El-Rehem, S. R. A., & El-Wahab, I. A. A. (2016). Estimation of Salivary Glucose, Total Proteins, and Albumin in Children with Type 1 Diabetes Mellitus. *Journal of Medical Science and Clinical Research*, 04(10), 13163–13170. <https://doi.org/https://dx.doi.org/10.18535/jmscr/v4i10.60>

Cenzato, N., Cazzaniga, F., Maspero, C., & Tartaglia, G. M. (2023). SALIVA-based diagnostic approach for diabetes mellitus: a step towards non-invasive detection – a scoping review. *European Review for Medical and Pharmacological Sciences*, 12080–12087.

Chen, Q., Lu, M., Monks, B. R., & Birnbaum, M. J. (2016). Insulin is required to maintain albumin expression by inhibiting forkhead box O1 protein. *Journal of Biological Chemistry*, 291(5), 2371–2378. <https://doi.org/10.1074/jbc.M115.677351>

Ciarambino, T., Crispino, P., Leto, G., Mastrolorenzo, E., Para, O., & Giordano, M. (2022). Influence of Gender in Diabetes Mellitus and Its Complication. *International Journal of Molecular Sciences*, 1–13.

Fouani, M., Basset, C. A., Jurjus, A. R., Giovanna, L., Giovanni, L., Leone, A., & Leone, A. (2021). Salivary gland proteins alterations in the diabetic milieu. *Journal of Molecular Histology*, 893–904. <https://doi.org/10.1007/s10735-021-09999-5>

- Ganesan, H., & Gopinath, P. (2019). Prevalence of hypoalbuminemia among tuberculosis patients receiving anti tuberculosis therapy: A cross sectional study. *International Journal of Advanced Biochemistry Research*, 3(2), 09–13.
<https://doi.org/10.33545/26174693.2019.v3.i2a.34>
- Gaputri, F., & Pangalila, F. (2020). Hubungan kadar albumin dengan Hba1c pada pasien diabetes mellitus tipe 2 di Rumah Sakit Royal Taruma Jakarta Barat periode tahun 2018-2019. *Tarumanagara Medical Journal*, 2(1), 59–63.
<https://doi.org/10.24912/tmj.v2i2.7838>
- IDF. (2021). IDF Diabetes Atlas 10TH edition. In *International Diabetes Federation*.
<https://doi.org/10.1016/j.diabres.2013.10.013>
- Kasuma, N. (2015). Fisiologi dan Patologi Saliva. In *Andalas University Press* (Vol. 2, Issue 5, p. 54). Andalas University Press.
<http://eprints.undip.ac.id/43725/0Ahttp://repo.unand.ac.id/3650/1/01.Buku-Fisiologi-dan-Patologi-Saliva.pdf>
- Komariah, & Rahayu, S. (2020). Hubungan Usia, Jenis Kelamin Dan Indeks Massa Tubuh Dengan Kadar Gula Darah Puasa Pada Pasien Diabetes Melitus Tipe 2 Di Klinik Pratama Rawat Jalan. *Jurnal Kesehatan Kusuma Husada*, 41–50.
- Ningsih, A. W., Wiyono, W. I., & Jayanti, M. (2023). Hubungan Lama Menderita Diabetes Melitus Tipe 2 Dengan Kejadian End-Stage Renal Disease Di RSUP Prof. R. D. Kandou. *Jurnal Kesehatan Tambusai*, 4, 1231–1236.
- Nirmala, A., & Sultana, M. (2021). Estimation of Salivary Protein as A Potential Biomarker For Diagnosis of Type -II Diabetes Mellitus. *Bulletin of Environment, Pharmacology and Life Sciences*, 10(March), 256–260.
- Umam, K., Ramdhani, Y., & Zulfikar. (2017). Efek kadar albumin terhadap perbaikan klinis pasien TB di Instalasi Pelayanan Tuberkulosis Terpadu (PTT) RSUDZA. *Jurnal Ilmiah Mahasiswa Kedokteran Biomedis*, 2(4), 8–14.
<https://jim.unsyiah.ac.id/FKB/article/view/6762>
- Vaziri, P. B., Vahedi, M., Abdollahzadeh, S. H., Abdolsamadi, H. R., Hajilooi, M., & Kasraee, S. H. (2009). Evaluation of salivary albumin in diabetic patients. *Iranian Journal of Public Health*, 38(3), 54–59.
- Zhang, C. Z., Cheng, X. Q., Li, J. Y., Zhang, P., Yi, P., Xu, X., & Zhou, X. D. (2016). Saliva in the diagnosis of diseases. *International Journal of Oral Science*, 8(3), 133–137.
<https://doi.org/10.1038/ijos.2016.38>

AN OVERVIEW OF USED OIL MANAGEMENT IN THE KEBUN HANDIL MARKET REPAIR SHOP, JAMBI CITY

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ABSTRACT

Background: The increase in motorcycle use has also resulted in an increase in the amount of used oil waste. Used oil is one of the B3 category wastes which if not managed properly and correctly can pollute the environment. This research aims to look at the description of used oil management in the Kebun Handil Market motorcycle repair shop area in Jambi City including storage, collection, and transportation of used oil.

Method: The type of research used was descriptive with an observational approach. The research sample was the entire population or total sampling with inclusion criteria so that a research sample of 51 motorcycle repair shop in Kebun Handil Market in Jambi City was obtained.

Result: The results showed that as many as 74.5% of repair shop had watertight floors, 100% of used oil storage packaging was not given toxic hazardous waste symbols and labels, 70.5% of used oil storage packaging conditions were not damaged, 100% there was no toxic hazardous waste spill handling equipment (spill kit), 17, 6% there are first aid facilities in accidents, 27.4% there are fire extinguishers, 27.4% of used oil collectors have licenses, 27.4% have cooperation contracts between producers and collectors, 27.4% have proof of delivery of toxic hazardous waste from producers and collectors, and 27.4% of toxic hazardous waste transporters have licenses.

Conclusion: The conclusion of the research shows that the storage and collection of used oil has a poor category and transportation of used oil has a good category.

Keywords: Toxic hazardous waste, used oil, storage, collection, transportation

INTRODUCTION

A general motor vehicle repair shop is a public repair shop with the function is to repair and maintain motor vehicles so that the motor vehicles still have a good technical requirements and roadworthy (Kurkarni, 2023). A repair shop is a type of small and medium entrepreneurship that operates in the field of repair services, it can be motorbikes or cars (Yoga, 2013).

Motor vehicle maintenance and repair activities certainly produce waste, for example used oil waste. Used oil waste is one of the hazardous and toxic waste materials (B3) from motor vehicle repair shop. Used oil waste contains high levels of metals,

additives, and other fuel residues (Han & Goleman, 2019). Especially with the presence of lead content. Its absorption into the soil will impact to the microorganisms which have a very important function in soil fertility, and in this case also cause soil pollution. Soil pollution can also have an impact on the ecosystem.

In Jambi city there are many motorcycle repair shops, but the repair shops that centered in one area is at Kebun Handil Market, Jambi City. With so many repair shops centered in one area, of course a lot of used oil is produce. Based on preliminary survey conducted at 10 repair shop stalls at Kebun Handil Market, Jambi City, on average each stalls can produce 16-20 liters of used oil

per day if there are a lot of customers, and less than 1 liter per day if there are few customers. A total of 8 repair shop stalls that provide service/maintenance services have blackish colored floors due to spills of used oil. This can be pollute the soil and surrounding environment if it's not managed properly. 10 repair shop stalls stored used oil only in metal tank without B3 symbols and labels and it placed in front of the stalls and partially exposed to direct sunlight and rain. Used oil is collected using jerry cans/used oil bottles that are modified by cutting them in half to form a funnel or open container so that they can hold the used oil before being put into the storage tank. 7 repair shop stalls transport used oil every 2-3 months and hand it over to parties who use the used oil (for sale).

Based on the problems above, it can be seen that the management of used oil in Kebun Handil Market Repair Shop in Jambi City has not been handled optimally. So researchers are interested in conducting research on "An Overview Of Used Oil Management in the Kebun Handil Market Repair Shop, Jambi City".

METHODS

The type of research using descriptive with an observational approach. The sample in this study was the entire population (total sampling) with a total of 51 samples. The data collection tool in this research is using checklist by observation. The checklist value measurement in this research is that the answer is Yes = 1, No = 0, the results obtained are categorized as good if $\geq 75\%$, and categorized as bad if $< 75\%$. To processing data in this research, using editing, coding, data entry, tabulation and cleaning techniques.

Data analysis in this research uses univariate (descriptive) analysis which aims to see a description of the management of used oil that grouped in poor or good category which includes storage, collection and

transportation of used oil at the Kebun Handil Market Repair Shop, Jambi City.

RESULTS AND DISCUSSION

a. Storage of Used Oil

Table 1. Storage of Used Oil

No	Assessment Components	Yes		No	
		N	%	N	%
1	Used oil storage facilities in the form of tanks and/or containers	51	100	0	0
2	Used oil storage location is free from flooding	47	92.16	4	7.84
3	Used oil storage location is not prone to natural disasters	51	100	0	0
4	Protected from direct sunlight	44	86.27	7	13.73
5	Protected from rainwater ingress	42	82.35	9	17.65
6	Has an airtight floor	38	74.51	13	25.49
7	Equipped with B3 waste symbols and labels in accordance with applicable regulations. (Used oil code: B105d, Used oil characteristics: Toxic)	0	0	51	100
8	Used oil is packaged using metal or plastic packaging	51	100	0	0
9	The packaging is able to contain used oil B3 waste so that it remains in the packaging	51	100	0	0
10	Has a strong cover to prevent spills during transfer and/or transportation	42	82.35	9	17.65
11	The packaging is not leaking	51	100	0	0
12	The packaging is not rusty	39	76.47	12	23.53
13	The packaging is not damaged	36	70.59	15	29.41
14	There is B3 waste handling equipment (spill kit)	0	0	51	100
15	There are first aid facilities (P3K)	9	17.65	42	82.35
16	There is emergency response equipment such as a detection system and emergency fire extinguishers (APAR)	14	27.45	37	72.55
17	Used oil is stored for a maximum of 365 (three hundred and sixty five) days since it is produced, for used oil produced less than 50 kg (fifty kilograms) per day	51	100	0	0

Table 1 showed that the storage of used oil at Kebun Handil Market Repair Shop is have a poor category. It's because there is still some item that didn't match with the regulation, such as watertight floors, symbols/labels of toxic hazardous waste on storage tank, good storage tank condition, the was was toxic hazardous waste spill handling equipment (spill kit), there are first aid

facilities in accidents, and there are fire extinguishers.

b. Collection of Used Oil

Table 2. Collection of Used Oil

No	Assessment Components	Yes		No	
		N	%	N	%
1	Used oil produced in the workshop is collected	51	100	0	0
2	The collected used oil is separated from other types of B3 waste (B3 waste segregation is carried out)	51	100	0	0
3	The collection of used oil is carried out by B3 waste Collectors (3 rd party)	51	100	0	0
4	The used oil collector has a B3 Waste Management permit for B3 Waste Collection	14	27.45	39	72.55
5	Have a cooperation contract between the producer and collector (3 rd party)	14	27.45	39	72.55
6	Have proof of handover of B3 waste from the producer to the collector	14	27.45	39	72.55

Table 2 showed that the collection of used oil at Kebun Handil Market Repair Shop is have a poor category. It's because there is still some item that didn't match with the regulation, such as licenses of used oil collectors, cooperation contracts between producers and collectors, and licenses of transporters.

c. Transportation of Used Oil

Table 3. Transportation of Used Oil

No	Assessment Components	Yes		No	
		N	%	N	%
1	Used oil produced by the workshop is transported	51	100	0	0
2	Transportation of used oil is carried out by a B3 waste transporter (3 rd party)	51	100	0	0
3	The B3 waste transporter has a B3 waste management permit for B3 waste transport	14	27.45	39	72.55
4	Used oil is transported using 4-wheeled vehicles or more with open/closed containers	51	100	0	0
5	Used oil is transported by road/railway/water transport	51	100	0	0

Table 4.3 showed that the transportation of used oil at Kebun Handil Market Repair Shop is have a good category, but there is one item that didn't match with the regulation, it's licenses of used oil transporters.

CONCLUSION

The conclusion of the research about an overview of used oil management in the Kebun Handil Market Repair Shop showed that the storage of used oil is has a poor category with a percentage of 64,7%, the collection of used oil also has a poor category with a percentage of 60%, and the transportation of used oil has a good category with a percentage of 80%.

REFERENCES

- Bawamenewi, A, Y, A., (2015), "Pengelolaan Limbah Minyak Pelumas (Oli) Bekas Oleh Bengkel Sebagai Upaya Pengendalian Pencemaran Lingkungan Di Kota Yogyakarta Berdasarkan Peraturan Daerah Kota Yogyakarta Nomor 1 Tahun 2012 Tentang Pengelolaan Lingkungan Hidup". Jurnal Fakultas Hukum Universitas Atma Jaya Yogyakarta
- Data Pasar Kebun Handil Tahun 2023, Dinas Perdagangan dan Perindustrian Kota Jambi.
- Nurdiani, D., Yosephina, Septiati A., Wahyudin, D., Ujang, Nurjaman, Program Diploma III Sanitasi Jurusan Kesehatan Lingkungan. (n.d). Pengelolaan Limbah Bahan Berbahaya dan Beracun (B3) Khusus Oli Bekas Pada Bengkel Kendaraan Bermotor di Wilayah Kecamatan Panumbangan Kabupaten Ciamis Tahun 2021.
- Faizah, L., Prodi Sanitasi Program Diploma Tiga, Pengelolaan Limbah B3 di Bengkel Pasar Kebun Handil Kota Jambi Tahun 2018.
- Kesehatan, J., Masyarakat, K., & Oleo, U. H. (n.d.). A MOKODOMPIT Syarwan Syahrir.
- Mukhlisoh, I. A. N. (n.d.). Pengelolaan

- Limbah B3 Bengkel Resmi Kendaraan Bermotor Roda Dua di Surabaya Pusat. Jurnal Teknik Lingkungan.
- Mulyono, T., Verawati, K., (2021)., Perkembangan dan Sistem Pengangkutan Limbah Berbahaya dan Beracun (B3) di Indonesia., Teknik Sipil Universitas Negeri Jakarta.
- Notoatmodjo. (2005). Metodologi Penelitian Kesehatan. PT.Rineka Cipta.
- Peraturan Menteri Kesehatan Republik Indonesia Nomor 2 Tahun 2023 Tentang Peraturan Pelaksanaan Peraturan Pemerintah Nomor 66 Tahun 2014 tentang Kesehatan Lingkungan. (2023).
- Peraturan Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia Nomor 6 Tahun 2021 Tentang Tata Cara dan Persyaratan Pengelolaan Limbah Bahan Berbahaya dan Beracun. (2021).
- Peraturan Pemerintah Republik Indonesia Nomor 22 Tahun 2021 Tentang Penyelenggaraan Perlindungan dan Pengelolaan Lingkungan Hidup. (2021).
- Roma, D. R. M., Rupiwardani, I., Yohanan, A., Program Studi Kesehatan Lingkungan, M., Widyagama Husada, S., & Program Studi Kesehatan Lingkungan, D. (n.d.). Pengelolaan Limbah Oli Bekas pada Bengkel Motor di Kota Malang.
- Sugiyono. (2016). Metode Penelitian Kuantitatif, Kualitatif dan R&D. PT Alfabet.
- Susanto, A. (n.d.). Simposium Nasional RAPI XIII-2014 FT UMS.
- Darsono, V., 2013, Panduan Pengelolaan Green Industry, Cahaya Atma Pustaka, Yogyakarta.
- Yeni, A., & Bawamenewi, A. (n.d.).
- PENGELOLAAN LIMBAH MINYAK PELUMAS (OLI) BEKAS OLEH BENGKEL SEBAGAI UPAYA PENGENDALIAN PENCEMARAN LINGKUNGAN DI KOTA YOGYAKARTA BERDASARKAN PERATURAN DAERAH KOTA YOGYAKARTA NOMOR 1 TAHUN 2012 TENTANG PENGELOLAAN LINGKUNGAN HIDUP.
<http://hukum.jojakarta.go.id/data/12PDY001.pdf>,
- Yulianto, E., Program Studi Pendidikan Teknik Otomotif Fakultas Teknik Universitas Negeri Yogyakarta. (n.d.). Pengelolaan Limbah Bahan Berbahaya dan Beracun (B3) di Bengkel Program Studi Pendidikan Teknik Otomotif Fakultas Teknik Universitas Negeri Yogyakarta. 23569-Article Text-61305-1-10- 20211030. (n.d.).
- Daud, M., Robby, A., Pramestyawati, N., Lingkungan, J. T., Sipil, T., Itats, P., Arief, J. L., & Hakim, R. (2023). STUDI PENGANGKUTAN DAN PENGUMPULAN LIMBAH B3 OLEH TRANSPORTER DAN PENGUMPUL LIMBAH B3. ~ 182 ~ Environmental Engineering Journal ITATS ENVITATS, 3(2)

PAIN MANAGEMENT RESPONSE USING BREASTFEEDING METHOD AND ICE COMPRESSION AT THE TIME OF IMMUNIZATION

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ABSTRACT

Background: According to WHO (2015), there are 18.7 million babies worldwide who do not get DPT immunization. Pain is a problem that must be overcome, because the comfort that the baby receives is very important for the development of trust, which is one of the developmental tasks at the age of the baby in overcoming discomfort during immunization so as not to cause trauma and in order to be able to receive immunization without any behavior distress. The purpose of this study was to determine the differences in breastfeeding techniques and ice packs on the pain response in infants during DPT immunization.

Methods: Design used a quasi-experimental research design using Post-test Only One Group Design. the first intervention group was given breastfeeding technique treatment and the second intervention group was given ice pack treatment, each technique is performed with a duration of 5 minutes. The number of samples of 20 infants who received DPT immunization. Analysis of the data using the Mann-Whitney statistical test.

Results: there was no significant difference between the breastfeeding technique and ice packs on the baby's pain response with a p-value of 0.063 ± 0.05 .

Conclusion: Breastfeeding and ice pack techniques have the same effectiveness in terms of reducing pain response in infants during DPT vaccination.

Keywords: Baby, immunization, vaccine

INTRODUCTION

Immunization is one way to stimulate the formation of antibodies from the immune system in the body by giving vaccines to prevent certain diseases (Roth Ga *et al*, 2022). Immunization has been proven to reduce the death rate in children due to infections such as measles, diphtheria, pertussis, tetanus, polio, hepatitis B, and tuberculosis (Pan *et al*, 2021). Immunization is also one of the government programs that is implemented to achieve the goals of the Sustainable Development Goals (SDGs) and immunization is one of the indicators to see the coverage of baby and toddler services in a certain area (Estiyanti, 2018).

According to the World Health Organization (WHO), there are 18.7 million babies worldwide who do not receive DPT3

immunization and more than 60% of children are spread in the Democratic Republic of Congo, Ethiopia, India, Indonesia, Iraq, Nigeria, Pakistan, Philippines, Uganda and South Africa (WHO, 2010). In Indonesia, based on data from the National Medium-Term Development Plan-Health (RPJMN-Kesehatan) on national immunization policies, it shows that in 2015-2019, the coverage of Complete Basic Immunization (IDL) reached 93% in babies aged 0-11 months, with details in 2015 is expected to reach 91%, 2016 is 91.5%, 2017 is 92%, 2018 is 92.5% and 2019 reaches 93% (Lukito, 2019).

Babies who receive vaccinations will experience pain when injected. The pain felt has not been a special concern for health workers, yet pain during the procedure that does not receive pain management will cause distress behaviors such as, longer crying

duration that is difficult to calm down, thrashing, also showing kicking or pulling legs by jerking, and restlessness during the procedure (Devi, 2018). The most common effects that often occur in DPT vaccination injections are fever, redness in the injection area, pain, and usually swelling at the injection site. Meanwhile, the most common Post-Immunization Incident (KIPI) in children is anaphylactic reactions, which are severe allergic reactions (Aminina, 2014).

Pain is a problem that must be addressed, because the comfort received by the baby is very important for the development of trust, which is one of the developmental tasks at the baby's age in dealing with discomfort during immunization so as not to cause trauma and to be able to accept immunization without distress behavior (Devi, 2018). In addition, pain that is not immediately handled can have an impact on a child's life, disrupting a child's activities, difficulty sleeping, and difficulty interacting because the child is focused on the pain felt (Fatriansari, 2020). Good or adequate sleep quality for babies will have a positive impact on babies, causing babies to be healthier (Abdullah Vi et al, 2022).

Pain management can be done with non-pharmacological methods such as compresses and breastfeeding techniques (Tiansa et al, 2020). These methods are much safer because they have minimal side effects and can reduce pain during the baby's vaccination. Breastfeeding is a physiological process that provides optimal nutrition to babies. Nothing is more valuable in a child's life than receiving high-quality nutrition from the start of their life and it also helps to stimulate early motor development (Global Breastfeeding Scorecard, 2022). Breast milk is the ideal nutrition for optimal health, growth, and development of babies. It is a white liquid produced by the mother's mammary glands through breastfeeding (Lyons et al, 2020).

Breast milk is produced in the mammary glands, then it enters the storage ducts near the

nipple through the milk ducts, and it remains there until the baby sucks it through the nipple (Lyons Ke et al, 2020). This is caused by the provision of breast milk which can increase the oxytocin hormone in the baby's body, which is the hormone related to calmness and pain reduction when the baby is given an immunization injection (Devi, 2018). Ice compression technique can be done by using small size ice cubes which aim to numb the pain and stop the bleeding. By giving ice compression can reduce pain and discomfort due to needle punctures because it functions as an effective, affordable, easily accepted and non-infectious local anesthesia (Estiyanti, 2018). Based on the magnitude of the impact and the lack of pain management during immunization, this prompted researchers to conduct this study which aims to analyze the difference in effectiveness between Breastfeeding Method and Ice Compression.

METHODS

The type of research uses a *quasi-experimental* research design to assess the difference between breastfeeding technique and ice compression on the pain response in babies during DPT vaccination, with a *post-test two group* design approach. The sample in this research is **babies** aged 2-11 months who received DPT vaccination at Malawei Health Center in Sorong City, totaling 20 respondents and meeting the inclusion criteria. Respondents were divided into two groups, namely the Ice Compression group and the breastfeeding group.

The Ice Compression group intervened by giving ice packs using an ice pack on the baby's thigh before injecting the DPT load with a duration of ± 1 minute. Whereas in the breastfeeding group the babies gave breast milk before injecting the eggs with a duration of $\pm 3 - 5$ minutes. The sampling technique used is purposive sampling, which is a technique for

determining samples with certain considerations (Sugiyono, 2015).

The instrument used in this research is the FLACC (Face, Leg, Activity, Cry, Consolability) questionnaire sheet as a measuring tool to assess pain response in babies injected with DPT vaccination. the FLACC questionnaire is a standard questionnaire so it is not tested for validity and reliability. The data analysis used is the Mann Whitney test. This research has obtained ethical approval from the Ethical Commission of Poltekkes Kemenkes Sorong with the number DM.03.05/6/056/2021.

RESULTS AND DISCUSSION

Univariate Analysis

1. Respondent Characteristics

Based on table 1, it shows that the frequency distribution of the characteristics of the breastfeeding technique group with 10 respondents and the ice compress group with 10.

Table 1. Respondent Characteristics

Variable	Breastfeeding		Ice compression	
	f	%	f	%
Age (Month)				
2	1	10	2	20
3	2	20	2	20
4	4	40	2	20,0
5	1	10	2	20,0
6	2	20	2	20,0
Total	10	100	10	100
Gender				
Boys	3	30,0	3	30,0
Girl	7	70,0	7	70,0
Total	10	100	10	100
DPT Immunization				
DPT 1	2	20,0	3	30,0
DPT 2	4	40,0	5	50,0
DPT 3	4	40,0	2	20,0
Total	10	100	10	100

Respondents at Puskesmas Malawei are as follows:

a. Breastfeeding Technique Group

Age, shows that respondents with an age of 4 months are 4 respondents (40.0%) more than respondents with an age of 2 and 5 months, which each have 1 respondent (10.0%).

Gender, shows that respondent with female gender are 7 respondents (70.0%) more

than respondents with male gender which are only 3 respondents (30.0%).

DPT Immunization, shows that respondents who received DPT 2 and DPT 3 vaccinations each have 4 respondents (40.0%) more than respondents who received DPT 1 vaccination with 2 respondents (20.0%).

b. Ice Compression Group

Age, shows that all respondents from 2 months to 6 months of age have the same number of values, namely each gets 2 respondents (20.0%).

Gender, shows that there are 7 female respondents (70.0%) more than male respondents who only have 3 respondents (30.0%).

DPT Immunization, Showing that the number of respondents who received DPT 2 vaccination is 5 respondents (50.0%) more than the number of respondents who received DPT 3 vaccination which is 2 respondents (20.0%).

2. Pain Level

Table 2. Distribution of Pain Response Level After Intervention

Pain Response Rate	Breastfeeding		Ice Compression	
	f	%	f	%
No Pain	0	0	0	0
Mild Pain	7	70	3	30
Moderate Pain	3	30	5	50
Severe Pain	0	0	2	20
Total	10	100	10	100

Based on Table 2, it can be seen that the pain response level of the respondents after being given the breastfeeding technique treatment, most of the respondents experienced mild pain as much as 7 respondents (70%), and 3 respondents (30%) experienced moderate pain. Meanwhile, the respondents who were given the ice compress technique mostly experienced moderate pain as many as 5 respondents (50%), 3 respondents (30%) experienced mild pain, and 2 respondents (20%) experienced severe pain.

Bivariate Analysis

Table 3. Statistical Test Result of the Difference between Breastfeeding and Ice Compress Technique

Variable	Mean Difference	p-Value
Breastfeeding	8,10	0,063
Ice Compress	12,90	
Technique		
*Mann-Whitney test	$p \geq 0,05$	
*Significant		

Based on Table 3, the results of data analysis after the Breastfeeding Technique and Ice Compress Technique were applied to the pain response in babies during DPT vaccination using the Mann Whitney test obtained a p-value of $0.063 \geq 0.05$, which means there is no difference between the breastfeeding technique and ice compress technique against the pain response in babies during DPT vaccination.

Discussion

The age range of the respondents in this research is 2-6 months. The majority of the respondents in this study were 4 months old as many as 6 people (30%) compared to 2 and 5 months old, each of which were 3 people (15%). According to Arief D. Kurniawan (2013) in Prasetyo (2010) and Ismanto (2010), age is an important variable in affecting pain in individuals. Young children have difficulty interpreting pain and procedures that may cause pain to arise (Prasetya, 2010).

Young children also cannot express words and have difficulty expressing verbally, the level of development will be in line with increasing age so that with increasing age tolerance to pain increases (Khoiriyah, 2016). At the time of immunization injections, it shows that there is a relationship between age and pain response during injections. Breastfeeding intervention can effectively reduce pain during immunization injections for babies of various ages up to 12 months (Prasetya, 2010).

The results of this study show that female respondents are more than male respondents, with 14 female respondents (70%), and 6 male

respondents (30%). Tolerance to pain has been a long-term research subject involving both men and women, but tolerance to pain can be influenced by some biochemical factors and is unique to each individual without showing gender (Potter, 2006).

Most of the types of DPT vaccinations in this research are DPT 2 vaccinations which amounted to 9 people (45%) while the least is only 5 people (25%). The type of vaccination is affected by various factors such as vaccine volume, needle diameter size and injection site, each type of vaccination has different results obtained by each baby. This is supported by research results that show that the difference in baby's response is not determined by the difference in the type of vaccination received by the baby (Khoiriyah, 2016).

Based on table 2, it shows that the level of pain response in babies during vaccination as measured by using FLACC pain scale, which is respondents who were given breastfeeding technique treatment experienced mild pain response with a total of 7 respondents (70%), while respondents who were given ice compress treatment experienced moderate pain response with a total of 5 respondents (50%).

From the Mann Whitney statistical test, the p-value obtained was $0.063 \geq 0.005$, which means that there is no difference between breastfeeding techniques and ice compress against pain response in babies when they are given DPT vaccinations. Breastfeeding is a type of non-pharmacological intervention that has been proven to minimize pain and have analgesic effects when procedures are performed on babies (Alfina et al, 2021).

This is due to the fact that breastfeeding can increase the hormone oxytocin in the baby's body, which is a hormone related to calmness and pain reduction when the baby is given an injection vaccination (Devi, 2018).

According to Estiyanti, 2017, the ice compression technique is a body temperature maintenance action performed using small ice cubes with the purpose of numbing pain and

stopping bleeding. Ice compression can also be defined as the action of attaching or wrapping a collection of ice on the surface of the skin with a cloth boundary so as not to cause excessive coldness (Choirunnisa et al, 2020).

By providing ice compression, it can reduce pain and discomfort due to needle punctures because it functions as an effective, affordable, easily accepted, and non-infective local anesthetic. Although there is no significant difference between breastfeeding techniques and ice compression in statistical tests, if seen from the scores obtained using the FLACC pain scale in the breastfeeding technique group is lower compared to the ice compression group.

CONCLUSION

There is no difference between breastfeeding and ice compress techniques in terms of pain response in babies during DPT vaccination.

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CONFLICT OF INTEREST

There is no conflict of interest in this research.

REFERENCES

- Roth Ga, Picece Vctm, Ou Bs, Luo W, Pulendran B, Appel Ea. Designing Spatial And Temporal Control Of Vaccine Responses. Vol. 7, Nature Reviews Materials. Nature Research; 2022. P. 174–95.
- Pan J, Wang Y, Cao L, Wang Y, Zhao Q, Tang S, Et Al. Impact Of Immunization Programs On 11 Childhood Vaccine-Preventable Diseases In China: 1950–2018. The Innovation. 2021 May 28;2(2).
- Estiyanti Ni. Pengaruh Kompres Es Terhadap Respon Nyeri Imunisasi Booster Pada Batita Di Puskesmas Kota Yogyakarta Tahun 2017 Imunisasi Booster Pada Batita Di Puskesmas Kota Yogyakarta Tahun 2017. Kebidanan. 2018;
- Who. World Health Statistics 2010. World Health Organization; 2010. 177 P.
- Lukito A. Cakupan Imunisasi Dasar Terhadap Standar Pelayanan Minimal Di Puskesmas Desa Binjai. Best Journal (Biology Education, Sains And Technology). 2019;2(1):40–5.
- Devi Ps. Pengaruh Teknik Breastfeeding Terhadap Respon Nyeri Pada Bayi Saat Imunisasi. 2018;
- Aminina Sz. Pengaruh Vaksin Dpt Seluler Dan Vaksin Dpt Aseluler Pada Bayi Usia 2-6 Bulan. Skripsi Fk Universitas Muhammadiyah Palembang. 2014;
- Fatriansari A, Ilmi_Jurnal B, Multi I, Kesehatan S, Studi P, Keperawatan I, Et Al. Pengaruh Kompres Dingin Terhadap Penurunan Skala Nyeri Pemasangan Infus Pada Anak Pra Sekolah Asih Fatriansari.
- Abdullah Vi, Haisah H. Efektifitas Baby Spa Terhadap Kualitas Tidur Bayi Umur 5-12 Bulan. Malahayati Nursing Journal. 2022 Jan 1;1(1):140–7.
- Tiansa Barus D, Dwi Yanti Institut Kesehatan Deli Husada Deli Tua M. The Influence Of Breastfeeding Action On Immunization Pain Intensity In Baby In East Ledong Village, Aek Ledong District, Asahan District [Internet]. Vol. 3, Jurnal Penelitian Keperawatan Medik.

2020. Available From: [Http:// Ejournal. Delihusada. Ac.Id/Index.Php/Jpkm](http://ejournal.delihusada.ac.id/index.php/jpkm)
- Global Breastfeeding Scorecard 2022
Protecting Breastfeeding Through
Further Investments And Policy Actions.
- Lyons Ke, Ryan Ca, Dempsey Em, Ross Rp,
Stanton C. Breast Milk, A Source Of
Beneficial Microbes And Associated
Benefits For Infant Health. Vol. 12,
Nutrients. Mdpi Ag; 2020.
- Sulandari T, Utami W. Physical Intervention
On Pain Scales In Babies After
Immunization Procedures. Available
From: [Https://Doi.Org/10.2991/978-2-494069-49-7_41](https://doi.org/10.2991/978-2-494069-49-7_41)
- Sugiyono. Metode Penelitian Kuantitatif,
Kualitatif, Dan R&D. Bandung:
Alfabeta; 2015.
- Prasety I. Study Komperatif Pemberian Asi
Dan Topikal Anestesi Terhadap Respon
Nyeri Imunisasi Pada Bayi Di
Puskesmas Bahu Manado. 2010;
- Khoiriyah D. Model Pengembangan
Kecakapan Berbahasa Anak Yang
Terlambat Berbicara (Speech Delay)
Khoiriyah 1) , Anizar Ahmad 2) ,Dewi
Fitriani 3). Model Pengembangan
Kecakapan Berbahasa Anak Yang
Terlambat Berbicara (Speech Delay).
2016;1(1):36–45.
- A Potter, & Perry Ag. Konsep, Buku Ajar
Fundamental Keperawatan: Proses, Dan
Praktik. Jakarta: Egc; 2006.
- Alfina L, Annisa F, Keperawatan A, Husada K.
Studi Literatur : Pemberian Asi Terhadap
Respon. 2021;5(1).
- Choirunissa R, Widowati R, Anandah Hp.
Effectiveness Of Warm Compress And
Cold Compress For Pain Management In
Dpt-Hb-Hib Immunization At Bpm “ D ”
Neglasari Tangerang City Banten In
2020. Strada Jurnal Ilmiah Kesehatan.
2021;10(1):943–51.