

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. Meanwhil 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 Wilxocon 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.

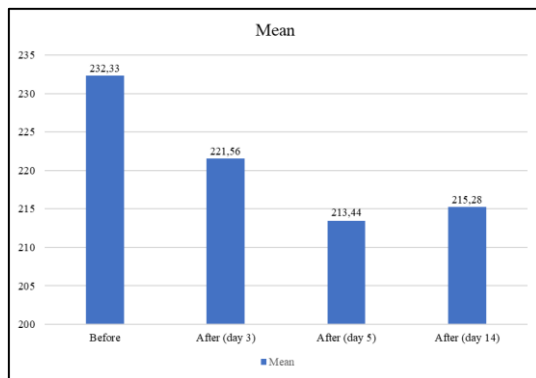


Figure 1. Sample of average blood sugar levels before and after diabetic foot exercises

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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