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IRON FOLIC ACID (IFA) SUPPLEMENTATION IN SCHOOLS FOR ADOLESCENTS: BARRIERS AND SUPPORT FACTORS

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ABSTRACT

Background: *Weekly iron and folic acid supplementation in schools is considered an effective measure to increase hemoglobin levels and has been adopted as one of the national health policies. In addition, the school-based weekly iron and folic acid supplementation program aims to improve compliance and reduce the possibility of side effects without reducing effectiveness. Increasing the WIFAS (weekly iron folic acid supplementation) program to reach larger populations are a challenge in some developing countries. This study aims to analyse Weekly IFA Supplementation program (WIFAS) in schools for adolescents has been proven to reduce the prevalence of anemia.*
Method: *Preferred Reporting Items for Review Systematic Review and Meta-Analysis (PRISMA) was used to review articles not earlier than 2019 for scientific reports in English. The navigation terms used are supplementation Iron Folic Acid; adolescents, ten criteria of the paper meet the criteria for assessment.*
Result: *By identifying the barriers in the weekly IFA (iron folic acid) tablet supplementation program, supporting factors will be found to reduce the barriers of the WIFAS program appropriately. Low knowledge and compliance of adolescents, lack of teacher participation in health education and supervision of IFA consumption are the barriers found.*
Conclusion*: Providing health education by combining several media and methods accompanied by supervision by peers or teachers during IFA consumption has succeeded in increasing the knowledge, attitudes, intentions, motivations, and behavior of adolescents in taking IFA tablets, ultimately reducing anemia. It is hoped that the results of this review can be used as a way to increase the coverage of weekly supplementation programs in schools.*

Keywords: *Iron Folic Acid; Supplementation; Adolescents*

INTRODUCTION

Anemia is a decrease in red blood cells or hemoglobin (Hb) concentration. (WHO, 2015, 2011) About 50% of anemia cases are caused by iron deficiency which occurs due to a lack of iron available to produce red blood cells normally. (WHO, 2015; WHO, 2005; Tesfaye, et.al, 2015) The World Health Organization (WHO) defines adolescence as the period between the ages of 10 and 19 years. About a quarter of adolescents in developing countries suffer from anemia,HoweverThe estimated prevalence of anemia in adolescents in the Southeast Asia region ranges from 27% to 55% (WHO, 2006). Adolescents' vulnerability to anemia is generally due to the biological need for micronutrients (such as iron and folate) associated with rapid physical growth, as well as the loss of these micronutrients due to parasitic infestations such as malaria and hookworm (de Benoist, et.al, 2008). In late adolescence, males rapidly regain adequate nutrient stores, while females remain susceptible to anemia due to menstrual blood loss. Therefore, females may continue to be anemic or become more anemic due to increased micronutrient needs from menstruation, pregnancy, and lactation. (Prentice, 2015) Anemia not only negatively

impacts the physical growth of adolescents, but also prevents them from reaching their full potential by reducing educational achievement and work productivity (WHO, 2006).

Anemia is also one of the main problems in adolescents in Indonesia. Research data from various regions in Indonesia shows that the prevalence of anemia in adolescent girls ranges from 32.4–61% (Ministry of Health of the Republic of Indonesia, 2015). Weekly iron and folic acid supplementation in schools is considered an effective step to increase hemoglobin levels and has been adopted as one of the national health policies (Ministry of Health of the Republic of Indonesia, 2014). In addition, the school-based weekly iron and folic acid supplementation program aims to increase compliance and reduce the possibility of side effects without reducing effectiveness (Briawan, 2008; Joshi, 2013). However, compliance with supplementation is still low. The 2018 basic health research found that the high coverage of iron supplements in schools (80.9%) was not followed by high consumption of iron supplements according to needs, reported only 1.4% of adolescent girls in schools consumed 52 tablets (Ministry of Health of the Republic of Indonesia, 2018).Scaling up weekly iron folic acid (WIFAS) programs to reach larger populations is a challenge in some developing countries. There are many barriers to successful implementation, such as supply chain management, inadequate procurement plans, and lack of understanding about anemia, the function of IFA supplements and how to deal with side effects of IFA consumption (Joshi, 2013). These barriers lead to low compliance with IFA supplement consumption.

METHODS

By using Literature Study, scientific article search using Science Direct, Scopus, and Proquest databases for the period 2019–2023. Data collection using database-based data was carried out by entering the keywords “Iron Tablets, Supplementation Anemia, Adolescents”. Three electronic databases were searched until October 2023. Keywords were identified to improve results related to the Fe supplementation program to reduce anemia in adolescents. There were 860 articles screened. From Science Direct there were 137 articles, Scopus 72 articles, Proquest 651 articles. After adding filters related to subject, language, respondent gender, journal coverage, research articles, and open access, 366 articles were obtained. Articles published before 2019 were assumed to be incompatible with this year's conditions. Of the 366 articles, they were re-screened for full text, duplicate publications, and eligibility, 29 articles were finally obtained. Then the last process was reading and selecting articles based on inclusion and exclusion criteria, 10 relevant articles were obtained (Table 1). Article evaluation based on; Inclusion criteria: articles discussing iron supplementation, published in 2019-2023, national and international publications, national journals have ISSN, using Indonesian and English, original research, open access. Exclusion criteria: non-adolescent population, anemia interventions other than IFA supplementation, texts in the form of short communications, meta-analyses, and literature reviews.

Table 1. Description of Research Article

Author, year, research area	Design, objectives, research sample	Research Findings	Obstacle	Support Factor to Enhance Programs
Gosdin, L et al (2021), Ghana	Design: longitudinal study, Objective: to evaluate the context-specific effectiveness of a school-based integrated anemia control program with IFA supplementation. Sample: 1,551 adolescents	The calculation of the minimum effective number of IFA tablets shows that increasing compliance will improve program outcomes. The program target should be higher than the current target of 10 tablets in 1 school year.	Student non-compliance in taking IFA tablets. Lack of teacher role.	Targeting supplementation program issues in schools and increasing teacher engagement.
Gosdin, L et al (2020), Ghana	Design: longitudinal and cross sectional. Objective: to evaluate barriers and facilitators to fidelity of a school-based anemia reduction program with weekly IFA supplementation. Sample: 1,387 adolescents	Schools are ultimately responsible for coverage and compliance with IFA supplementation.	Student non-compliance with the program. Lack of student knowledge about anemia and supplementation programs. Missed IFA distribution.	Ensure annual training for school staff, including leaders, that includes guidance on addressing missed IFA distributions.
Bali, S & Alok, Y (2022), India.	Design: cross sectional Objective: to assess knowledge about the WIFAS program in adolescents. Sample: 3,213 adolescents.	Knowledge of the WIFAS program was significantly associated with the incidence of anemia and the severity of anemia.	Lack of student knowledge about anemia and the WIFAS program.	Ensuring availability of IFA tablets, monitoring side effects, training for school authorities and health workers. Educational interventions based on problem-based learning and behavior change theory. Utilizing mass media and peer advocacy.
Shinde, S, et.al (2021). India.	Design: longitudinal study. Objective: to examine the relationship between IFA supplementation, deworming, and dietary diversity.	It is important to identify contextual and structural barriers to adherence. Students receiving IFA had higher hemoglobin.	Lack of knowledge, attitudes, beliefs, and compliance of students towards the IFA supplementation program.	Evidence-based science strategies and implementation must be used. Ensuring compliance is not just about IFA distribution.
Madanijah, et.al. (2020). Indonesia	Design: cross sectional. Objective: to determine students' determinants in consuming IFA.	Schools are responsible for the coverage and compliance of students consuming IFA.	Respondents were not compliant because they considered IFA unnecessary. Lack of health media	Building teacher capacity in educating students to consume IFA. The WIFAS program must involve the education and health

Author, year, research area	Design, objectives, research sample	Research Findings	Obstacle	Support Factor to Enhance Programs
	Sample: 274 high school female adolescents.		Lack of knowledge about anemia and IFA.	sectors and coordinate with other sectors.
Alifah, E, et.al. (2020). Indonesia.	Design: cross sectional. Objective: to assess coverage and compliance with the WIFAS program among school-going adolescent girls. Sample: 1,856 adolescent girls.	Coverage and compliance in consuming IFA is very low in adolescent girls.	Compliance with the WIFAS program. Implementation of different WIFAS program rules. The IFA awarding system varies from school to school.	WIFAS program campaign by making 1 day an IFA drinking day under the supervision of teachers and peers.
Jafari, et.al. (2023). Iran.	Design: cross sectional. Objective: to examine the barriers and facilitations of the WIFAS program. Sample: 399 adolescent girls.	Students are more obedient in consuming IFA when there is education about IFA from teachers.	Lack of knowledge about IFA and anemia. Lack of means to drink IFA in class.	The most important facilitators of IFA supplement use are distribution by students, health education, and teachers' positive attitudes toward the WIFAS.
Madestria, et.al. (2021). Indonesia.	Design: quasi-experimental. Objective: The effect of anemia video education and IFA packaging modification on IFA drinking behavior. Sample: 62 adolescent girls.	Education with videos about anemia and modification of IFA packaging increases student compliance in consuming IFA.	Low knowledge, attitudes, intentions, and compliance of adolescents towards the WIFAS program.	The use of two or more media simultaneously in health education will have a stronger influence on changes in IFA consumption behavior.
Rusdin, et.al. (2021). Indonesia.	Design: quasi experiment. Objective: The influence of the active, creative, effective, and enjoyable learning education model on WIFAS compliance. Sample: 249 adolescent girls.	The active, creative, effective and enjoyable learning education model increases the knowledge, attitudes and motivation of adolescents about anemia and IFA consumption.	Low knowledge, attitudes, and motivation affect the WIFAS program.	Combining complementary health education media and methods increases the effectiveness of WIFAS program interventions.
Singh, et.al. (2020). India.	Design: quasi experiment. Objective: effectiveness of one month of education on knowledge and compliance with WIFAS. Sample: 210 adolescent girls	The WIFAS program accompanied by health education increases the chances of overcoming anemia in adolescent girls.	Knowledge and compliance in consuming IFA in adolescents.	At least health education about anemia and WIFAS is provided once a month.

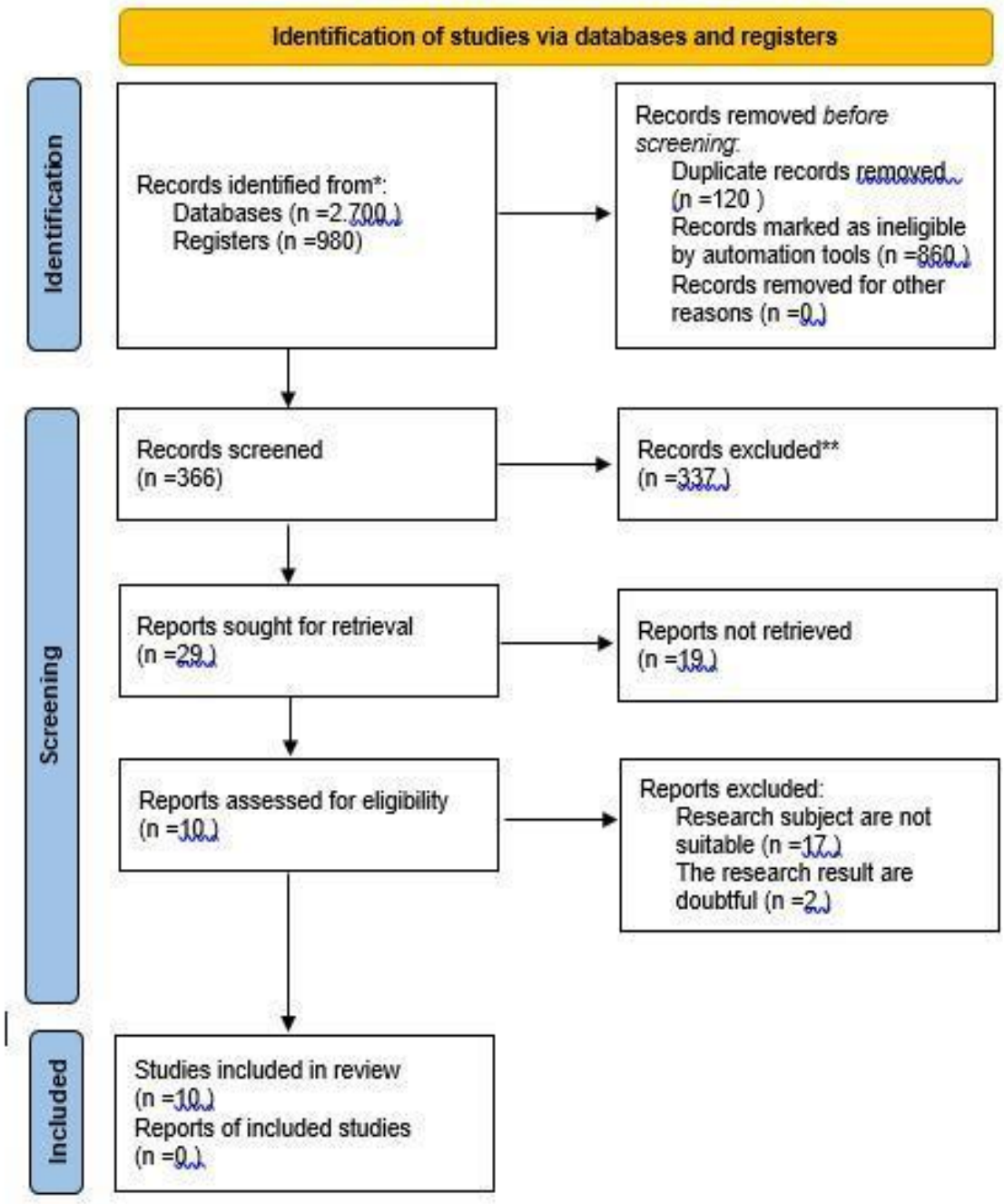

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flow diagram of study selection

RESULTS AND DISCUSSION

The results of the literature review show that pheredity the prevalence of anemia in the population by 5.4 points, meaning a reduction of around 22,000 cases of anemia among adolescent girls in schools in the surveyed area in just 8 months.

Compliance with weekly iron folate supplementation (WIFAS) program was lower than with similar iron folate (IFA) programs (Vir SC, et.al, 2008; Risonar, et.al, 2008), this

implies a program bottleneck. Barriers such as supply chain, training, stakeholder engagement, side effects, and perceptions have been identified by similar programs in other countries and may be causes of low compliance (Aguayo, et.al, 2013; Roche, et.al, 2018; Priya, et.al, 2016). In this evaluation, only 3% of schools missed the distribution of IFA tablets due to lack of supplies, and other school factors, including school-level teacher training, distribution, and perceptions. teacher, is associated with obedience (Gosdin, et.al, 2020). In this study 26.7 tablets weekly during the school year may be the minimum effective number of IFA tablets for 1 school year in the population (Gosdin, et.al, 2021). Gosdin's (2020) study found that the ability to make IFA distributions without missing was the only statistically significant student-level predictor. In addition, teacher training on the WIFAS program, and teacher experience and perceptions of the program were significant predictors at the school level. In schools that reported problems with refusing to take IFA tablets, female students consumed an average of 4.02 ($P < 0.05$) fewer tablets. In schools where teacher respondents at the school considered the program difficult to implement and too time-consuming, female students consumed an average of 6.92 ($P < 0.01$) and 4.41 ($P < 0.05$) fewer tablets over 1 school year. Teacher training on the program remained the main predictor of the number of IFA tablets consumed, even in the adjusted model. Educators' experiences and perceptions of the program can influence their motivation and ultimately the performance of the WIFAS program in their schools. This is supported by research showing that knowledge of risks and benefits improves adherence to micronutrient interventions (Tumilowicz, et.al, 2019; Ford, et.al, 2019). Female students with low knowledge of IFA often thought the tablets were related to reproductive health, such as menstrual regulation, contraception, or fertility drugs (Malhotra, et.al, 2015). Annual training and additional training for school staff including other key stakeholders such as principals increased teacher loyalty and perceptions and motivation towards the program. Proper management of IFA tablets increased the availability of IFA tablets, improving schools' ability to maintain knowledge of the location, quantity, and condition of their stock. Challenges such as improper storage of IFA tablets can be addressed through adequate training at all levels (Malhotra, et.al, 2015; Jefferds, et.al, 2015; Reerink, et.al, 2017), frequent interaction between health staff and teachers, and thorough monitoring (Risonar, et.al, 2008). Similar findings were also conveyed from a similar study which stated that the main barriers to effective iron supplementation programs worldwide are lack of knowledge about the program, low compliance with iron tablet consumption due to potential adverse effects of the tablets, and irregular supply of good quality iron tablets (Malhotra, et.al, 2015). Knowledge of WIFAS has been shown to play a significant role in optimal coverage and utilization of IFA. (Bali and Alok, 2022) The findings of this study also suggest that the valuable insights gained from the success of the WIFAS trial have not been fully translated and assimilated into the rollout of the national program, which includes inclusion of all stakeholders, peer advocacy, and settlement problem Which fast. Problem implementation, continuous availability of supplements, and technical support and supervision (Sudfeld, et.al, 2020). Compliance is also influenced by knowledge, according to the results of Apriningsih's study (2019) The majority of respondents were not compliant in consuming IFA (62.8%) with the most common reason being that they considered it unnecessary (36.1%) and the factors that most influenced the decision to consume IFA were their knowledge about anemia and the benefits of IFA (37.2%), (51.1%) had checked their Hb but did not know or forgot the results (44.5%). Only 36.5% of schools implemented IFA

routinely once a week, while 50.4% of respondents stated that their teachers had conveyed about anemia and the benefits of IFA, and only 6.2% of respondents stated that their schools had health education media about anemia and the benefits of IFA. Only 39.8% of respondents mentioned that there was health education from health center officers (community health centers (Madanijah, et.al, 2020). The Ministry of Health should supervise the procurement and distribution of IFA supplies and coordinate with other sectors. The education office must implement this program with support from the school community, especially school teachers (Malhotra, et.al, 2015). A study in two provinces in Indonesia showed that the level of compliance in consuming IFA supplements was very low, namely 1% in East Java, and 0% in East Nusa Tenggara. On average, adolescent girls only consumed 0.4–0.7 tablets in the last 6 months. This coverage rate is very low so that the level of compliance also shows a very low figure, among adolescent girls who had received IFA in July to December 2017, only 22% in East Java and less than 1% in East Nusa Tenggara received IFA according to the recommended scheme (24 tablets in 6 months) (Alfiah, et.al, 2020). In some countries, knowledge about the benefits and potential side effects of IFA tablets from health workers health and society are the keys to the success of iron supplementation programs for both adolescent girls and pregnant women (Vir SC, et.al, 2008; Compaore, et.al, 2018; Niquini, et.al, 2016). Compliance also causes IFA tablets that have been received but not consumed,there may be many obstacles in supervision of weekly IFA supplementation administration through schools and health workers, in addition the IFA supplementation program has not operationalized the additional components of the 'test and treat' strategy, namely anemia screening and referral of cases to appropriate health facilities. The implementation of the program in the community is influenced by various factors, including support, resistance, or indifference from caregivers and other community members, as well as cultural and media norms, and educational activities. (Kapil, et.al, 2019) To close this policy-to-practice gap, evidence-based science and implementation strategies must be used. For example, teachers and frontline health workers must act to improve adolescents' knowledge, attitudes, and beliefs about IFA supplementation and ensure compliance beyond just distribution. (Shinde, et.al, 2021) Compliance is also influenced by peers as distributors, when the supplements are distributed by fellow students, the level of IFA consumption increases. One of the most effective groups in choosing health behaviors by students is the peer group, and adolescents are usually most influenced by their friends (Matos, et.al, 2012). Therefore, one of the groups in schools that is effective in encouraging students to behave healthily is the peer group. Educational programs increase the use of iron supplements by students, students use iron supplements or IFA more when educational programs are provided by teachers. It seems to provideTeacherhealth in every school may be one of the best ways to improve the quality of program implementation (Jafari, et.al, 2023).WIFAS accompanied by health education can overcome anemia, compliance is almost 100%, because the consumption of IFA tablets is directly supervised. In developing countries like India with a large adolescent population, WIFAS with health education can be seen as an important nutritional intervention. WIFAS increases compliance, reduces side effects, and is cost-effective compared to daily medication (Singh, et.al, 2020). If the media and health education methods are combined, they will complement each other. Using a health education program with an active learning approach that is conditioned creatively, effectively, and pleasantly. to improve knowledge, attitudes, motivation, and practices of taking Fe tablets in adolescent girls. can be an option. There is an influence of the

active learning education model that is conditioned creatively, effectively, and pleasantly and leaflet media and audiovisual media to increase respondents' knowledge about anemia and Fe tablets, active learning methods that are conditioned creatively, effectively, and fun increase respondents' motivation and actions in consuming IFA tablets. Respondent compliance in taking IFA tablets every week for 8 weeks is higher by 91.4% (Rusdin, et.al, 2021). In addition to active learning that is conditioned creatively, effectively, and fun, education in the form of videos and packaging modifications can also increase the knowledge of adolescent girls. In a study of the impact of a combination of audio-visual media in the form of educational videos about the importance of iron tablets and modifications to iron tablet packaging which are printed media, simultaneously had a more significant influence on changes in knowledge, attitudes, and intentions (Madestria, et.al, 2021). If education is carried out periodically and continuously with two educational media at once, the behavioral changes formed in adolescent girls towards consuming iron supplementation will become permanent and sustainable behavior (Andriastuti, 2019).

CONCLUSION

The weekly IFA supplementation program or WIFAS in schools for adolescents has been proven to reduce the prevalence of anemia. However, in its implementation, there are still many obstacles, so that the goal of reducing anemia in adolescents has not been achieved. These obstacles are more due to the low knowledge of students about IFA and anemia, which will ultimately lead to non-compliance in taking IFA. In addition to the non-compliance factor, other causes are the lack of teacher role in providing health education about IFA and anemia and the lack of teacher supervision when adolescents take IFA tablets. And the most common obstacle is related to the availability and distribution of IFA in schools. So from these obstacles, various supporting solutions need to be found to overcome the obstacles. Supporting factors as solutions that can be provided are teacher training on the WIFAS program which is expected to provide motivation and supervision that increases student knowledge and compliance (adolescents). In addition, by increasing the involvement of the principal as an influential leader. In providing health education, it should also pay attention to the media and methods used, for example by combining several media and methods at once in providing health education with the aim of making students active, creative, effective and enjoyable for students. Thus, it will increase students' knowledge, attitudes, intentions, motivation and behavior to consume IFA weekly.

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CONFLICT OF INTEREST

The author hereby declares that there is no conflict of interest with any party.

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