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Improvement In Adolescent Girls' Knowledge Of Iron Tablet Consumption Following Leaflet-Based Health Education

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ABSTRACT

Background: Adolescence is a transitional period characterized by rapid physical growth and development, requiring adequate nutritional intake, particularly iron (Fe), which plays an essential role in hemoglobin formation. Iron deficiency can lead to anemia, a common nutritional problem among adolescent girls. The prevalence of anemia among adolescents in Aceh reached 33.8%, while in West Aceh Regency, it was recorded at 35.1% in 2023. Limited knowledge and inadequate access to health information contribute to low awareness and compliance with Fe tablet consumption. Health education through leaflet media is considered an effective approach because it provides concise, attractive, and easily accessible information that adolescents can read independently. Objective: This study aimed to determine the effect of health education using leaflet media on improving adolescent girls' knowledge regarding Fe tablet consumption at SMP Negeri 1 Meulaboh, West Aceh Regency. Methods: This study employed a quasi-experimental design using a one-group pretest-post test approach. A total of 68 adolescent girls were selected as respondents through proportionate stratified random sampling. The study was conducted in September 2025. Data were collected using questionnaires administered before and after the health education intervention. The Wilcoxon signed-rank test was used to analyze differences in knowledge scores. Results: The statistical analysis revealed a significant difference in adolescent girls' knowledge before and after the health education intervention using leaflet media, with a p-value of 0.000 ($p < 0.05$) and a Z-value of -7.028. These findings indicate a significant improvement in knowledge following the intervention. Conclusion: Health education using leaflet media significantly improves adolescent girls' knowledge regarding Fe tablet consumption. Therefore, leaflets can be used as an educational medium to support anemia prevention programs among adolescent girls in schools.

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INTRODUCTION

Adolescence is a transitional period marked by rapid physical and psychological changes, requiring optimal iron (Fe) intake for hemoglobin synthesis (Ministry of Health of the Republic of Indonesia, 2022). Despite national distribution programs, iron deficiency anemia remains a major public health challenge; globally, 29.9% of adolescent girls aged 15–19 years are affected (WHO, 2025), while in Indonesia, compliance with taking Iron Supplement Tablets (TTD) at least 52 tablets per year remains critically low at 1.4% (Ministry of Health, 2022b). Regionally, the prevalence is similarly alarming, reaching 33.8% in Aceh Province and 35.1% in West Aceh Regency (West Aceh Health Office, 2023). This low compliance is driven primarily by inadequate knowledge, negative side effect perceptions, and limited access to clear health information (Susanti & Nursalam, 2021).

While previous studies indicate that educational interventions can improve knowledge and supplementation compliance (Sugiyono, 2024) (Sugiarti et al., 2020), the success of school based health promotion heavily depends on selecting appropriate educational media (Widyaningsih & Astuti, 2021). Print media such as leaflets offers a concise, visual, and cost-effective solution that supports *self-paced learning* (Astuti & Handayani, 2022).

Nevertheless, a notable research gap remains. Most contemporary adolescent health interventions rely heavily on digital or audio-visual platforms conducted predominantly in urban settings (Taryzafitri et al., 2025). There is a scarcity of empirical evaluations examining structured print interventions specifically zigzag fold (*Z-fold*) leaflets targeting secondary school students in semi-suburban regions where technological infrastructure varies (Adyani et al., 2024). Furthermore, a preliminary study at SMP Negeri 1 Meulaboh revealed a distinct practical gap: although general counseling had been provided, 7 out of 10 female students still lacked fundamental comprehension regarding Fe tablets and failed to maintain regular consumption.

Unlike previous broad educational studies, this study distinctly differentiates itself by evaluating the specific, measurable cognitive impact of structured *Z-fold* leaflets combined with an intensive reinforcement schedule in a semi-suburban secondary school setting. Therefore, this study aims to analyze the effect of health education using leaflets on increasing the knowledge of adolescent girls regarding Fe tablet consumption at SMP Negeri 1 Meulaboh, West Aceh Regency. The findings are expected to provide actionable empirical evidence for optimizing school-based anemia prevention strategies in similar resource-limited regions.

METHOD

This study employed a quasi-experimental design with a one-group pretest-posttest design (Sugiyono, 2024). The population comprised all female students in grades VII, VIII, and IX at SMP Negeri 1 Meulaboh, West Aceh Regency, totaling 205 students.

The population in this study was all female adolescents in grades VII, VIII, and IX at SMP Negeri 1 Meulaboh, West Aceh Regency, totaling 205 students. The sampling technique used *proportionate stratified random sampling* to ensure proportional representation of the 14 study groups. The sample size was determined using the Slovin formula with a *margin of error* (*e* = 0.1).

Slowvin's formula:

$$n = \frac{N}{1 + N(d^2)} = 68 \text{ Responden}$$

The intervention program was administered over a one-week period, structured into three interactive educational sessions lasting 30-45 minutes each. Data collection began with a baseline pretest on Day 1, followed by the delivery of educational sessions using *Z-fold* leaflets covering anemia definitions, iron tablet benefits, optimal consumption timing (nighttime before sleep to reduce nausea), and absorption enhancers versus inhibitors (tea, coffee, and milk). An immediate post test evaluation was conducted on Day 7 to measure knowledge changes. Prior to the study, formal ethical approval, administrative school permission, written parental informed consent, and active student assent were successfully obtained to guarantee voluntary participation and confidentiality.

The research instrument utilized a structured questionnaire containing 20 validated multiple-choice questions (correct answer score = 1, incorrect = 0), categorized into Good (76–100%), Sufficient (56–75%), and Poor (<55%). The questionnaire demonstrated high validity (r > 0.444) and reliability (Cronbach's Alpha = 0.769). Uni variate analysis presented frequency distributions, whereas bi variate hypothesis testing utilized the non-parametric Wilcoxon Signed-Rank Test at a 95% confidence level (alpha = 0.05) due to a non-normal data distribution identified via the Kolmogorov-Smirnov test (p < 0.05).

RESULTS AND DISCUSSION

Table 1. Frequency Distribution of Respondents' Age Characteristics

Age (Years)	*f*	%
13	27	39.7
14	24	35.3
Total	**68**	**100**

Table 2. Distribution of Respondents' Knowledge Level Before Intervention (Pretest)

Knowledge	*f*	%
Good	5	7.4
Enough	59	86.8
Not enough	4	5.9
Total	**68**	**100**

Table 3. Distribution of Respondents' Knowledge Level After Intervention (Posttest)

Knowledge	*f*	%
Good	62	91.2
Enough	6	8.8
Not enough	0	0
Total	**68**	**100**

Table 4. Analysis of the Influence of Leaflet Media Health Education on the Knowledge of Adolescent Girls

Knowledge	Mean	Elementary School	Min	Max	Z	*P-Value*
Pre-Test	63.9	6.6	50	75	-7,028	0,000
Post Test	80.4	8.1	55	95		

The findings showed that most respondents were 13 years old (39.7%; 27 students), while the smallest proportion was aged 12 years (25.0%; 17 students). This age distribution reflects the early adolescent stage, during which physical growth and development increase the body's nutritional requirements. Adequate iron intake is particularly important during this period because iron plays a central role in hemoglobin production and helps prevent iron deficiency anemia.

Before the intervention, most respondents had a moderate level of knowledge regarding Fe tablet consumption (86.8%; 59 students). Only 7.4% (5 students) demonstrated good knowledge, while 5.9% (4 students) had poor knowledge. The mean pretest score was 63.9 (SD ± 6.6), with scores ranging from 50 to 75. These findings suggest that although most students already had some understanding of Fe tablets, their knowledge was not yet sufficient in several practical aspects of iron supplementation. Responses to the questionnaire indicated that students had difficulty identifying the appropriate time to take Fe tablets, understanding the role of vitamin C in improving iron absorption, and recognizing beverages or foods that may interfere with iron absorption, such as tea, coffee, and milk.

This gap in knowledge highlights the importance of providing adolescents with clear and accessible information about iron supplementation. Previous studies by Indriani et al. (2025) and Maharani et al. (2025) also reported that the availability of school-based iron supplementation programs does not necessarily ensure that adolescents fully understand the benefits and appropriate use of Fe tablets. In this

regard, Larasati et al. (2024) emphasized that knowledge about anemia is an important foundation for developing preventive health behaviors. Therefore, health education needs to go beyond introducing the benefits of Fe tablets and should also address practical information that students can apply in their daily lives.

By following the health education intervention using zigzag-fold leaflet media (Z-fold), respondents demonstrated a considerable improvement in their knowledge. The proportion of students with good knowledge increased from 7.4% (5 students) to 91.2% (62 students). In contrast, the proportion with moderate knowledge decreased from 86.8% (59 students) to 8.8% (6 students), while none remained in the poor knowledge category. The mean knowledge score also increased from 63.9 (SD ± 6.6) to 80.4 (SD ± 8.1). These changes indicate that the educational intervention helped students gain a better understanding of Fe tablet consumption, particularly in areas where their initial knowledge had been limited.

The statistical findings supported this improvement. The Wilcoxon signed-rank test showed a significant difference between pretest and posttest knowledge scores ($Z = -7.028$; $p < 0.001$). This result indicates that health education delivered through leaflet media was associated with a significant improvement in adolescent girls' knowledge about Fe tablet consumption at SMP Negeri 1 Meulaboh. The improvement may be related to the way information was presented in the leaflets. By combining concise explanations, organized content, and visual illustrations, the material made health information easier to follow and understand. Rather than relying solely on verbal explanations, students could also refer to the written information to reinforce what they had learned.

Similar findings were reported by Mahdi et al. (2023), who found that leaflet-based health education significantly improved adolescent girls' understanding of iron supplementation. The use of printed educational materials allows information to be presented in a simple and accessible manner, making it easier for students to understand health topics that may otherwise seem unfamiliar. Another advantage of leaflets is that students can keep them and revisit the information independently. This opportunity for repeated reading may help strengthen their understanding and retention of the material. Fitriani and Samria (2021) similarly highlighted the role of visual educational media in supporting information processing and knowledge acquisition.

The findings are also consistent with studies by Sari and Husna (2022) and Deviyanti et al. (2026), which reported positive effects of leaflet-based education on adolescents' understanding of iron supplementation and their compliance with Fe tablet consumption. One possible explanation is that providing accurate and straightforward information can help address common misconceptions about Fe tablets, including concerns about nausea, unpleasant taste, and potential side effects. When adolescents understand the purpose and proper use of iron supplements, they may be better prepared to make informed decisions

about their health. However, improved knowledge should not automatically be interpreted as improved compliance, as actual consumption behavior may also be influenced by family support, school policies, availability of supplements, and individual attitudes.

The use of Z-fold leaflets also offers practical advantages for school-based health education, particularly in areas where access to digital learning resources may differ among students. Unlike digital media, printed leaflets do not require internet access or electronic devices and can be distributed and used easily within the school environment. Their relatively low cost and flexibility make them a feasible option for supporting health promotion activities, especially in schools with limited educational resources.

Finally, the findings demonstrate that health education using Z-fold leaflet media can significantly improve adolescent girls' knowledge regarding Fe tablet consumption. The improvement in both knowledge categories and mean scores suggests that providing clear, accessible, and well-organized educational information can help address gaps in adolescents' understanding of iron supplementation. Integrating leaflet-based education into school health programs may therefore serve as a practical approach to strengthening anemia prevention efforts. Nevertheless, further research involving a control group and direct measurement of Fe tablet consumption is needed to determine whether improvements in knowledge are sustained and translated into better consumption practices.

CONCLUSION

Health education using leaflets has been shown to significantly improve adolescent girls' knowledge about consuming iron tablets at SMP Negeri 1 Meulaboh, West Aceh Regency. The use of practical, concise, and visual educational media significantly improved adolescents' cognitive domains, from poor to good.

Implications and Suggestions for Schools in collaboration with local Community Health Centers are advised to utilize leaflets as a routine educational instrument in the Iron Supplement (TTD) program at schools. For further researchers, it is recommended to conduct experimental research with a control group (*Randomized Control Trial*) and evaluate the impact of the intervention to the level of compliance with the behavior of consuming Fe tablets and hemoglobin levels of students.

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