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Prevention Of Anemia In Adolescent Girls Through Print Media Bookmarks For Adolescent Girls at SMP Negeri 11 Makassar City

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ABSTRACT

Background and Objectives: Stunting remains a major health challenge in Indonesia, particularly in rural areas. Iron deficiency leading to anemia can impair child growth and increase the risk of stunting. Adolescent girls are especially vulnerable to anemia due to inadequate iron intake, unbalanced diets, and low compliance with iron supplementation through weekly iron tablets (Tablet Tambah Darah or TTD). A lack of awareness regarding anemia and the importance of TTD contributes to the high prevalence of anemia and the long-term risk of stunting. Therefore, early health education is essential to equip adolescent girls with knowledge on anemia prevention and its implications for reproductive health and child development. This study aimed to improve adolescent girls' knowledge regarding the importance of iron tablet consumption as a preventive measure against anemia and stunting risk. Methods and Study Design. Health education was delivered through a counseling session using lectures and interactive Q&A methods, supported by printed bookmark media. The target group consisted of 75 female students at SMP Negeri 11 Makassar. Participants' knowledge was measured using a structured questionnaire administered as a pre-test and post-test. Data were analyzed using a paired t-test to evaluate the effectiveness of the intervention. Results. There was a significant increase in participants' average knowledge scores from 52.00 (pre-test) to 70.67 (post-test) after the educational session. The paired t-test showed a statistically significant difference (p = 0.000) between pre- and post-intervention scores. Additionally, participants demonstrated high enthusiasm and active engagement throughout the session. Conclusion. Educational intervention using printed bookmark media effectively improved adolescent girls' knowledge about iron supplementation. This increase in knowledge is expected to promote sustainable behavioral changes for anemia prevention and contribute to reducing the risk of stunting in the future.

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Key Messages:

- **The Importance of Anemia Prevention Among Adolescent Girls** Preventing anemia is a crucial step in reducing the risk of stunting in Indonesia, particularly among adolescent girls who experience increased iron requirements during menstruation and are vulnerable to inadequate nutritional intake.
- **Effectiveness of Printed Bookmark Media** Printed educational media such as bookmarks have proven effective in increasing knowledge about anemia and iron supplement consumption among junior high school students, as demonstrated by a significant improvement in knowledge scores following the intervention (from 52.00 to 70.67; p = 0.000).
- **Sustainable and Contextual Health Education** Providing education from adolescence using simple,

engaging, and accessible media like bookmarks is highly relevant in school settings, especially in areas with limited digital access, as part of a life-cycle approach to preventing anemia and stunting.

INTRODUCTION

Stunting is a chronic nutritional problem that remains a significant public health challenge in Indonesia, particularly in rural areas. The government continues to implement various interventions to reduce its prevalence. One contributing factor to stunting is anemia, which disrupts optimal growth and development in children.[1] Anemia remains prevalent among adolescent girls, primarily due to iron deficiency and a lack of knowledge about the importance of taking iron supplements, commonly referred to as *Tablet Tambah Darah* (TTD). Many female students report symptoms such as dizziness and fatigue during menstruation, when in fact, they are advised to take one iron tablet weekly to prevent anemia. Left unaddressed, anemia can lead to reduced immunity, impaired growth, and decreased academic performance. Hence, health education programs like *"Sabtu Sehat"* (Healthy Saturday) are essential to normalize the practice of taking iron supplements together, promoting better health and school performance.

According to the 2023 Indonesian Health Survey (SKI), the prevalence of anemia among individuals aged 15–24 years—representing the typical age of junior high school girls—was 15.5%. The 2024 Indonesia Nutritional Status Survey (SSGI) reported that the stunting prevalence among children under five was 19.8%, a decline from 21.5% in 2023. This translates to an estimated 4,482,340 stunted children in 2024, with the most significant decrease occurring in the 12–23 months age group.[2]

Anemia is generally caused by iron deficiency due to inadequate dietary intake, unhealthy eating habits, or blood loss—either acute or chronic. Adolescent girls are at greater risk than boys due to monthly blood loss during menstruation. A person is considered anemic when their hemoglobin level falls below 12.0 g/dL.[3] Preventing anemia should begin in adolescence—not only during pregnancy—as part of a broader 8000-day life cycle approach. Educational interventions delivered in schools as part of reproductive health programs are essential to raise awareness about anemia and its link to future stunting. Strategies include providing accurate information, regular hemoglobin screening, and routine iron supplementation.

Adolescence is a transitional period from childhood to adulthood, defined by WHO as the age range of 10–19 years, and by the Indonesian Ministry of Health Regulation No. 25 of 2014 as 10–18 years. This phase is further divided into early (10–12 years), middle (13–15 years), and late adolescence (16–18 years). It is characterized by physical, psychological, and social development, including increased independence, critical thinking skills, and identity formation. Late adolescence is a pivotal period for preparing for adulthood and defining long-term health behavior.[4]

One of the key strategies to prevent stunting early in life is by improving public awareness of anemia. This community engagement initiative aims to ensure adolescent girls—as future mothers—understand and care about the importance of anemia prevention through education and early detection.

Effective nutrition education depends heavily on the use of appropriate instructional media. Printed materials such as posters, leaflets, booklets, and bookmarks are widely used in school-based health promotion campaigns. These tools help clarify and streamline the delivery of key concepts and messages, making them more accessible and understandable to adolescents. According to Dzurrul Fatih et al. (2021), the advantage of printed media lies in their ability to be distributed directly to the target audience and reviewed repeatedly, which enhances their effectiveness in health education and behavior change initiatives.[6]

Therefore, this study aims to explore the use of bookmark media as an effective educational tool to increase adolescent girls' knowledge about iron supplementation as a preventive measure against anemia, which may ultimately contribute to reducing the risk of stunting in future generations.

METHOD

The design of this study was quasi-experimental using a one-group pre-test post-test design.

The research was conducted in the working area of the Kapasa Public Health Center, located at SMP Negeri 11, Makassar City. The study was carried out in May 2025. The population in this study was adolescent girls aged 11–15 years who were actively enrolled in junior high school. The questionnaire consisted of 10 multiple-choice questions designed to assess adolescents' nutrition knowledge. The instrument underwent content review to ensure its relevance to the study objectives and was administered in both pre-test and post-test.

Procedure

The study involved 75 female students who met the inclusion criteria: (1) aged between 11 and 15 years; (2) registered as students at SMPN 11 Makassar; and (3) willing to participate in the entire research process. The sampling technique used

was **convenience sampling**, based on the availability and consent of the participants. The participants were recruited using a convenience sampling technique, considering accessibility and the willingness of students aged 11–15 years to participate. The respondents were female adolescents enrolled as active students at SMP Negeri 11 Makassar, in good physical health, and willing to take part in the educational sessions and complete the questionnaires voluntarily. Only those who were present during the intervention, free from health conditions that could interfere with concentration, had not participated in similar educational activities within the past three months, and were able to comprehend the information delivered through the bookmark media were included in the study.

The educational intervention was carried out using **bookmark-based media** containing concise, attractive, and informative messages related to anemia prevention, the importance of consuming iron supplements (Tablet Tambah Darah/TTD), signs of anemia, and iron-rich foods. Prior to the intervention, a **pre-test** was administered, followed by the **educational session**, and concluded with a **post-test** using the same instrument.

The knowledge questionnaire used for both pre- and post-test consisted of **10 multiple-choice questions**, adapted to the educational content. Scores were summed and converted into percentages. Knowledge levels were categorized into three groups: low (<60%), moderate (60–80%), and high (>80%).

Data Analysis

Data were analyzed using **SPSS software**. **Univariate analysis** was used to describe the characteristics of the respondents and the distribution of knowledge scores. The **paired t-test** was used to analyze differences between pre-test and post-test knowledge scores within the same group. If the data did not meet the normality assumption, the **Wilcoxon signed-rank test** was used as an alternative. In addition, the **chi-square test** was applied to compare the proportion of knowledge levels before and after the intervention.

Research Ethics

The research was conducted from June to July 2025. Ethical approval for this study was granted by the Health Research Ethics Committee of the Health Polytechnic of the Ministry of Health in Makassar, under approval number 1414/M/KEPK-PTKMS/VII/2025. Written informed consent was obtained from all participants before the study began.

RESULTS

Subject Characteristics

The characteristics of the respondents in this study are shown in Table 1. All participants were female adolescents aged between 11 and 15 years, reflecting a uniform age and gender distribution among the sample. The total number of respondents was 75, all of whom completed both the pre-test and post-test questionnaires as part of the educational intervention.

Knowledge Improvement After Education

A significant improvement in knowledge was observed after the intervention. The average knowledge score before the education (pre-test) was 52.00, and it increased to 70.67 in the post-test. This difference was statistically significant (p = 0.000), as shown in Table 2. The results suggest that the educational intervention using printed bookmark media had a positive effect on increasing awareness and understanding of anemia prevention among adolescent girls.

Table 1. The average knowledge score

	Mean	n	Std. Deviation	Std. Error Mean	Pair 1: Pre-Test & Post-Test
Pair 1: Pre-Test	52.00	75	19.242	2.222	0.000
Post-Test	70.67	75	15.882	1.834	

Effectiveness of Bookmark Media in Health Education

The educational activity using bookmark media was effective in delivering concise and engaging messages about iron tablet consumption and anemia prevention. Respondents demonstrated active participation and positive engagement throughout the intervention session. The use of attractive and simple media contributed to increased interest and comprehension of the educational material.

DISCUSSIONS

Main Finding

Based on the results of statistical analysis, the average score of participants before the intervention (pre-test) was 52.00, which increased to 70.67 after the intervention (post-test), indicating a score improvement of 18.67 points. Furthermore,

the correlation value between the pre-test and post-test scores was 0.442 with a significance level of 0.000. This indicates a strong and significant relationship between pre- and post-intervention scores, showing the effectiveness of the intervention in enhancing participants' knowledge.

This finding aligns with research conducted by Afina et al. (2021), which also demonstrated a significant increase in knowledge about anemia following health education using leaflets shared via WhatsApp, with a p-value of 0.000 (<0.05). The use of printed leaflets was found to be effective in increasing adolescent girls' understanding of anemia. Leaflets offer advantages such as portability and concise information, allowing distribution in strategic locations like schools, health centers, and public areas.[6]

The study by Safitri et al. (2025) demonstrated that leaflet media had a significant effect on improving adolescent girls' knowledge about anemia, with a p-value of 0.000 (<0.05). Leaflets were considered effective because they are practical, attractive, portable, and contain concise yet clear information that can be easily understood by adolescents. These findings are in line with the present research, which also confirmed the positive impact of print-based educational media on enhancing students' knowledge about anemia.[7]

The study titled "Prevention Of Anemia In Adolescent Girls Through Print Media Bookmarks For Adolescent Girls at SMP Negeri 11 Makassar City" offers a meaningful contribution to the field of nutrition education, particularly among adolescents. By utilizing simple print media such as bookmarks, the intervention successfully enhanced nutrition literacy, as evidenced by a significant increase in knowledge scores from 52.00 to 70.67. This approach is especially valuable in contexts with limited access to digital resources, demonstrating that low-cost and context-sensitive tools can be both inclusive and effective. Furthermore, the study supports the integration of print-based educational materials into school health programs, such as the School Health Unit (UKS), where bookmarks can serve as engaging and accessible learning aids. The findings also align with Indonesia's national strategies for anemia and stunting prevention, providing evidence that school-based interventions can contribute to broader public health goals. Additionally, the study opens opportunities for replication in other regions, with potential for further development of the media—such as incorporating visual enhancements or QR codes to link students to additional resources. Overall, this research reinforces the importance of innovative, scalable, and culturally appropriate methods in advancing nutrition education for adolescents.

One of the most effective ways to improve individual knowledge is through health education sessions. Knowledge acquisition is influenced by several factors, one of which is the level of education. Higher educational attainment often correlates with positive behavioral changes. Additionally, knowledge is shaped by life experiences and the individual's ability to absorb information from both printed and electronic media. Adequate access to health information accelerates understanding and broadens a person's health literacy.[8]

The participants in this study were 75 female adolescents aged 11 to 15 years. Adolescence is a transitional phase marked by puberty, involving physical, emotional, and social changes. For girls, one of the key indicators of puberty is the onset of menstruation, which signals reproductive maturity (Fathony et al., 2022).

Menarche, the first menstrual period, marks the beginning of female reproductive function. It results from increased gonadotropin hormone secretion by the pituitary gland, typically beginning around age 8 and peaking between ages 11 and 15.[9]

Anemia is a condition characterized by low levels of hemoglobin, hematocrit, and red blood cells. In adolescent girls, it is commonly caused by iron and protein deficiencies. Iron is essential for hemoglobin production, while protein helps transport iron to the bone marrow for red blood cell formation. A diet low in iron can lead to nutritional deficiencies that contribute to anemia and potentially increase the risk of stunting in future pregnancies.[10]

Adolescent girls are at higher risk of anemia due to menstrual blood loss and increased iron requirements during growth. Poor dietary intake and menstrual irregularities may further aggravate the condition. If left unaddressed during adolescence, anemia can persist into pregnancy, increasing the risk of stunting in offspring. Research indicates that pregnant women with anemia are more than four times as likely to deliver stunted children than non-anemic mothers. Thus, it is crucial for adolescent girls to adopt a balanced diet rich in iron and protein for their current and future health.

Limited iron intake and lack of awareness regarding anemia prevention make adolescent girls a vulnerable group. Printed educational media such as bookmarks serve as an effective alternative for promoting awareness. Bookmarks are concise, visually appealing, portable, and can be reviewed repeatedly. They do not require electricity or internet access, making them suitable for school environments with limited gadget use. Although online media has become more popular due to ease of access via smartphones and digital platforms, printed materials still offer distinct advantages, such as clarity, completeness, and depth of information. Moreover, printed media remains accessible to populations with limited access to digital technology. In adolescent health education, printed media like bookmarks remain a practical and relevant tool, especially for students with restricted digital literacy or device use.

The rise of digital platforms has indeed transformed information access habits and poses a challenge for traditional print media. Nevertheless, print media still offers benefits in clarity, completeness, and independence from internet connectivity. Both media types have their strengths and can be complementary in disseminating health information.[11]

The findings from SMP Negeri 11 Makassar showed that educational intervention using printed bookmarks had a positive impact on adolescent girls' knowledge of anemia and the importance of iron supplementation. This was evidenced by the significant improvement in post-test scores compared to pre-test scores.

The paired t-test revealed a highly significant difference in pre- and post-test scores, with a t-value of -7.340 and a significance level of 0.000 (well below 0.05). The 95% confidence interval ranged from -18.414 to -9.919, reinforcing the conclusion that the intervention was effective in improving knowledge.

During the counseling sessions, adolescent participants demonstrated a good understanding of the material. Active engagement and interaction with facilitators reflected strong interest and involvement in the topic. The students showed enthusiasm, particularly when discussing health-related issues such as anemia, iron tablets, and their link to stunting risk.

At the end of the program, a knowledge evaluation was conducted using a structured questionnaire. Most participants answered the questions correctly, indicating improved understanding post-intervention. These positive results support the conclusion that health education using printed media like bookmarks is an effective method for increasing health knowledge among adolescent girls.

CONCLUSION

There was a significant improvement in knowledge among adolescent girls after receiving education on the importance of iron supplementation to prevent anemia, with a p-value of 0.000. This result is expected to support adolescent girls in adopting positive attitudes and behaviors at home, ultimately forming healthy habits that can be applied in their daily lives.

Declaration of Conflicting Interests

The researcher admits that there is no conflict of interest in this study.

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