



Changes in hemoglobin levels in relation to self-efficacy and adherence to weekly iron tablet supplementation among female high school students: a pre-experimental study

Perubahan kadar hemoglobin ditinjau dari efikasi diri dan kepatuhan konsumsi suplementasi tablet zat besi pada remaja putri sekolah menengah atas: studi pra-eksperimental

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Article History:

Received: December 21, 2025; Revised:

March 05, 2026; Accepted: July 22, 2026;

Published: September 04, 2026.

Publisher:



Politeknik Kesehatan Aceh
Kementerian Kesehatan RI

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Abstract

Iron deficiency anemia (IDA) is a major public health problem, particularly among adolescent girls. The effectiveness of iron (Fe) tablet supplementation programs largely depends on adherence to consumption, which is influenced by behavioral factors such as self-efficacy. Low adherence reduces the success of iron tablet supplementation. This study aimed to analyze the changes in hemoglobin levels associated with self-efficacy and adherence to iron tablet consumption among adolescent girls. This study employed a pre-experimental, one-group, pretest-posttest design without a control group. The intervention consisted of administering iron tablets (60 mg elemental iron and 0.25 mg folic acid) once a week for one month. The study population included female adolescents from the Aulia Cendekia Talang Jambe Integrated Islamic Senior High School in Palembang City. A total of 33 subjects were selected using purposive sampling based on the inclusion and exclusion criteria. The variables in this study included participant characteristics, self-efficacy, adherence to iron tablet consumption, and changes in hemoglobin levels. Wilcoxon and chi-square tests were used for the data analysis. The results showed that 70.4% of patients with high self-efficacy experienced an increase in hemoglobin levels; however, there was no statistically significant relationship between self-efficacy and changes in hemoglobin levels ($p = 0.338$). In contrast, adherence to iron tablet consumption was significantly associated with changes in hemoglobin levels ($p = 0.021$). Non-adherent subjects were six times more likely to experience stable or decreased hemoglobin levels than adherent subjects (PR = 6.0; 95% CI: 1.2–28.9). In conclusion, adherence to iron tablet consumption is a significant factor influencing hemoglobin levels among the subjects.

Keywords: Adherence, iron tablet consumption, adolescent girls, iron deficiency anemia, self-efficacy, hemoglobin level

Abstrak

Anemia defisiensi besi (AGB) saat ini menjadi fokus permasalahan masyarakat khususnya pada remaja putri. Efektivitas program suplementasi tablet Fe sangat bergantung pada kepatuhan konsumsi, yang dipengaruhi oleh faktor perilaku seperti efikasi diri. Rendahnya kepatuhan mengurangi keberhasilan program tablet Fe. Penelitian ini bertujuan untuk menganalisis peningkatan kadar hemoglobin yang dikaitkan dengan efikasi diri dan kepatuhan konsumsi tablet Fe pada remaja putri. Penelitian ini menggunakan desain *pre-experimental study* dengan rancangan *one group design* (tanpa kelompok kontrol). Intervensi

yang dilakukan dengan memberikan tablet Fe (60 mg besi elemental dan 0.25 mg asam folat) satu minggu satu kali selama satu bulan. Populasi penelitian adalah remaja putri SMA-IT Aulia Cendekia Talang Jambe, Kota Palembang. Sampel dipilih secara *purposive*, sebanyak 33 subjek diperoleh yang memenuhi kriteria inklusi dan eksklusi penelitian. Variabel penelitian meliputi karakteristik subjek, efikasi diri, kepatuhan dalam mengonsumsi tablet Fe serta peningkatan kadar hemoglobin. Uji wilcoxon dan chi-square digunakan dalam analisis ini. Hasil penelitian menunjukkan bahwa 70,4% subjek dengan efikasi diri tinggi mengalami peningkatan kadar hemoglobin, namun tidak terdapat hubungan yang signifikan antara efikasi diri dan peningkatan kadar hemoglobin ($p=0.338$). Sebaliknya, kepatuhan konsumsi tablet Fe menunjukkan hubungan yang signifikan dengan peningkatan kadar hemoglobin ($p=0.021$). Subjek yang tidak patuh memiliki kemungkinan 6 kali lebih besar mengalami kadar Hb tetap atau menurun dibandingkan yang patuh ($PR=6.0$; 95%CI: 1.2–28.9). Kesimpulannya, kepatuhan konsumsi tablet Fe sebagai faktor yang mempengaruhi kadar hemoglobin pada subjek.

Kata Kunci: Anemia defisiensi besi, efikasi diri, kepatuhan konsumsi tablet Fe, kadar hemoglobin, remaja putri

Introduction

Iron-deficiency anemia remains a major public health concern. According to the World Health Organization (2019), 30% of women aged 15–49 years are affected by anemia. Indonesia's Basic Health Research (*Riset Kesehatan Dasar* [Riskesdas]) indicates an increasing trend in the prevalence of anemia among adolescents. Approximately 32% of Indonesian adolescents are anemic, with a prevalence of 27.2% among adolescent girls. The 2023 Indonesian Health Survey (*Survei Kesehatan Indonesia* [SKI]) reported that the prevalence of anemia among adolescents and young adults aged 15–24 years was 15.5%, reaching 18% among females (Kementerian Kesehatan RI Badan Penelitian dan Pengembangan, 2018; Kementerian Kesehatan RI, 2023). Although the prevalence of anemia has declined, it remains above the threshold established by the World Health Organization (WHO). When anemia affects 10% or more of a population, it is considered a public health burden that substantially compromises population health (World Health Organization [WHO], 2025). Data from the South Sumatra Provincial Health Office showed that 57.1% of adolescent girls were anemic in 2020. Anemia also remains a public health concern in Palembang because its prevalence exceeds 15% and reaches 26.5% among school-aged adolescents (Dinas Kesehatan Provinsi Sumatera Selatan, 2020).

During adolescence, iron requirements increase substantially because of accelerated

physical growth, increased blood volume, and tissue maturation. An imbalance between iron requirements and intake during this developmental stage can impair hemoglobin synthesis, adversely affecting cognitive function, learning capacity, and long-term productivity (Kumalasari et al., 2019; Rehman et al., 2025). Menstruation is a physiological process that occurs periodically, typically every month, in adolescent females, placing them at a higher risk of developing anemia than their male counterparts (Pai et al., 2023; Wiafe et al., 2023).

Anemia among adolescent girls can be prevented through regular adherence to iron tablet supplementation, as promoted by the Iron Deficiency Anemia Prevention and Control Program (*Program Pencegahan dan Penanggulangan Anemia Gizi Besi* [PPAGB]). This initiative is outlined in the 2023–2027 National Strategy for Accelerating Anemia Prevention Among Adolescent Girls and supports Sustainable Development Goal 3, Good Health and Well-Being, by promoting iron supplementation to improve the health of adolescents. Biologically, iron supplementation directly contributes to hemoglobin production and improves the anemia status. A meta-analysis by Rehman et al. (2025) demonstrated that iron supplementation significantly increased hemoglobin concentrations in children and adolescents, particularly when administered according to the recommended regimens.

From a health behavior perspective, adherence to iron tablet supplementation is

influenced by psychosocial factors, among which self-efficacy plays a particularly important role in adherence. The concept of self-efficacy is grounded in Bandura's social cognitive theory and refers to an individual's belief in their ability to overcome various challenges, which substantially influences both cognitive processes and behavior (Salim et al., 2025; Fauzianty et al., 2025). Individuals who believe that a new behavior will benefit them are more likely to adopt it. Conversely, those who doubt their ability to perform the behavior tend not to attempt it because self-efficacy determines an individual's perceived capacity to act (Wolf et al., 2018; Yani et al., 2023).

Chalatha et al. (2024) found that adolescent girls with high self-efficacy demonstrated better adherence to iron tablet supplementation than those with low self-efficacy levels. Thus, differences in adherence to iron tablet consumption among adolescent girls may be partly explained by their self-efficacy levels. Self-efficacy provides an essential foundation for engaging in positive health behaviors (Stewart-Knox et al., 2021). Accordingly, an individual's confidence in their ability to take iron tablets may determine their intention to adhere to iron supplementation (Annisa & Nurmala, 2018; Silitonga et al., 2023).

Adherence to iron tablet supplementation is significantly associated with hemoglobin concentration (Yalestyarini et al., 2026). Daily oral iron supplementation reduces the prevalence of anemia and iron deficiency, increases hemoglobin concentrations and iron stores, improves performance, and alleviates fatigue, a common symptom of anemia. Iron tablet supplementation during adolescence is also beneficial for improving anemia status and increasing iron stores during early pregnancy (Joe et al., 2022; Msy et al., 2016). Furthermore, oral iron supplementation is considered a cost-effective program for reducing the incidence of anemia in patients with CKD.

Although the relationships among iron supplementation, adherence, and psychosocial factors have been extensively investigated, most previous studies have focused on supplementation adherence as a behavioral outcome (Ambarsari et al., 2023; Chalatha et al., 2024). In contrast, the present study used hemoglobin concentration as a biological outcome and simultaneously examined self-efficacy and adherence to iron tablet

supplementation among female high school students. This study also supports the implementation of PPAGB in addressing anemia among adolescent girls in school settings. Therefore, this study aimed to analyze the changes in hemoglobin concentrations in relation to self-efficacy and adherence to iron tablet supplementation among female senior high school students. We hypothesized that self-efficacy and adherence to iron tablet supplementation would be associated with increased hemoglobin concentrations in adolescent girls.

Methods

The study was conducted from November to December 2025, using a pre-experimental one-group design. The study population comprised 10th-grade female students from the Aulia Cendekia Integrated Islamic Senior High School in Palembang, Indonesia. Grade 10 was selected because students at this level were included in the screening activities of the Iron Deficiency Anemia Prevention and Control Program (*Program Pencegahan dan Penanggulangan Anemia Gizi Besi* [PPAGB]) for adolescent girls, conducted by the community health center. Participants were selected using purposive sampling according to the following inclusion criteria: (1) female students aged 14–17 years, (2) having experienced menarche, and (3) willingness to participate in the study. The exclusion criteria were as follows: (1) transfer to another school, (2) undergoing treatment for an infectious disease or another clinical condition contraindicating iron supplementation, and (3) incomplete data. All eligible students were recruited through total sampling, resulting in an initial sample of 40 participants in the study. During the study, five students were absent during the endline data collection, and two had incomplete data. Therefore, the final sample consisted of 33 participants.

The study variables comprised (1) hemoglobin (Hb) concentration as the dependent variable and (2) participant characteristics, self-efficacy, and adherence to iron tablet supplementation as independent variables. Hb concentration was measured twice, at baseline and endline, before and after iron tablet supplementation. Changes in Hb concentration were calculated as the difference

between the baseline and endline measurements. Negative values or no change were categorized as decreased/unchanged, whereas positive values were categorized as increased. Capillary blood samples were collected by finger prick by healthcare personnel from the Talang Jambe Community Health Center in Palembang, Indonesia.

Participant characteristics, including age, previous exposure to information about iron tablets, and sources of information, were obtained using a questionnaire. Self-efficacy was assessed using a 17-item questionnaire containing positively and negatively worded statements rated on a four-point scale ranging from strongly disagree to strongly agree. The instrument was a modified version of the Self-Efficacy Scale developed by Sherer et al. (1982), as cited by Putri (2025). The questionnaire underwent validity and reliability testing and demonstrated a Cronbach's alpha coefficient of 0.795. The final score was calculated by summing each participant's responses to all items. Higher scores indicate greater self-efficacy, whereas lower scores indicate poorer self-efficacy. Self-efficacy was categorized as low when the mean score was ≤ 5 and high when the mean score was > 5 (Putri 2025).

Adherence to iron tablet supplementation was assessed using an iron tablet consumption monitoring card to document the number of tablets consumed by each participant daily. Participants also submitted iron tablets recorded as consumed, allowing the researchers to calculate the number of tablets taken and verify this information against the monitoring card. Iron tablet consumption was conducted collectively under the supervision of teachers or homeroom teachers. Adherence was categorized as nonadherent when participants consumed iron tablets fewer than four times per month and adherent when they consumed them four times per month.

Each participant received iron tablets containing 60 mg of elemental iron and 0.25 mg of folic acid, along with a consumption-monitoring card. Participants were instructed to check the appropriate column on the monitoring card after taking each tablet daily. The recommended regimen was one iron tablet per week, and adherence was monitored for one month after enrollment. The monthly distribution has been reported to be more

effective than distribution every two months because it reduces the risk of damage to the iron tablets and facilitates closer adherence monitoring (Permatasari et al., 2018).

After collection and verification, the data were processed using Microsoft Excel and analyzed using SPSS version 25.0. Descriptive and inferential analyses were conducted. Descriptive statistics included the means, standard deviations, minimum and maximum values, frequencies, and percentages. Changes in Hb concentration were analyzed using the Wilcoxon signed-rank test because the data were not normally distributed, as indicated by a Shapiro-Wilk test result of $p < .05$. Chi-square tests were subsequently performed to examine the associations of self-efficacy and adherence to iron tablet supplementation with increased Hb concentrations at a 95% confidence level. Prevalence ratios were calculated to estimate the association between these factors and increased Hb concentrations.

This study was approved by the Research Ethics Committee of the Faculty of Public Health, Universitas Sriwijaya (Approval No. 842/UN9.FKM/TU.KKE/2025).

Result and Discussion

This study involved 33 female students from the Aulia Cendekia Integrated Islamic Senior High School in Palembang, Indonesia. The participants had a mean age of 15.2 years, with the largest proportion aged 14–15. This finding is consistent with a previous study that reported a mean participant age of 15.08 ± 1.47 years, with 60.5% classified as being in middle adolescence (Permatasari et al., 2018). Heryanda et al. (2025) reported a similar finding in their study of anemia among adolescent girls, in which the participants were approximately 14–16 years of age. The World Health Organization classifies adolescence into three stages based on age: early adolescence (10–13 years), middle adolescence (14–17 years), and late adolescence (18–21 years) (World Health Organization, 2021).

Most participants (66.7%) received a daily allowance of $\leq$ IDR 20,000 from their parents. Parents provide allowances to meet their children's food and non-food needs (Hidayat, 2023). The amount of allowance received may influence the dietary patterns of adolescents.

Adolescents with larger allowances tend to have greater financial access to food, including snacks purchased from school canteens and vendors outside school (Sartika et al., 2022). Two-thirds of the participants (66.7%) had never received information on iron tablets. Consistent with previous studies, 93.8% of students reported that their schools had not provided information about anemia or iron tablets through media-based interventions. A lack of education regarding an appropriate diet has been significantly associated with anemia (Apriningsih et al., 2020; El-Kholy et al., 2023). Among the participants who had previously received information about iron tablets, electronic media, including television, radio, and the Internet, were the most commonly reported sources. The use of media is an effective approach to delivering nutrition information and may motivate adolescents to improve their knowledge, awareness, attitudes, and practices related to anemia prevention and their overall nutritional status.

Table 1. Participant characteristics

Participant characteristics	n	%
Age (years)		
14–15	27	81.8
16–17	6	18.2
Mean ± SD (min–max)	15.2 ± 0.72 (14–17)	
Daily allowance		
≤IDR 20,000/day	22	66.7
>IDR 20,000/day	11	33.3
Previous receipt of information about iron tablets		
Yes	11	33.3
No	22	66.7
Source of information about iron tablets		
Electronic media (television, radio, or internet)	7	21.2
Activities conducted by healthcare professionals (counseling or webinars)	0	0
School	4	12.1
Never received information	22	66.7

Table 2 presents the distribution of participants according to self-efficacy and adherence to iron tablet supplementation, most participants (81.8%) had high self-efficacy for iron tablet consumption. This finding supports

that of Chalatha et al. (2024), who reported that 51.1% of adolescent girls had high self-efficacy in sports. According to Bandura's theoretical framework, high self-efficacy may influence adherence to iron tablet supplementation (Chalatha et al., 2024). Thus, self-efficacy is an important determinant of adolescent girls' intentions to consume iron tablets regularly.

Ainaya et al. (2022) demonstrated that the intention to consume iron tablets increased when individuals had high self-efficacy. Conversely, a lack of confidence in one's ability to consume iron tablets as recommended may adversely affect supplementation behaviors (Lismiana & Indarjo, 2021). The lower an individual's confidence in consuming iron tablets, the weaker their intention to do so, potentially increasing their risk of developing anemia (Chalatha et al., 2024). A study conducted in the United States also found that high self-efficacy was associated with greater fruit and vegetable consumption for chronic disease prevention (Broers et al., 2017).

Table 2. Self-efficacy and adherence to iron tablet supplementation

Self-efficacy and adherence to iron tablet supplementation	n	%
Self-efficacy		
High (≤ mean)	27	81.8
Low (> mean)	6	18.2
Mean ± SD (min–max)	3.6 ± 0.4 (2.5–4.0)	
Iron tablet consumption		
Adherent (4 times/week)	23	69.7
Nonadherent (<4 times/week)	10	30.3
Mean ± SD (min–max)	3.2 ± 1.3 (0.0–4.0)	

The distribution of participants according to adherence to iron tablet supplementation is shown in Table 2. Most participants (69.7%) adhered to iron tablet supplementation, with a mean consumption frequency of 3.2 times per week. This finding is consistent with that of Chalatha et al. (2024), who reported high adherence to iron supplementation among most participants. Another study similarly found that most adolescent girls demonstrated good adherence, with 67.7% categorized as adherent to iron tablet supplementation (Verma & Baniya, 2022). Among the 378 students who reported receiving iron tablets during the preceding school month, 67.7% met the iron tablet consumption

requirements (Wangaskar et al., 2021). The higher adherence among these students may have resulted from effective supervision by schoolteachers, who ensured that the students consumed the tablets in their presence, as well as from the students' strong self-efficacy. Intervention studies conducted in India and other countries have demonstrated a reduction in the prevalence of anemia when students adhered

more closely to weekly iron-folic acid supplementation programs (Shah et al., 2016).

Iron status in the human body can be assessed using hematological and biochemical methods. According to the AISAP, several laboratory indicators can be used to determine iron status, including the measurement of blood Hb concentration to assess the presence of iron deficiency.

Table 3. Hemoglobin concentrations before and after iron tablet supplementation

Hb concentration (g/dL)	n	%	Mean $\pm$ SD	Min-max	Difference	p value
Baseline						
≥ 12	9	27.3	11.07 $\pm$ 1.30	9.0–14.4	0.7 $\pm$ 1.69	0.033*
< 12	24	72.7				
Endline						
≥ 12	18	54.5	11.72 $\pm$ 1.48	8.40–14.2		
< 12	15	45.5				

Data were analyzed using the Wilcoxon signed-rank test. *p-values < 0.05 were considered statistically significant.

The mean Hb concentration increased from 11.01 $\pm$ 1.30 g/dL at baseline to 11.72 $\pm$ 1.48 g/dL after one month of iron tablet supplementation. The difference in Hb concentrations between baseline and endline was statistically significant ($p = .033$), with an increase of 0.7 g/dL after the intervention. This finding is consistent with that of Permatasari et al. (2017), who reported an overall improvement in Hb concentrations with a mean increase of 0.89 $\pm$ 1.32 g/dL. In that study, the mean post-supplementation Hb concentration was 13.75 $\pm$ 1.63 g/dL. Comparative analysis demonstrated a statistically significant difference in hemoglobin concentrations between the pre- and post-intervention phases ($p < 0.05$), indicating a significant intervention effect (Permatasari et al., 2017).

Sari & Sari (2022) reported similar results. The mean Hb concentration among adolescent girls increased from 13.9 g/dL before iron supplementation to 16.0 g/dL after supplementation, representing a difference of 2.1 g/dL. A statistical test indicated a significant

difference in Hb concentrations before and after iron tablet supplementation ($p = 0.000$), demonstrating that iron tablets affected Hb concentrations in adolescent girls.

Iron tablets can effectively improve nutritional status when consumed according to the recommended instructions, which include taking one tablet per week. Iron supplementation provides several clinical benefits, including restoring iron stores depleted by menstrual blood loss and meeting the increased iron requirements associated with pregnancy and with lactation. This intervention also contributes to the prevention and management of anemia among adolescent girls. In addition to its biological effects, adequate iron intake supports optimal cognitive function, improves academic performance, and increases productivity. More broadly, iron supplementation may improve women's nutritional and health status, strengthen the development of competitive human resources, and positively affect the health of future generations (Kementerian Kesehatan Republik Indonesia, 2018).

Table 4. Analysis of changes in hemoglobin concentrations according to self-efficacy and adherence to iron tablet supplementation

Variable	Decreased		Increased		p-value	PR (95% CI)
	n	%	n	%		
Self-efficacy						
Low	1	16.7	5	83.3	0.338	2.4 (0.4–14.4)
High	8	29.6	19	70.4		
Adherence to iron tablet supplementation						

Nonadherent	5	50	5	50	0.021*	6.0 (1.2–28.9)
Adherent	4	17.4	9	82.6		

Data were analyzed using the chi-square test. PR: prevalence ratio; CI: confidence interval. Statistical significance was set at $p < 0.05$.

Table 4 presents the association between self-efficacy, adherence to iron tablet supplementation, and increased Hb concentrations. Among participants with high self-efficacy, 70.4% experienced an increase in Hb concentration after iron tablet consumption. However, the statistical analysis demonstrated no significant association between self-efficacy and increased serum Hb concentration ($p = 0.338$). This finding indicates that high self-efficacy does not automatically result in biological changes in the form of increased Hb concentration.

This finding is consistent with Bandura's theoretical framework, which proposes that self-efficacy plays a more prominent role in promoting behavioral change than in directly producing biological changes. The effect of self-efficacy on Hb concentration is indirect and is mediated by adherence to iron tablet supplementation and the quality of daily dietary intake of iron (Abdel-Khalek, 2016; Setianingsih et al., 2025). Therefore, self-efficacy should be understood as an indirect factor that supports changes in Hb concentration through iron tablet consumption behavior rather than as a primary determinant.

The nonsignificant association observed in this study may also be explained by the complexity of the factors affecting Hb concentration. Previous studies have demonstrated that Hb status is influenced not only by adherence to iron tablet supplementation but also by other factors, including dietary iron intake, the consumption of absorption inhibitors such as tannins and phytates, nutritional status, and menstrual blood loss (Hisa et al., 2019; P. Sari et al., 2022; Setianingsih et al., 2025; Traissac et al., 2020).

The association between adherence to iron tablet supplementation and increased Hb concentration is presented in Table 4. Among participants who adhered to iron tablet supplementation, 82.6% experienced increased Hb concentrations, whereas 17.4% had unchanged or decreased Hb concentrations. Statistical analysis demonstrated a significant association between adherence to iron tablet supplementation and increased hemoglobin concentration. Participants who did not adhere

to the once-weekly supplementation regimen were six times more likely to experience a decrease in Hb concentration than those who adhered to the regimen ($p = .021$; PR = 6.0; 95% CI [1.2, 28.9]). This result is consistent with the findings of Ambarsari et al. (2023), who reported that 63.6% of participants who adhered to iron tablet supplementation experienced increased Hb concentration. Their findings also demonstrated a significant association between adherence to iron tablet supplementation and Hb concentration ($p = .001$; $\alpha = .05$).

A systematic review confirmed that iron tablet supplementation effectively increases Hb concentrations in adolescent girls. Iron supplementation replaces depleted iron stores and promotes erythropoiesis and oxygen transport throughout the body. Iron is transported across cell membranes via divalent metal transporter 1 and is incorporated into ferritin for storage within macrophages. It is subsequently converted into absorbable Fe^{2+} ions and bound to transferrin for transport to various tissues, including the bone marrow, where red blood cells are synthesized. Iron combines with other components, including porphyrin and globin chains, to form hemoglobin, which transports oxygen from the lungs to other organs (Ems et al., 2026; Nguyen & Tadi, 2023).

The effectiveness of iron tablets is attributable to their elemental iron content in the form of ferrous sulfate, ferrous fumarate, or ferrous gluconate, along with folic acid, which supports red blood cell production. These components collectively contribute to increased Hb concentration and improved overall hematological health (Cia et al., 2021). Previous studies have demonstrated significant increases in Hb concentrations following intervention, indicating that iron supplementation remains a reliable, evidence-based approach, particularly for addressing iron deficiency anemia in adolescents (Nanda et al., 2024; Sari et al., 2022).

Iron supplementation is recommended to prevent anemia in adolescent girls. The World Health Organization recommends intermittent iron and folic acid supplementation once a week as a public health strategy for women to increase Hb concentrations, improve iron status,

and reduce the risk of anemia (World Health Organization, 2022). This strategy is also consistent with Sustainable Development Goal 3, Good Health and Well-Being, through its contribution to increasing Hb concentrations and reducing the risk of iron deficiency anemia in pregnant women. Support for the PPAGB may be implemented through the routine weekly provision of iron tablets by school health units or school healthcare personnel, accompanied by documentation of consumption using monitoring cards or student records. Schools may also establish a designated schedule for students to consume iron tablets simultaneously during school hours to improve adherence, accompanied by balanced nutrition education delivered through school health activities. Previous research has demonstrated that adherence to iron supplementation is a key factor in reducing the prevalence of anemia among adolescents (Salim et al., 2025).

This study has several limitations. The use of a pre-experimental one-group design without a control group limited the ability to conclude that the increase in Hb concentration was entirely attributable to the iron tablet intervention. Other factors that may affect Hb concentrations were not examined, including foods and beverages that inhibit or enhance iron absorption, nutritional status, and the menstrual cycle (Kementerian Kesehatan Republik Indonesia, 2018). The study was also limited by its small sample size and assessment of bivariate associations without controlling for other variables through multivariate analysis.

Conclusion

The iron deficiency anemia prevention and control program (*Program Pencegahan dan Penanggulangan Anemia Gizi Besi* [PPAGB]) may improve hemoglobin (Hb) concentrations in adolescent girls. The findings indicate that adherence to iron tablet supplementation was significantly associated with increased Hb levels. Participants who did not adhere to the once-weekly supplementation regimen were six times more likely to experience decreased Hb concentrations than those who adhered to the regimen. Conversely, self-efficacy was not significantly associated with increased hemoglobin concentrations.

Future studies should assess not only iron tablet consumption but also dietary inhibitors and enhancers of iron absorption, nutritional status, and menstrual cycle, all of which may influence changes in Hb concentrations. Multivariate analyses should be performed to account for these factors.

Acknowledgements

The authors gratefully acknowledge SMA-IT Aulia Cendekia Palembang, the Ethics Committee of the Faculty of Public Health, and the Institute for Research and Community Services (LPPM), Universitas Sriwijaya, for facilitating this study.

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