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Association between Iron Tablet Adherence and Anemia among Adolescent Girls

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ABSTRACT

Background: Anemia in adolescent girls can impair growth and development, and iron tablet supplementation is a key strategy to meet iron requirements beyond dietary intake. In this study, respondents were given four iron tablets over one month, taken once weekly.

Purpose: The purpose of this research was to examine the relationship between adherence to iron tablet consumption and the incidence of anemia among students at SMPN 1 Wates.

Methods: A correlational analytical design with a cross-sectional approach was used, involving a population of 180 individuals and a sample of 124 participants selected through proportional random sampling. Data were collected using observation sheets to assess adherence to iron tablet consumption and to measure hemoglobin levels, and analyzed using a contingency table statistical test.

Results: The results showed that the highest proportion of normal hemoglobin levels occurred in the compliant group (92 individuals, 74.2%), while the highest incidence of anemia was found in the non-compliant group (20 individuals, 22.6%). The chi-square test yielded a p-value of 0.000, which is less than α=0.05, indicating a significant relationship between adherence to iron tablet consumption and the incidence of anemia.

Conclusion: In conclusion, regular consumption of iron tablets can help adolescent girls prevent anemia, improve learning ability, and enhance nutritional status and overall health, especially when combined with vitamin C–rich foods or beverages that enhance iron absorption.

Keywords: Adherence, Anemia, Iron Tablets

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BACKGROUND

Adolescence is a transitional phase that begins when a child shows signs of puberty and continues with changes from non-sexual to sexual characteristics. Puberty in boys occurs at a later age, typically between 9 and 14 years, while puberty in girls generally occurs between 9 and 12 years. Physical growth and the maturation of reproductive organs, such as sexual maturation, are among the major challenges faced by adolescents (Affandy, 2017). Rapid growth during adolescence leads to increased nutritional requirements to support this growth. Anemia is particularly common among adolescent girls. Anemia in adolescent girls can impair growth and development, and iron tablet supplementation is a key strategy to meet iron requirements beyond dietary intake. However, despite national programs promoting iron supplementation, gaps remain in understanding the level of adherence among adolescents and its direct association with anemia incidence at the school level, particularly in specific local contexts such as SMPN 1 Wates. Many previous studies have focused on prevalence or knowledge of anemia, but limited evidence examines actual compliance with iron tablet consumption and its measurable impact on hemoglobin levels. Therefore, this study is needed to address this gap and provide empirical data linking adherence behavior to anemia outcomes.

Common nutritional disorders among adolescents include energy and protein deficiency, nutritional anemia, and deficiencies in various vitamins (Dieny, 2019). Anemia among adolescent girls remains quite high to this day. Data from the Ministry of Health (2023) indicate that the prevalence of nutritional anemia among adolescents (≥15 years) is 22.2%, up from 19.7% in 2018 regarding anemia incidence in adolescents, and the prevalence of anemia among adolescent girls is projected to rise to between 32.4–61% by 2023 (Kemenkes, 2023).

From hemoglobin (Hb) screenings at junior high schools (SMP/MTS) in 2023, a total of 593 adolescent girls were tested, with 495 showing normal Hb levels, 63 cases of mild anemia, and 29 cases of moderate anemia. From interviews with 10 adolescents at SMP Negeri 1 Wates, it was found that their adherence to taking iron tablets was low; 7 students did not take iron regularly because they did not feel sick, and 3 students took iron regularly at school every Friday. In terms of diet, adolescents tend to consume a lot of fast food, such as: fried chicken, nuggets, sausages, seblak, instant noodles, and sugary drinks. They rarely consume vegetables and plain water.

Adolescent girls who suffer from anemia during pregnancy are at risk of giving birth to infants with Low Birth Weight (LBW) and stunting. Iron-deficiency anemia is one of the main causes of anemia, primarily due to insufficient intake of iron-rich foods. Adolescent girls during puberty are at high risk of developing iron-deficiency anemia. This is due to the significant loss of iron during menstruation. This is further exacerbated by insufficient iron intake, as iron is crucial for the body's growth and development during adolescence. Not all iron in food is absorbed by the body due to low bioavailability or insufficient intake of animal-based foods. Iron requirements also increase in adolescent girls due to the onset of menstruation. Adolescents, particularly those who have started menstruating, are more susceptible to anemia compared to those who have not yet menstruated, due to blood loss experienced during menstruation. Women generally tend to have lower iron stores than men, making them more prone to iron deficiency when iron intake is insufficient or when needs increase, such as during menstruation (Andaruni, 2018).

Anemia can be treated with oral or injectable iron supplements at a dose of 60–180 mg/day until levels return to normal. Adolescents and women have an iron requirement of approximately 14–33 mg/day. To prevent iron-deficiency anemia, one can consume primary dietary sources of iron such as meat, eggs, milk, and vegetables in accordance with recommended nutritional guidelines. As part of a program by the Department of Health through

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Community Health Centers (Puskesmas), hemoglobin (HB) screenings are conducted annually for female adolescents in grades 7 and 10. Students with HB levels of 11.0–11.9 g/dL (mild anemia) will be required to take one iron (Fe) tablet daily for two weeks; for students with an HB level of 8–10.9 g/dL (moderate anemia), they will be required to take two iron tablets daily for two weeks; and for those with an HB level <8 g/dL (severe anemia), they will be required to take three iron tablets daily for two weeks. The service area of the Wates Community Health Center (UPTD Puskesmas Wates) includes 14 elementary schools (SD/MI), 8 junior high schools (SMP/Mts), and 6 senior high schools (SMA/MA). Iron tablets are distributed to students at junior high and senior high schools in the Wates Community Health Center's service area every 10 weeks, with the tablets distributed to each school over the course of one year. The distribution method is as follows: each adolescent girl receives 10 iron tablets to be taken together at school once a week, with the specific day of administration determined by mutual agreement with each school. If the iron tablets run out, the Health Center will distribute more tablets to the schools. Based on the explanation above, the researcher is interested in addressing the research topic: Compliance with Iron Tablet Consumption and Its Relationship to the Incidence of Anemia in Adolescent Girls.

OBJECTIVE

The study aimed to examine the relationship between adherence to iron tablet consumption and anemia incidence among adolescent girls.

METHODS

This study employs a correlational analytical design with a cross-sectional approach. The study population consists of all 180 seventh-grade female students at SMPN 1 Wates, with a sample of 124 respondents selected using proportional random sampling. The independent variable in this study is adherence to iron tablet consumption, while the dependent variable is the incidence of anemia, measured based on hemoglobin (Hb) levels.

Data collection was conducted using: an observation sheet for iron tablet consumption compliance and hemoglobin level testing using a hemoglobin meter. Data analysis was performed using: the chi-square test to examine the relationship between variables and Spearman's rho test to determine the strength of the correlation. The significance level used was $\alpha = 0.05$.

This study adhered to ethical principles to ensure the protection and rights of all participants. Ethical approval was obtained from the relevant institutional ethics committee prior to data collection. Permission to conduct the study was also secured from the school authorities of SMPN 1 Wates. All participants were provided with clear information regarding the purpose, procedures, benefits, and potential risks of the study, and informed consent was obtained before participation; for participants under 18 years of age, consent was also obtained from parents or guardians. Participation was voluntary, and respondents had the right to withdraw at any time without any consequences. Confidentiality and anonymity were strictly maintained by using coded identifiers instead of personal information, and all data were used solely for research purposes. The measurement of hemoglobin levels was conducted following standard procedures to ensure participant safety and comfort, minimizing any potential physical or psychological harm. Additionally, participants identified with anemia were informed of their results and advised to seek further medical evaluation or appropriate treatment through available health services.

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RESULTS

Iron Tablet Intake Compliance

Table 1. Iron Tablet Intake Compliance Among Adolescent Girls

Compliance	Frequency	Percentage
Compliant	96	77%
Non-compliant	28	23%
Total	124	100%

Source: Primary Data 2025

Most respondents demonstrated adherence to taking iron tablets, totaling 96 respondents (77%), while 28 respondents (23%) were non-adherent.

Incidence of Anemia

Table 2. Incidence of anemia in adolescent girls based on hemoglobin level characteristics Hemoglobin

Hb Level	Frequency	Percentage
Normal	100	80.6%
Anemia	24	19.4%
Total	124	100

Source: Primary Data 2025

Table 2 shows that out of 124 respondents, 100 (80.6%) were found to be normal/not anemic and 24 (19.4%) were anemic**.**

Relationship Between Compliance with Iron Supplementation ( ) and the Incidence of Anemia

Table 3. Relationship Between Compliance with Iron Tablet Intake and the Incidence of Anemia

Incidence of Anemia	Adherence		Total	p-value	OR
	Compliant	Non-compliant			
Normal	92	8	100	< 0.05	57.5 (15.76–209.71)
	74.2%	6.5%	80.6%		
Anemia	4	20	24		
	3.2%	16.1%	19.4%		
Total	96	28	124		
	77.4%	22.6%	100		

Source: Primary Data 2025

Based on the cross-tabulation table, it can be concluded that the highest incidence of normal anemia was among the compliant group, with 92 people (74.2%), and the highest incidence of anemia was among the non-compliant group, with 20 people (22.6%). Based on the results of the *chi-square* test of the relationship between the incidence of anemia and adherence, a *p-value* or sig. of 0.000 was obtained, which is smaller than α=0.05; therefore, it can be concluded that H_1 is accepted, namely that there is a relationship between the incidence of anemia and the level of adherence. The OR (Odds Ratio) value is 57.5, meaning that students who are compliant are 57.5 times more likely to have normal HB levels compared to those who are non-compliant, and vice versa.

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Table 4. Statistical Test of the Effect of Iron Tablet Consumption on the Incidence of Anemia in Adolescent Girls

Correlations			
			Compliance Level
Spearman's rho	Observed Hb Levels	Correlation Coefficient	,712**
		Sig. (2-tailed)	0.000
		N	124
**. Correlation is significant at the 0.01 level (two-tailed).			

Based on the table of *Spearman's correlation* test results, which were used to further examine the relationship between the variable "Iron Tablet Compliance" and the "Incidence of Anemia," the p-value was 0.000, which is less than 0.05. This means that $H_1$is accepted, indicating that there is a relationship between Iron Tablet Compliance and the Incidence of Anemia, with a correlation coefficient of 0.712, which indicates a strong relationship between Iron Tablet Compliance and the Incidence of Anemia. A positive correlation coefficient means that as students' compliance improves, it increases hemoglobin levels or reduces the incidence of anemia among students.

DISCUSSION

Iron Tablet Compliance Among Adolescent Girls

The research results indicate that out of 124 respondents studied, 96 (77%) were compliant with iron tablet consumption, while 28 (23%) were non-compliant. This is because, during adolescence, awareness of the importance of iron among adolescents who have already experienced menstruation tends to be low; this is evidenced by their belief that medication should only be taken when one is sick. This significantly impacts adherence to iron tablet consumption, as they do not consistently take the tablets weekly at school. In addition to not feeling sick, other factors include many of them being unable to take medication and a lack of supervision from teachers or class supervisors.

According to the theory, iron tablets are iron-folate tablets, with each tablet containing 200 mg of ferrous sulfate or 60 mg of elemental iron and 0.25 mg of folic acid. Women and adolescent girls need to take iron tablets because women experience menstruation, which requires iron to replace lost blood. Adolescents require higher levels of iron, which must be built up starting in adolescence to prepare for pregnancy and breastfeeding when they become adults. For women of childbearing age, the dosage is 1 (one) tablet per week and 1 (one) tablet per day during menstruation.

Consistency in taking iron supplements on a weekly basis has the same effectiveness as taking them weekly and during menstruation in increasing hemoglobin levels in adolescent girls. High consistency in taking weekly supplements can increase hemoglobin levels in adolescent girls.

Awareness of taking iron supplements is closely tied to the information and knowledge a person acquires, as knowledge is a factor influencing consumption behavior. The behavior of taking iron supplements involves a person's action of consuming these supplements as a preventive measure against anemia to increase blood hemoglobin levels.

Adherence to iron supplementation or the administration of iron tablets significantly influences changes in hemoglobin levels; normal hemoglobin levels indicate a normal anemia status, thereby helping to prevent and manage iron-deficiency anemia.

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Incidence of Anemia in Adolescent Girls

Research findings indicate that of the 124 respondents studied, 100 (80.6%) had normal Hb levels, while 24 (19.4%) were anemic or had abnormal Hb levels.

During adolescence, particularly among teenage girls, there is often a strong awareness of body shape, leading many to restrict their food intake. In fact, many female students diet without the advice or supervision of a health or nutrition professional, and their habits of drinking tea, coffee, or sugary beverages result in unbalanced eating patterns and portion sizes, causing them to develop anemia. Adolescent girls are at a higher risk of developing anemia than adolescent boys. This is due to improper eating habits aimed at maintaining their appearance, excessive preference for certain foods, the habit of drinking coffee or tea, and the monthly menstrual cycle. The iron requirement for women is three times greater than that for men. Women experience menstruation every month, which automatically results in blood loss. This is why women need iron to restore their bodies to their original condition. Similarly, during pregnancy, the need for iron increases threefold compared to before pregnancy. This is related to the developmental needs of the fetus they are carrying. Iron deficiency in the body is caused, in part, by foods containing substances that inhibit iron absorption. Iron absorption depends on the amount of food components that inhibit or enhance absorption, so iron absorption from daily meals varies. From the interview results, it was found that most respondents have the habit of drinking tea, coffee, or sweetened beverages at least once a day after meals. Female students have the habit of drinking tea in disposable cups purchased from a nearby shop or within the school environment. Most respondents have the habit of drinking tea at least once a day after eating iron-rich foods, causing iron absorption from those foods to be inhibited by the tannins contained in the tea. This incomplete iron absorption is what causes the amount of iron entering the body to fall short of the body's needs, which leads to cases of anemia. Additionally, adolescent girls often skip two meals and prefer to buy takeout food that is high in calories but contains very few nutrients, which can also disrupt (suppress) their appetite. Furthermore, adolescents—especially teenage girls—are increasingly drawn to junk food that contains very little (or in some cases, none at all) calcium, iron, riboflavin, folic acid, vitamin A, and other vitamins, such as: fried chicken, nuggets, sausages, seblak, and instant noodles. Adolescent girls' misguided perceptions about body shape lead them to restrict their food intake, consume insufficient animal-based protein sources, and lose more iron due to monthly menstruation.

Anemia is a condition in which hemoglobin concentration or red blood cell count is below normal. A decrease in hemoglobin or red blood cells naturally reduces the ability of red blood cells to carry oxygen throughout the body. Consequently, the body receives insufficient oxygen supply, leading to weakness and rapid fatigue (Ministry of Health, 2019). Anemia is not a disease but rather a reflection of an underlying disease or a disruption in bodily function. Iron-deficiency anemia is anemia caused by a lack of iron in the blood; this means that hemoglobin levels in the blood decrease due to impaired red blood cell production resulting from insufficient iron levels in the blood.

Researchers suggest that adolescents are at high risk of developing anemia due to iron deficiency. This is because during this phase, adolescents experience rapid growth accompanied by various hormonal changes as they approach adulthood. Adolescents require significant amounts of nutrients, particularly iron, which is used to transport oxygen. Insufficient iron intake can trigger the onset of anemia. In women, more iron is lost from the body compared to men. Women experience menstruation every month, and during each menstrual period, an average of 30 mg of iron is lost per cycle. Consequently, women face a higher risk of developing anemia compared to men.

Adherence to Iron Tablet Consumption and the Incidence of Anemia in Adolescent Girls

Based on the results of statistical analysis using Spearman's correlation test, a relationship was found between the variables of Iron Tablet Compliance and the Incidence of Anemia, with a p-value of 0.000, which is less than 0.05. This means $H_i$is accepted, indicating a relationship between Iron Tablet Compliance and the Incidence of Anemia, with a correlation coefficient of 0.712, indicating a strong relationship. A positive correlation coefficient means that as students' compliance improves, it increases hemoglobin levels or reduces the incidence of anemia among students.

These findings align with the results of a study conducted by Andaruni (2018), which showed that the administration of iron tablets to adolescent girls influences an increase in hemoglobin levels. Additionally, these findings align with the results of a study conducted by Tonasih (2019), which demonstrated that the administration of iron tablets to adolescent girls influences an increase in hemoglobin levels.

Researchers suggest that taking iron tablets can treat anemia in women and adolescent girls, improve learning ability, and enhance the nutritional status and health of adolescents. Iron tablets should be taken with foods or beverages containing vitamin C, such as orange juice, to enhance iron absorption, or alongside meat, fish, or chicken to stimulate stomach acid production. When taking iron supplements, avoid consuming alcohol, tea, coffee, or fruits containing alcohol—such as durian, tape, pineapple, and mango—as these can reduce iron absorption in the body, diminishing the supplement's benefits. To minimize nausea and vomiting, take iron tablets after dinner or before bedtime.

Adolescent girls are one of the groups most susceptible to anemia. Therefore, the target audience for nutritional anemia prevention programs has been expanded to include adolescent girls in junior high school, senior high school, and equivalent levels, as well as out-of-school women, as a strategic effort to break the cycle of nutritional problems. The consumption of iron tablets has been promoted by community health centers in collaboration with junior high and senior high schools to prevent anemia among adolescents. Adolescents who do not take iron tablets as recommended are more likely to develop anemia, whereas those who follow health workers' recommendations do not develop anemia.

Based on the researcher's hypothesis that there is a relationship between iron tablet consumption and anemia in adolescent girls, respondents who regularly consume iron tablets will maintain normal hemoglobin levels. Consuming iron tablets is highly effective in addressing anemia; thus, adolescents who experience monthly menstruation but regularly take iron tablets maintain normal hemoglobin levels >12 g/dL.

Compared with previous studies, the present findings are consistent with a broad body of evidence showing that adherence to iron supplementation is significantly associated with improved hemoglobin levels and reduced anemia among adolescent girls. Prior research in school-based and community settings has similarly reported that compliant adolescents are more likely to maintain normal hemoglobin levels, while non-adherence remains a major contributor to persistent anemia. However, many earlier studies have focused primarily on knowledge, attitudes, or program coverage, rather than directly linking adherence behavior with objective hemoglobin measurements. This study strengthens the existing literature by providing empirical evidence from a specific school context, confirming that adherence is a critical determinant of anemia outcomes. In some studies, barriers such as side effects, forgetfulness, and lack of supervision were identified as key factors influencing adherence, which may also explain the presence of anemia in the non-compliant group observed in this study.

The implications for nursing and public health practice are substantial. Nurses,

particularly school and community health nurses, play a vital role in promoting adherence to iron supplementation through health education, counseling, and regular monitoring. Interventions should emphasize the importance of consistent iron tablet consumption, proper timing, and combining supplementation with vitamin C–rich foods to enhance absorption. Public health programs should strengthen school-based supplementation initiatives by incorporating supervision mechanisms, reminder systems, and involvement of teachers and parents to improve compliance. Additionally, routine screening for anemia and continuous evaluation of supplementation programs are essential to ensure effectiveness. These findings highlight the need for integrated, behavior-focused strategies to reduce anemia prevalence and improve the overall health and academic performance of adolescent girls.

CONCLUSION

Adherence to iron tablet consumption was significantly associated with lower anemia incidence among adolescent girls. Strengthening school-based supplementation programs may improve adolescent health outcomes

Consuming iron tablets can help adolescent girls prevent anemia, improve learning ability, and enhance their nutritional status and overall health. Iron tablets can be taken alongside foods or beverages containing vitamin C or orange juice, which accelerate iron absorption by stimulating stomach acid production.

Adolescent girls are one of the groups most susceptible to anemia. Therefore, the target of the nutritional anemia prevention program has been expanded to include adolescent girls in junior high school, senior high school, and equivalent levels, as well as out-of-school women as a strategic effort to break the cycle of nutritional problems. The consumption of iron tablets has been promoted by public health centers in collaboration with junior high and senior high schools to prevent anemia in adolescents.

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CONFLICTS OF INTEREST

The authors declare no competing interests. This research was carried out in the absence of any commercial, financial, or personal relationships that could inappropriately influence or bias the results and interpretation of the findings.

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