

EFFECTIVENESS OF IRON SUPPLEMENTATION IN REDUCING THE INCIDENCE OF ANEMIA IN ADOLESCENT GIRLS AT DARUSSALAM WANARAJA HIGH SCHOOL IN GARUT REGENCY IN 2025

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ABSTRACT

Adolescents are a generation that needs to be prepared to contribute to national development and compete globally. Healthy, intelligent, and cheerful adolescents are the key to creating superior human resources (HR). Anemia remains a significant global health problem, particularly among adolescents and women of childbearing age. According to the World Health Organization (WHO, 2023), the prevalence of anemia among women aged 15–49 worldwide reaches 30.7%, while among pregnant women it reaches 35.5%, with the highest rates found in South Asia and Sub-Saharan Africa. This situation reflects that anemia remains a major challenge in efforts to improve the nutritional status and health of the global population. In Indonesia, a similar problem remains high (WHO, 2023). In West Java Province, the prevalence of anemia among adolescent girls remains relatively high and shows an increasing trend. Data from the West Java Provincial Health Office indicates that the prevalence of anemia among adolescent girls will reach approximately 45% in 2024, increasing to approximately 47% in 2025 (West Java Health Office, 2025). Darussalam Wanaraja High School, one of the schools within the Wanaraja Community Health Center (Puskesmas) working area, Wanaraja District, Garut Regency, also contributes to the highest incidence of anemia among adolescents compared to other schools in the same area. A common cause of anemia is a decrease in the number of erythrocytes or hemoglobin levels in the blood. Based on the above description, the researchers were interested in conducting a study entitled "The Effectiveness of Iron Supplementation in Reducing the Incidence of Anemia in Adolescent Girls at Darussalam Wanaraja High School, Garut Regency in 2026."

Keywords: Iron, anemia, adolescent girls

I. INTRODUCTION

Adolescents are a generation that needs to be prepared to contribute to national development and compete globally. Healthy, intelligent, and cheerful adolescents are the key to creating superior human resources (HR). The health of adolescent girls needs to be addressed early on because they will eventually become mothers, and health problems during this period can impact the next generation. Adolescence is synonymous with high levels of physical activity, both related to school and extracurricular activities. Therefore, nutritional needs for adolescents must be considered in terms of both quality and quantity (WHO, 2020). Anemia remains a significant global health problem, particularly among adolescents and women of childbearing age. According to the World Health Organization According to the World Health Organization (WHO, 2023), the prevalence of anemia among women aged 15–49 worldwide reached 30.7%, while among pregnant women it reached 35.5%, with the highest rates found in South Asia and Sub-Saharan Africa. This situation reflects that anemia remains a major challenge in efforts to improve the nutritional status and health of the global population. In Indonesia, a similar problem remains high (WHO, 2023).

According to a report by the Indonesian Ministry of Health (Kemenkes, 2024), the prevalence of anemia among adolescents aged 15–24 reached approximately 32%, and monitoring results from the January–September 2025 quarter showed that 22.6% of adolescents in grades 7 and 10 were anemic. These high rates indicate that anemia among adolescents, especially adolescent girls, remains a public health issue that requires serious attention. Strategic measures such as hemoglobin (Hb) level screening and regular iron (Fe) supplementation in schools are needed to reduce the incidence of anemia in this group.

In West Java Province, the prevalence of anemia among adolescent girls remains high and shows an increasing trend. Data from the West Java Provincial Health Office indicates that in 2024 the prevalence of anemia among adolescent girls reached approximately 45%, and in 2025 it increased to approximately 47% (West Java Health Office, 2025). In Garut Regency, Health Office data shows that in 2022, 647 adolescent girls (44.3%) suffered from anemia, increasing to 856 adolescent girls (51.2%) in 2023, and 52.2% in 2024 (Garut Health Office, 2024).

Darussalam Wanaraja High School is one of the schools within the Wanaraja Community Health Center (Puskesmas) working area in Wanaraja District, Garut Regency, and also contributes to the highest incidence of anemia among adolescents compared to other schools in the same area. According to the 2024 annual report from the Wanaraja Community Health Center, hemoglobin level tests for students at Darussalam Wanaraja High School in Wanaraja District, Garut Regency, found that 47.6% of female students had Hb levels <12 g/dL (Wanaraja Community Health Center, 2024).

A common cause of anemia is a decrease in the number of erodes or hemoglobin levels in the blood. Many factors can contribute to iron deficiency anemia, including increased demand, insufficient iron intake, infections, gastrointestinal bleeding, and other factors. This is certainly detrimental to adolescent development as it can interfere with productivity. Iron deficiency anemia can be diagnosed through anamnesis, physical examination, and supporting tests (Alfian, 2023).

Adolescent girls with anemia tend to tire easily, lose enthusiasm, have difficulty concentrating, and experience decreased academic performance. In the long term, anemia can compromise the health of expectant mothers, increasing the risk of pregnancy complications, low birth weight (LBW), prematurity, and maternal death. Furthermore, anemia weakens the immune system, making it susceptible to infection, which ultimately impacts the quality of human resources (Tunnisa, 2018).

Anemia prevention efforts in adolescent girls can be implemented through hemoglobin screening programs to detect anemia early and the provision of iron (Fe) tablets as an effective intervention (Nancy Olii, 2020). Furthermore, the government program not only provides iron supplements to pregnant women but also extends to adolescents. This is done to prevent anemia. 23.8% of adolescent girls in Indonesia have not received iron supplements from their schools.

(RISKESDAS, 2018). This government program provides one iron tablet once a week to adolescent girls aged 12–18 in secondary schools (SMP/SMA/Equivalent) throughout the year. This activity is assisted by sub-district health workers and school teachers. The absorption of iron into the body is also influenced by vitamin C (Artika Sari, 2019).

Hb screening is a simple laboratory test used to detect early decreases in hemoglobin levels in the blood. This test is very useful for determining anemia status before clinical symptoms appear, allowing for early intervention. According to the Indonesian Ministry of Health (2021), hemoglobin screening for adolescent girls in schools is part of the adolescent health program, which aims to monitor nutritional status and prevent iron deficiency anemia. With regular Hb screening, schools and health workers can identify at-risk students, provide nutrition education,

and continue with iron supplementation (Fe) tablets as a follow-up to early prevention and treatment.

In addition to hemoglobin screening, administering iron (Fe) tablets is a proven effective intervention for reducing the incidence of anemia. Iron tablets contain iron, which plays a role in the body's hemoglobin formation process. According to the Indonesian Ministry of Health (2022), adolescent girls are advised to consume one iron tablet (containing 60 mg of elemental iron and 0.4 mg of folic acid) weekly throughout the year. Iron supplementation helps meet the increased iron needs during adolescence due to rapid growth and blood loss during menstruation. Research also shows that regular iron supplementation can increase hemoglobin levels, improve learning concentration, and reduce the risk of anemia among school-age adolescents (Wulandari et al., 2023). Therefore, the combination of hemoglobin screening for early detection and iron supplementation as a preventative measure is an effective strategy for reducing the prevalence of anemia in adolescent girls.

A study conducted by Pratiwi and Handayani (2021) entitled "Effectiveness of the Iron Supplement Program on Increasing Hemoglobin Levels in Adolescent Girls at SMA Negeri 2 Sukabumi" showed a significant increase in Hb levels after administering iron tablets for eight weeks. The average Hb level of respondents increased from 10.8 g/dL to 12.3 g/dL, with a p-value <0.05. These results indicate that regular consumption of iron tablets can improve anemia status and reduce the number of adolescents with mild to moderate anemia.

Furthermore, a study by Rahmadani et al. (2022) entitled "The Relationship between Hemoglobin Screening and Anemia Prevention Efforts in Adolescent Girls in Tasikmalaya Regency" revealed that routine Hb screening activities play a crucial role in increasing adolescents' awareness of their health status. The results showed a significant relationship between Hb screening and anemia prevention measures, with adolescents who underwent screening tending to be more compliant in taking iron tablets and maintaining a balanced nutritional diet than those who did not undergo screening.

Another study by Saraswati and Lestari (2023) entitled "The Effectiveness of Iron Tablet Supplementation on the Incidence of Anemia in Adolescent Girls at SMP Negeri 1 Cirebon" found that after three months of iron tablet administration, the prevalence of anemia in the intervention group decreased from 48.6% to 21.4%. Meanwhile in the group No significant changes were observed in controls who did not receive supplementation. This study confirms that iron intervention accompanied by Hb level monitoring can significantly reduce the incidence of anemia.

Based on the description above, the researcher is interested in conducting research with the title "Effectiveness of Providing Fe in Reducing the Incidence of Anemia in Adolescent Girls at Darussalam Wanaraja High School, Garut Regency in 2026".

II. RESEARCH METHODS

This study was a quasi-experimental study with a one-group pre-test post-test design. A quasi-experimental study is a type of research conducted to determine the effect of a treatment intentionally administered by the researcher on the research subjects (Arianto, 2019).

In this study, hemoglobin (Hb) levels were observed before the intervention as a pre-test. Furthermore, all adolescent girls diagnosed with anemia were given iron tablets as an intervention to increase their hemoglobin levels. After the intervention period was completed, hemoglobin levels were measured again as a post-test. Changes in Hb levels before and after iron tablet administration were analyzed to determine the effectiveness of the intervention in reducing the incidence of anemia.

Table 3.1 Research Design

	<i>Pre-Tes</i>	Treatment	<i>Post-Tes</i>
Responden	O ₁	X	O ₂

Information :

O₁ : Average hemoglobin level before being given Fe tablets (pre-test)

X₁ : Giving Fe tablets

O₂ : Average hemoglobin levels after being given Fe tablets (post-test)

Data collection in this study uses the observation method. The observation method is a planned procedure, which includes seeing, hearing, and recording a number and level of certain activities or certain situations that are related to the problem being studied (Notoatmodjo; 2018). The data analysis used in this study is univariate data analysis and bivariate data analysis.

III. RESULTS AND DISCUSSION

Research result

Univariate Results

Hemoglobin Levels in Adolescent Girls Before Being Given Iron Tablets

Table 1.

Hemoglobin Levels in Adolescent Girls Before Iron Administration at Darussalam Wanaraja High School Garut Regency in 2026

Results	Respondent's Hb Level				
	N	Min	Max	Mean	SD
Pre-Test	36	10,6	11,6	11,086	0,2758

Source: SPSS Data Processing for 2026

Based on Table 1, it shows that from 36 respondents before being given the intervention, the results of hemoglobin (Hb) level measurements were obtained with the The lowest was 10.6 g/dL, the highest was 11.6 g/dL, and the average was 11.086 g/dL with a standard deviation of 0.2758.

Hemoglobin Levels in Adolescent Girls Before Iron Tablet Administration

Table 2.

Hemoglobin Levels in Adolescent Girls After Iron Administration at Darussalam Wanaraja High School, Garut Regency in 2026

Results	Kadar Hb Responden				
	N	Min	Max	Mean	SD
Post-Test	36	11,1	12,7	11,936	0,4467

Source: SPSS Data Processing for 2026

Based on Table 2, it shows that from 36 respondents after being given the intervention, the results of hemoglobin (Hb) level measurements were obtained with the lowest value of 11.1

g/dL, the highest of 12.7 g/dL, and an average of 11.936 g/dL with a standard deviation of 0.4467.

Bivariate Results

Bivariate analysis was conducted to determine whether there were differences in pre-test and post-test results between the iron tablet and red guava juice group and the iron tablet and honey group, as well as differences in the post-test results between these groups. However, before testing the hypothesis, the researcher first tested the data for normality using SPSS v.25 with the Shapiro-Wilk test. The results are as follows:

Normality Test

Table 3. Normality Test Results

Respondents	N	<i>p-value</i>	Information
Pre-Tes	36	0,245	Normal
Post-Tes	36	0,265	Normal

Source: SPSS Data Processing for 2026

Based on table 3, it is known that the p-value for all data is > 0.05 , so it can be concluded that the research data is normally distributed, so the data analysis test used is a parametric test, namely the Paired Samples Test with the following analysis results:

Test Analysis Results *Paired Samples Test*

Table 4.
Effectiveness of Iron Supplementation in Reducing the Incidence of
Anemia in Adolescent Girls at Darussalam Wanaraja High School, Garut
Regency
2026

Results	N	Mean	SD	<i>p-value</i>
Pre-Test	36	11,086	0,2758	0,000
Post-Test	36	11,936	0,4467	

Source: SPSS Data Processing for 2026

Based on Table 4, the analysis results using the Paired Samples Test obtained a p-value of 0.000 ($p < 0.05$). This indicates that there is a significant difference between hemoglobin levels before and after the intervention. Therefore, it can be concluded that the administration of Fe tablets has an effect on increasing hemoglobin levels in female adolescents at Darussalam Wanaraja High School, Garut Regency in 2026.

Discussion

Hemoglobin Levels in Adolescent Girls Before Iron Administration at Darussalam Wanaraja High School, Garut Regency in 2026

Based on the research results, it was found that the average hemoglobin (Hb) level of adolescent girls before being given the Fe tablet intervention was 11.086 g/dL with the lowest value being 10.6 g/dL and the highest value being 11.6 g/dL. These results indicate that some

respondents were in the mild anemia category because their hemoglobin levels were still below the normal limit for adolescent girls, which is ≥ 12 g/dL. This condition indicates that before the intervention, most respondents had relatively low hemoglobin levels, thus being at risk of developing more severe anemia. The results of this study align with research conducted by Sari Ningsih (2021), which showed that the average hemoglobin level of adolescent girls before iron supplementation was 10.82 g/dL, which is considered mild anemia. The study also reported that approximately 68% of respondents experienced mild anemia before the intervention. Another study conducted by Lestari (2020) also found similar results, with the average hemoglobin level of adolescent girls before the intervention being 10.74 g/dL, with the majority of respondents being mildly anemic. This condition occurs due to low iron intake and unbalanced dietary habits in adolescent girls, such as low consumption of iron-rich foods and high consumption of fast food.

This condition is also supported by national data showing that the prevalence of anemia among adolescent girls in Indonesia remains quite high. A survey reported by the Indonesian Ministry of Health (2018) showed that approximately 32% of adolescent girls in Indonesia suffer from anemia, largely due to iron deficiency due to inadequate nutritional intake.

Theoretically, anemia in adolescent girls can occur due to increased iron requirements during growth and blood loss during menstruation. According to Arisman (2019), adolescence is a period of growth that requires higher iron intake than childhood. Furthermore, according to Almatier (2018), iron deficiency is the main cause of anemia in adolescent girls because iron plays a crucial role in the formation of hemoglobin in red blood cells.

Based on the findings in the field, researchers assume that the low hemoglobin levels in respondents before being given the intervention were possibly influenced by a lack of knowledge about consuming Fe Tablets.

Hemoglobin Levels in Adolescent Girls After Iron Administration at Darussalam Wanaraja High School, Garut Regency in 2026

The study found that the average hemoglobin level of female adolescents after receiving iron tablets increased to 11.936 g/dL, with the lowest value being 11.1 g/dL and the highest being 12.7 g/dL. This finding indicates that hemoglobin levels increased in most respondents after the intervention, thus improving their previously anemia.

The results of this study align with research conducted by Rahmawati (2022), which showed that routine iron supplementation in anemic adolescent girls can significantly increase hemoglobin levels. The study reported that the average hemoglobin level of respondents before iron supplementation was 10.87 g/dL, which then increased to 11.92 g/dL after several weeks of intervention. Another study conducted by Handayani (2021) also showed similar results, where the average hemoglobin level of adolescent girls before iron supplementation was 10.95 g/dL and increased to 11.85 g/dL after iron supplementation. This increase in hemoglobin levels indicates that routine iron tablet administration can help improve anemia in adolescent girls.

Theoretically, iron plays a crucial role in the formation of hemoglobin, which transports oxygen throughout the body's tissues. According to Almatier (2018), adequate iron consumption can increase hemoglobin production, thereby improving anemia. Furthermore, according to Arisman (2019), iron supplementation is an effective intervention for increasing hemoglobin levels, especially in groups at high risk for anemia, such as adolescent girls.

Based on the results of observations during the study, the researcher assumed that the increase in hemoglobin levels in respondents was influenced by respondents' compliance in consuming the Fe tablets given during the intervention period.

The Effectiveness of Iron Provision in Reducing the Incidence of Anemia in Adolescent Girls at Darussalam Wanaraja High School, Garut Regency in 2026

Based on the analysis results using the paired samples test, a p-value of 0.000 ($p < 0.05$) was obtained, indicating a significant difference between hemoglobin levels before and after the intervention. The average hemoglobin level increased from 11.086 g/dL to 11.936 g/dL, thus concluding that the administration of Fe tablets was effective in increasing hemoglobin levels in female adolescents at Darussalam Wanaraja High School, Garut Regency in 2026.

The results of this study align with research conducted by Pratiwi (2022), which showed that regular iron supplementation can increase hemoglobin levels and reduce the incidence of anemia in adolescent girls. Another study by Putri (2021) also found a significant difference between hemoglobin levels before and after iron tablet administration, with a p-value < 0.05 .

In theory, iron supplementation is a recommended strategy for addressing iron deficiency anemia, particularly in at-risk groups such as adolescent girls. According to the World Health Organization (2020), iron deficiency anemia occurs when the body lacks sufficient iron to produce hemoglobin, a protein in red blood cells that transports oxygen throughout the body's tissues. Therefore, regular iron supplementation can help increase hemoglobin levels and improve iron status. This supplementation is an important effort in anemia prevention and management programs because it can increase iron reserves and support the process of erythropoiesis or red blood cell formation. In addition, according to Almatsier (2018), iron is an essential mineral that plays a vital role in hemoglobin synthesis and various metabolic processes in the body. Iron functions to carry oxygen from the lungs to all body tissues. Therefore, low hemoglobin levels reduce the oxygen supply to the tissues. This condition can cause various symptoms of anemia, such as fatigue, paleness, dizziness, and decreased concentration in learning in adolescents. Therefore, increasing iron intake through supplementation or iron-rich foods is essential to improve anemia.

Iron absorption in the body is also influenced by the presence of other nutrients that can enhance or inhibit iron absorption. According to Gropper (2018), vitamin C is one nutrient that can increase the absorption of non-heme iron in the intestine by reducing iron to a form that is more easily absorbed by the body. Conversely, substances such as tannins in tea, phytates in grains, and high amounts of calcium can inhibit iron absorption. Therefore, consuming foods or drinks rich in vitamin C along with iron supplementation can help increase the effectiveness of iron absorption in the body.

Based on field findings, researchers assumed that the increase in hemoglobin levels in respondents was influenced not only by the administration of iron tablets, but also by increased awareness of the importance of maintaining health and paying attention to nutritional intake. During the study, some respondents showed behavioral changes, such as increasing attention to nutritious food consumption and being more disciplined in taking iron tablets.

IV. CONCLUSION

Based on the results of the data analysis and statistical calculations described in the previous chapter, the researcher can draw the following conclusions:

- 1) The average hemoglobin level in adolescent girls before being given iron tablets at Darussalam Wanaraja High School, Garut Regency in 2026 was 11.086 g/dL.
- 2) The average hemoglobin level in adolescent girls after being given iron tablets at Darussalam Wanaraja High School, Garut Regency in 2026 was 11.936 g/dL.

3) Administering iron tablets was proven effective in increasing hemoglobin levels in adolescent girls with a p-value of 0.000 ($p < 0.05$), indicating a significant difference between hemoglobin levels before and after iron tablet administration.

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