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Prevention of Anemia in Adolescents Through Nutrition Education And Iron Supplementation in Cihideung Village in 2025

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Abstract

Purpose: This study aimed to prevent anemia among adolescents by increasing their knowledge and improving hemoglobin levels through nutrition education and iron supplementation. Anemia is a significant public health problem among adolescents, especially girls, caused by increased iron requirements, unbalanced dietary patterns, and limited nutritional awareness.

Method: A quasi-experimental design with a pre-test and post-test without a control group was employed. The study involved 70 adolescents aged 13–18 years in Cihideung Village, Bandung Barat Regency. Participants attended interactive nutrition education sessions and received iron supplementation for 15 days. Data were collected using knowledge questionnaires and hemoglobin measurements and analyzed with a paired t-test.

Practical Applications: The findings can be applied to develop community-based interventions for anemia prevention among adolescents. Implementing similar programs in schools and youth organizations may enhance awareness, encourage healthy eating behaviors, and reduce anemia prevalence.

Conclusion: The intervention significantly increased adolescents' knowledge and improved hemoglobin levels, reducing anemia prevalence from 34.3% to 18.6%. Combining education with supplementation is an effective strategy for preventing anemia in adolescents.

Introduction

Anemia remains a significant public health issue in Indonesia, especially among adolescents. Adolescence is a transitional period from childhood to adulthood characterized by rapid physical growth, hormonal changes, and increased nutritional needs. During this phase, adolescents require higher nutritional intake to support optimal growth and development. However, in reality, many adolescents do not get adequate nutrition, especially iron, putting them at high risk of anemia. Data from the 2018 Basic Health Research (Riskesdas) shows that the prevalence of anemia among adolescents in Indonesia reaches 32%. This means that nearly one-third of Indonesian adolescents face this problem, which can impact their health, fitness, and productivity.

Conditions at the regional level also show an alarming situation. In West Bandung Regency, the prevalence of anemia among adolescents in 2023 was reported to be 28%. Although this figure is slightly lower than the national prevalence, it is still far above the government's target of 20%. These findings indicate that anemia remains a serious health problem and requires special attention. Health screening results at one of the largest secondary education institutions in the Parongpong area, namely SIAS Islamic Boarding School, even showed that 25% of its students had mild to moderate anemia in 2024. This fact reinforces the urgency of targeted interventions in efforts to prevent and treat anemia in adolescents.

By definition, anemia is a condition in which the number of red blood cells or hemoglobin concentration in the blood is below normal. Hemoglobin is an important component of red blood cells that binds and transports oxygen to all tissues in the body. A lack of hemoglobin reduces oxygen transport capacity, causing the body to experience various symptoms, such as weakness, lethargy, dizziness, shortness of breath, and decreased concentration. Optimal hemoglobin concentration is influenced by various factors, including age, gender, nutritional status, altitude, smoking habits, and pregnancy status. The causes of anemia can vary, ranging from nutritional deficiencies (iron, folate, vitamin B12, vitamin A), chronic diseases, infections (such as malaria or tuberculosis), gynecological disorders, to inherited blood disorders. However, the most common cause in adolescents is iron deficiency anemia due to inadequate diet.

Anemia is a significant global health problem. The WHO (2024) estimates that 40% of children aged 6–59 months, 37% of pregnant women, and 30% of women aged 15–49 years worldwide suffer from anemia. The global prevalence of anemia in women of reproductive age (15–49 years) is 29.9%, with a rate of 29.6% in non-pregnant women. In Southeast Asia, the prevalence of anemia reaches 42%, the highest compared to other regions. In Indonesia alone, the prevalence of anemia in women aged ≥15 years is recorded at 23%, higher than in neighboring countries, such as Malaysia (21%) and Singapore (22%). Among adolescents, Riskesdas (2018) reported a prevalence of anemia of 32% among those aged 15–24 years, with a higher prevalence among adolescent girls (27.2%) than boys (20.3%). The Indonesian Demographic and Health Survey also found a prevalence of anemia of 23% among adolescents aged 13–18 years.

The high rate of anemia among adolescents, especially adolescent girls, is inseparable from complex contributing factors. One of these is an unbalanced diet. Many adolescent girls deliberately reduce their food intake, especially animal protein, for reasons related to dieting and physical appearance, even though animal protein is very important in the formation of hemoglobin. In addition, adolescent girls experience menstruation every month, which increases their iron requirements. The habit of consuming tea or coffee with meals also inhibits iron absorption. Other factors such as lack of nutritional knowledge, limited access to nutritious food, and socioeconomic status also exacerbate this condition.

The impact of anemia on adolescents is extensive. Academically, anemia contributes to decreased concentration, memory, and school performance. From a health perspective, anemia can reduce physical fitness and endurance, as well as increase the risk of infectious

diseases. In the long term, anemia in adolescent girls increases the risk of pregnancy complications later in life, such as premature birth and low birth weight babies. The social and economic impacts are equally significant, as adolescents with anemia tend to have low productivity, which can ultimately hinder future human resource development.

Efforts to prevent anemia in adolescents have been carried out through various strategies, including iron supplementation with iron tablets. However, the coverage of this program is still not optimal. In West Java, for example, the coverage of adolescent girls receiving iron tablets in 2021 was only 25.2%, far below the provincial target of 52%. This indicates the need for a more innovative, collaborative, and sustainable approach to treating anemia in adolescents. Based on these conditions, Karang Taruna in the village of Cihideung, Parongpong District, West Bandung Regency was chosen as the location for intervention due to the high prevalence of anemia. The program “Prevention of Anemia in Adolescents: Collaboration between Ikes Rajawali and the West Bandung Regency Health Office” was designed to increase students' knowledge, awareness, and skills in preventing anemia. The program includes nutrition education, iron supplementation, training in early detection of anemia using the CIBINA method (Check Initiative Evidence Indication of Anemia), empowerment of youth health cadres, and modification of school canteen menus. It is hoped that this program will create an effective intervention model that can be replicated in other schools in West Bandung Regency and other regions in Indonesia.

Method

This study is a quantitative study with a quasi-experimental design approach, using a pre-test and post-test design without a control group. This design was chosen to determine the effectiveness of nutrition education and iron supplementation on increasing knowledge and preventing anemia in adolescents. This study was conducted at the Karang Taruna Youth Organization in Cihideung Village, Parongpong District, West Bandung Regency, from July to August 2025.

The population in this study consisted of all adolescents who were members of the Cihideung Village Youth Organization, totaling 80 people. The sampling technique used was total sampling, so that all adolescents who attended the counseling activities became research respondents. The number of participants involved in this study was 70 people. The inclusion criteria for this study included adolescents aged 13–18 years, residing in Cihideung Village, and willing to participate in the entire series of research activities by signing an informed consent form. Meanwhile, the exclusion criteria were adolescents who were seriously ill and therefore unable to fully participate in the activities, as well as those who were absent during the pre-test and post-test.

The variables studied in this research consisted of independent and dependent variables. The independent variables were interventions in the form of nutrition education and iron supplementation, while the dependent variables were adolescents' level of knowledge about anemia and anemia status as measured by hemoglobin (Hb) levels. The instruments used in this study included a knowledge questionnaire containing 20 multiple-choice questions to measure adolescents' understanding of anemia. This questionnaire had undergone validity and reliability testing before use. In addition, a portable Hb meter was used to check hemoglobin levels, and an observation sheet was used to record the activity process, participant attendance, and compliance with supplement consumption.

The research procedure began with a preparation stage that included coordination with the Karang Taruna youth organization, village officials, and the West Bandung District Health Office, preparation of educational materials, and logistical preparations such as leaflets, posters, and Hb testing equipment. The research team also prepared pre-test and post-test questionnaires to be used during the study. The implementation phase began with initial measurements through a pre-test to assess participants' knowledge levels and Hb level checks to determine anemia status before the intervention was given. Next, nutrition education

was provided by lecturers and students from the Ikes Rajawali Faculty of Midwifery using lectures, interactive discussions, and demonstrations on choosing nutritious foods. After the education session, iron supplements were given to participants whose test results showed a risk of anemia. Additionally, youth health cadres were formed to serve as agents of continuous education in schools and communities.

Evaluation was conducted through a post-test after the counseling to measure the increase in participants' knowledge. Hb levels were re-measured 15 days after the intervention to observe changes in anemia status. All data obtained were then analyzed to evaluate the effectiveness of the program. Data analysis was performed using statistical software. The type of analysis used was univariate analysis to describe respondent characteristics such as age, gender, initial knowledge level, and initial Hb level. Next, bivariate analysis was performed using a paired t-test to compare the pre-test and post-test results, both in terms of knowledge level and Hb level. A p-value < 0.05 was set as the significance threshold for the study.

Research ethics were strictly observed. Before the study began, all participants were given an explanation of the objectives, procedures, benefits, and possible risks, and were then asked to sign an informed consent form. This study has obtained permission and approval from the Rajawali Health Institute Health Research Ethics Committee. All participant data was kept confidential and was only used for research purposes.

Result

Research on anemia prevention among adolescents in Karang Taruna, Cihideung Village, Parongpong District, West Bandung Regency was conducted in July-August 2025. A total of 70 respondents out of 80 Karang Taruna members participated in this activity. All participants took part in a series of activities, ranging from pre-test completion, nutrition counseling, hemoglobin (Hb) level checks, to post-test completion.

Table 1. Characteristics of Respondents Based on Age

Age (Years)	Frequency (n)	Percentage (%)
13-15	25	35,7%
16-17	38	54,3 %
18	7	10,0%
Total	70	100%

Source: Author's Work, 2025.

Table 1 shows that the majority of respondents are in the 16-17 age group (54.3%), which is mid-adolescence, corresponding to the high school phase.

Table 2. Characteristics of Respondents Based on Gender

Gender	Frequency (n)	Percentage (%)
Male	30	42,9%
Female	40	57,1 %
Total	70	100%

Source: Author's Work, 2025.

Table 2 shows that the majority of respondents were female (57.1%). This is in line with the objective of the anemia prevention program, which focuses more on adolescent girls, as this group has a higher risk of anemia due to menstruation and increased iron requirements.

Table 3. Distribution of Adolescents' Knowledge about Anemia Before and After Intervention

Knowledge Category	**Pre-test (n=70)**	**%**	**Post-test (n=70)**	**%**
Good	10	14,3%	58	82,9%
Adequate	14	20,0%	8	11,4%
Inadquate	46	65,7%	4	5,7%
Total	70	100%	70	100%

Source: Author's Work, 2025.

Table 3. Shows that the distribution of adolescents' knowledge about anemia before the intervention was carried out, most participants had low knowledge about anemia, as indicated by the pre-test results showing that 65.7% of respondents were in the poor knowledge category. After interactive nutrition counseling and the distribution of educational leaflets, there was a significant increase in the post-test results, with 82.9% of respondents reaching the good knowledge category.

Table 4. Distribution of Anemia Status in Adolescents Before and After Intervention

Anemia Status	Pre-test (n=70)	%	Post-test (n=70)	%
Not anemic	46	65,7%	57	81,4%
Mild Anemia	20	28,6%	11	15,7%
Moderate Anemia	4	5,7%	2	2,9%
Severe Anemia	0	0%	0	0%
Total	70	100%	70	100%

Source: Author's Work, 2025.

Table 4. Shows that before the intervention, 24 respondents (34.3%) had anemia, consisting of 20 people (28.6%) with mild anemia and 4 people (5.7%) with moderate anemia. After 15 days of iron supplementation, the number of respondents with anemia decreased to 13 (18.6%), consisting of 11 (15.7%) with mild anemia and 2 (2.9%) with moderate anemia. In addition, there was an increase in the number of adolescents who did not have anemia from 46 people (65.7%) before the intervention to 57 people (81.4%) after the intervention. The average hemoglobin (Hb) level of respondents also increased by 0.9 g/dL, from 11.2 g/dL to 12.1 g/dL.

Table 5. Bivariate Analysis of Knowledge and Anemia Status in Adolescents Before and After Intervention

Variabel	Before Intervensi		After Intervensi		Mean Difference	p-value
	Mean	Std. Deviasi	Mean	Std. Deviasi		
Knowledge skor	52,4	8,7	84,6	7,9	32,2	<0,001
Hb Level (g/dL)	11,2	0,9	12,1	1,0	0,9	0,000

Source: Author's Work, 2025.

The results of the bivariate analysis in Table 5 show a significant increase in adolescents' knowledge scores and hemoglobin (Hb) levels after the intervention. The average knowledge score before the intervention was 52.4 with a standard deviation of 8.7, increasing to 84.6 with a standard deviation of 7.9 after nutrition education and leaflet distribution, with a difference of 32.2 p ($p < 0.001$). Similarly, Hb levels increased from 11.2 with a standard deviation of 0.9 g/dL to 12.1 with a standard deviation of 1.0 g/dL after 15 days of iron supplementation, with a difference of 0.9 g/dL ($p = 0.000$).

Statistical tests using paired t-tests showed significant differences between pre-test and post-test values for both knowledge levels and Hb levels, with $p < 0.05$. This indicates that the intervention was effective in improving adolescents' understanding of anemia and improving their anemia status.

Discussion

This study proves that interventions in the form of nutrition education and iron supplementation are effective in increasing knowledge and improving anemia status among adolescents in Karang Taruna, Cihideung Village, West Bandung Regency. The majority of research respondents were adolescents aged 16–17 years (54.3%) and most were female (57.1%). These findings are relevant to the literature which states that adolescent girls are at higher risk of anemia than boys, due to increased iron requirements as a result of

menstruation, an unbalanced diet, and socio-cultural factors related to diet and body image.

The results showed that before the intervention, most respondents had low knowledge about anemia (65.7%). After interactive nutrition education accompanied by the distribution of educational leaflets, there was a significant increase, with 82.9% of respondents achieving good knowledge. This shows that education methods with an interactive approach and supporting media can improve adolescents' understanding. Similar studies by Dewi et al. (2020) and Marfiah (2022) also reported that the use of educational media such as leaflets, posters, and group discussions was proven to significantly improve adolescents' nutritional knowledge. Good nutritional knowledge is very important because it is closely related to changes in behavior towards healthier and more varied food consumption, thereby supporting efforts to prevent anemia.

In addition to increasing knowledge, this study also showed an improvement in anemia status. Before the intervention, 34.3% of respondents had mild to moderate anemia. After the intervention, this figure decreased to 18.6%. The average hemoglobin level also increased from 11.2 g/dL to 12.1 g/dL, with a difference of 0.9 g/dL. The results of the paired t-test showed a significant difference [11], which recommends iron supplementation as the main strategy for preventing anemia in adolescent girls. Research by Rachmawati et al. (2021) in Central Java also showed that administering iron tablets (TTD) for 1 month was able to significantly increase Hb levels in high school adolescents.

Improvements in anemia status in this study were not only influenced by iron supplementation, but also by increased nutritional knowledge that encouraged changes in eating behavior. A study by Suryani et al. (2022) confirmed that anemia interventions in adolescents are more effective when carried out comprehensively, combining nutritional education, iron supplementation, and modification of daily eating patterns. Thus, the results of this study reinforce the evidence that anemia prevention efforts should not only focus on providing supplements, but also include aspects of education and empowerment of adolescents.

Although the results of this study are positive, it should be noted that iron supplementation was only given for a period of 15 days, so the long-term effects cannot yet be evaluated. Previous studies have indicated that adolescent adherence to TTD consumption is often a challenge due to gastrointestinal side effects such as nausea or constipation [11]. Therefore, sustainability strategies such as monitoring TTD consumption, improving the palatability of iron-rich foods, and support from families and schools are essential to ensure long-term effectiveness.

Overall, the findings of this study confirm that integrated nutrition interventions can be an effective strategy for reducing the prevalence of anemia in adolescents. This program can be replicated in other adolescent communities by involving various parties, such as health workers, teachers, parents, and adolescent health cadres. Given that the prevalence of anemia among adolescents in Indonesia remains high [12], the results of this study make a real contribution to the development of an intervention model that is applicable at the community level.

Conclusion

This study proves that nutrition education and iron supplementation are effective in improving knowledge and anemia status among adolescents in Karang Taruna, Cihideung Village, West Bandung Regency. There was a significant increase in knowledge scores from poor to good, as well as a decrease in anemia prevalence from 34.3% to 18.6%, with an average increase in hemoglobin levels of 0.9 g/dL. The integrated nutrition intervention, through education, supplementation, and youth empowerment, has been proven to have a positive impact on anemia prevention. This program can be used as a model intervention that can be replicated in other youth communities as a strategy to reduce the prevalence of anemia and support the improvement of health quality and productivity among adolescents in

Indonesia.

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