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Article Review: The Effect of Iron Tablet Consumption on Reducing the Prevalence of Anemia in Adolescent Girls

Suharni Pintamas Sinaga¹

¹Doctoral Student in Public Health, Faculty of Public Health Universitas Strada Indonesia, Kediri, Indonesia

Corresponding Author: Suharni (suharnisinaga26@gmail.com)

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Abstract: Iron deficiency anemia is a common blood condition that affects 12% of community members, 40% of hospital patients, and 47% of nursing home residents. We still do not fully understand how inflammation affects red blood cell formation and iron processing. There are three types of iron deficiency anemia in older people: iron deficiency anemia brought on by malnutrition, iron deficiency anemia from hemorrhage, and iron deficiency anemia with no apparent reason. females, children, and people from low- and middle-income countries are among the most vulnerable groups affected by this illness. The present research highlights its crucial function in non-heme iron absorption by examining the relationship between iron supplement consumption, food intake, nutrition status, and iron deficiency anemia among adolescent females. The findings highlight the necessity of comprehensive nutrition programs that support foods high in vitamin C in addition to iron supplementation. This nutritional synergy should be addressed by realigning school-based policy. In order to effectively implement strategies aimed at reducing iron deficiency and improving overall health outcomes, addressing IDA in Indonesia ultimately requires a coordinated effort involving collaboration between governmental bodies, health care professionals, research organizations, and local communities.

1 INTRODUCTION

Adolescents, as defined by World Health Organization (WHO), are aged 10-19 years. Adolescent is a period of gold wherein there is maximum growth and development. From birth to when children reach the age of adulthood, they have fundamental physical and psychological requirements and in addition to a lack of vitamins one problem is iron deficiency anemia. iron deficiency anemia is a major public health concern among female adolescents, females of reproductive age, pregnant females and children in developed as well as developing world. Indonesia one of the developing countries is still facing stunting and iron deficiency anemia cases. Indonesian females aged 15–49 years old are experiencing increasing iron deficiency anemia prevalence (21.6 to 22.3% in 2018) (Thalya and Nishijima, 2021).

Iron deficiency anemia refers to a state of having insufficient red blood cells or hemoglobin. The primary reason for this condition is a lack of iron. While iron deficiency leads to reduced

production of hemoglobin and red blood cells, resulting in lower levels of hemoglobin and hematocrit, there are numerous other factors that can lead to iron deficiency anemia that do not relate to iron. iron deficiency anemia can be categorized as mild, moderate, or severe depending on the hemoglobin levels. For non-pregnant females, the thresholds for hemoglobin concentration are: nonanemic; mild; moderate; and severe which are at least 12 g/dL, 11.0 to 11.9 g/dL, and 8.0 to 10.9 g/dL, respectively (Amani and Sebaynag, 2024).

Sickle cell iron deficiency anemia (SCA) stands out as the most critical form of hemoglobin disorder globally. This condition is particularly common in areas with poor socioeconomic conditions. The highest occurrences of sickle cell iron deficiency anemia are seen in regions of Sub-Saharan Africa, the Southern Mediterranean, and among Middle Eastern and Indian populations. Studies in epidemiology have indicated that this disorder has developed naturally in tropical climates where malaria is widespread. Given that our research location is not known for malaria, we

refrained from performing tests to check for SCA. Though low MCV and MCH can indicate the presence of SCA, further testing is necessary. To rule out SCA, we performed a thorough medical history assessment and a physical examination (Teixeira et al., 2023).

Iron deficiency anemia falls under the category of nutritional deficiencies, influenced by factors such as the process of growth and development, biological aspects, gender, age, and ethnicity. It is also linked to infections like helminthiasis, schistosomiasis, malaria, HIV, tuberculosis, genetic conditions affecting hemoglobin, thalassemia, as well as social behaviors and environmental influences. Furthermore, deficiencies in certain micronutrients that are recognized for leading to or exacerbating iron deficiency anemia include vitamins A, B2, B6, B9, B12, C, D, and E, along with zinc, each of which plays a role through various pathways (Kumar et al., 2022; Kolarš and Mijatovi, 2025).

Teenagers' body mass index (BMI) and overall nutrition status are greatly influenced by the food they eat. The relationship between iron deficiency anemia and BMI and mid-upper arm circumference (MUAC) has been the subject of numerous investigations. Regardless of their MUAC readings, females who were overweight or obese had a decreased risk of getting iron deficiency anemia than those with a healthy BMI, according to a prior research done in Indonesia. Furthermore to body measurements, menstruation factors, parental education, and income levels all have an impact on iron deficiency anemia (Jeong et al., 2022; Eltayeb et al., 2023).

Iron deficiency anemia's lack of hemoglobin limits the blood's ability to carry oxygen, which impairs mental and physical capacities and raises a number of health issues. Nutrient intake and life quality are related. Adolescents with iron deficiency anemia had a lower life quality, according to a different research (Eksikliği, Anemik and Ergenlerin, 2022; Cheung et al., 2023). According to the World Health Organization, a person's life quality is determined by their goals, objectives, and concerns as well as how they view their place in daily life, which is influenced by their culture and beliefs. In order to improve females's health, children's well-being, academic performance, females's productivity at work, positive pregnancy outcomes, and long-term benefits for health, the economy, and community advancement, it is imperative that iron deficiency anemia in females of reproductive age be addressed

(Tonino, Zwaginga and Schipperus, 2023; Wacka et al., 2024; Grzegorzewski et al., 2025).

Multiple initiatives aimed at reducing Iron Deficiency iron deficiency anemia (IDA) have been carried out in Indonesia. These initiatives involve supplying iron pills with 60 mg of elemental iron and 400 mcg of folic acid, along with educating the public about proper nutrition, emphasizing the importance of enhancing dietary quality (Pai et al., 2023). A framework for a unified health care system is essential to avert IDA. While integrated care lacks a precise definition, it is typically understood as an approach aimed at enhancing both the health of patients and their experiences within the health care system. Numerous models of integrated health care systems have been created, including the Chronic Care Model designed for long-term illnesses and various models focused on combined health services. Nonetheless, there is no dedicated model addressing IDA. The objective of this research is to examine the key elements necessary for developing a unified health care system model aimed at reducing IDA in teenage girls (Yanisah and Widati, 2023).

2 LITERATURE

A medical disorder known as iron deficiency anemia occurs when the body does not produce enough healthy red blood cells or hemoglobin, the protein that carries oxygen from the lungs to the body's tissues. The body's tissues and organs cannot operate at their best without adequate oxygen delivery, which findings in symptoms like weakness and exhaustion. A complete blood count (CBC) is the main method used to diagnose iron deficiency anemia. The World Health Organization (WHO) states that it is often defined by the following hemoglobin (Hb) levels: less than 13.0 g/dL or 130 g/L for men, less than 12.0 g/dL or 120 g/L for non-pregnant females, and fewer than 11.0 g/dL or 110 g/L for pregnant females.

Reduced production (the body does not make enough red blood cells), increased destruction (red blood cells are destroyed more quickly than they can be replaced; hemolytic iron deficiency anemia), and blood loss (excessive bleeding from injury, surgery, or chronic conditions like heavy menstruation or ulcers) are the three main ways that iron deficiency anemia can occur. Iron deficiency anemia was classified into three categories based on the size of the red blood cells (Mean Corpuscular Volume, or MCV): microcytic (less than 80 fL-cells, usually caused by iron deficiency or

thalassemia), normocytic (80–100 fL-cells, normal size but low in number, frequently caused by chronic diseases or acute blood loss), and macrocytic (more than 100 fL-cells, frequently related to vitamin B12 or folate deficiency).

3 RESEARCH METODHS

The present research utilized the Systematic Literature Review approach by looking for pertinent articles in the Google Scholar. The search for articles took place in January 2022, utilizing specific keywords on Google Scholar: "iron supplementation and iron deficiency anemia status in adolescents/iron deficiency anemia among female adolescents and adolescent iron deficiency anemia and compliance. The criteria for including studies in this research were as follows: (1) publications must appear in both domestic and international journals, (2) articles should be in Indonesian or English, (3) full-text versions must be accessible, and (4) the publications should have been released between 2022 and 2026. The criteria for determining publication eligibility are: (1) the population consists of female students or females globally, (2) the exposure involves providing iron supplementation and support from schools, (3) the outcome measured is iron deficiency anemia status.

4 RESULTS AND DISCUSSION

The process of searching for publications with specific keywords in the databases yielded a total of 17.3000 articles with keyword "iron deficiency anemia Among female adolescents". The other articles with key word iron supplements and iron deficiency anemia status in adolescents in the databases yielded a total of 15.900 articles.

From the article, all articles underwent a screening process to assess their titles against the inclusion criteria, leading to the exclusion of 4270 articles that happened in Indonesia. After the title screening, 65 articles were identified for further review, and duplicate entries were managed using the Mendeley application, resulting in the identification and removal of 30 duplicates. The remaining 35 articles were then evaluated based on their research abstracts, with 20 being excluded as their abstracts did not align with the research requirements. From the left-over articles, 15 more were removed because the full text could not be accessed. After all identifications, 5 articles were found to be eligible for review as table 1 below.

Table 1. Iron Deficiency Anemia Literature.

Author, Province, Journal	Year	Research Title	Method	Participant, Comparison, Outcome	Exposure, Conclusion
Puspa Sari et al. 2022. East Java (Jatinagor) International Journal of females's Health (2022)		Iron Deficiency iron deficiency anemia and Associated Factors Among female adolescents and females in a Rural Area of Jatinagor, Indonesia	A cross-sectional research was conducted from April to November 2018	Involving 180 respondents (95 female adolescents aged 10–19 years and 85 females aged 20–35 years). Exposure : respondents were selected using cluster random sampling from seven villages. Comparison : Data collection included sociodemographic characteristics, menstrual history, anthropometric measurements, food intake (24-hour recall), and hematological parameters (hemoglobin, MCV, MCH, MCHC). Outcome : Data were analyzed using descriptive statistics and bivariate and multivariable logistic regression.	• The prevalence of iron deficiency anemia was 21.1% in female adolescents and 9.4% in females, classifying iron deficiency anemia as a mild major public health concern based on WHO criteria. • Mean hemoglobin levels indicated moderate iron deficiency anemia in adolescents and mild iron deficiency anemia in females. • Most respondents had normal BMI and were not stunted. • Food intake of iron,

Puspa Sari, Dewi Marhaeni, Diah Herawati, MeitaDhamayanti and Dany Hilmanto. 2022. Nutrients West Java iron deficiency anemia among female adolescents in West Java, Indonesia: Related Factors and Consequences on the life quality

This cross-sectional research

Participant : 286 female students (15–19 years).
Exposure : A 24-h recall questionnaire was used to collect the nutrient intake. We use the WHOQOL-BREF to analyze the life quality.
Comparison : This investigation assessed height, weight, body mass index (BMI), mid-upper arm circumference (MUAC), and a capillary blood sample to determine hemoglobin levels.
Outcome : Bivariate and multiple logistic regression tests were measured to find the factors most influencing iron deficiency anemia

folic acid, vitamin C, and fat was generally inadequate in both groups.

- Hematological indices (low MCV and MCH) confirmed iron deficiency anemia patterns.
- Protein intake was the only factor significantly related to iron deficiency anemia in multivariate analysis (OR = 0.25; 95% CI: 0.11–0.58), indicating that insufficient protein intake increased the risk of iron deficiency anemia.

The prevalence of iron deficiency anemia was 14.3%. Related factors of iron deficiency anemia in this research were: duration of blood show per menses, iron consumption, weight, height, and MUAC. From bivariate analyses, iron deficiency anemia influenced the social relationships domain with $p < 0.05$. Multivariate logistic regression showed that the most influencing factors for iron deficiency anemia were MUAC and duration of blood per menses. iron deficiency anemia impacted the social relationships domain. In this research, the two main factors that affected iron deficiency anemia were MUAC and duration of blood each menstrual cycle

Nasrul, Fahmi, Hafid, Taqwin, Hikmah, Risma, Atika, Nuswantari, Sarina Sariman. Iron Supplement Consumption, food intake, nutrition status, and

A cross-sectional research was conducted

Participant : involving 231 girls aged 12–15 years from two schools not yet implementing the Aksi Bergizi program. Data were collected via (Exposure)SQ-

The highlighting its critical role in non-heme iron absorption. The findings underscore the need for integrated

2025. Journal of Health and Nutrition Research. Donggala Regency.	iron deficiency anemia Among female adolescents in Banawa, Donggala Regency		FFQ, anthropometry, and hemoglobin testing using POCT. Comparison : Experimental group and non-experimental group Outcome : The iron deficiency anemia prevalence was alarmingly high at 71.0%. While 61.0% of respondents were compliant with iron supplementation, no substantial association was found between compliance and iron deficiency anemia (p=0.743). Similarly, protein (p=0.823) and iron intake (p=0.201) were not significantly associated. Participant : 105 female students aged 12–15 years in Madiun Regency, Indonesia, using a total sampling approach. Exposure : Data collection included anthropometric measurements, food intake assessed with a semi- quantitative food frequency questionnaire (SQ-FFQ), hemoglobin levels measured by point-of-care testing, and Comparison : iron supplement compliance, with anemia defined as hemoglobin <12 g/dL. The prevalence of iron deficiency anemia was 14.3%. While 88.6% of respondents adhered to iron supplementation, non- adherence was associated with a 24.5-fold higher risk of anemia (p< 0.001). Outcome : Most participants reported in adequate dietary intake, specifically in terms of energy (79.0%), protein (76.2%), zinc (62.9%), and iron (93.3%). Nutritional intake and BMI-based nutrition status showed no substantial association with iron deficiency anemia, although non-chronic energy deficiency (non-KEK) was linked to a higher prevalence (p= 0.030). Respondents : 11	nutrition programs that promote vitamin C-rich foods alongside iron supplementation. School-based policies should be realigned to address this nutritional synergy.
Taufiqurrahman , Fahmi Hafid, Mujayanto, Atika Nuswantari, Ratno , Rina Rahayuningtyas , A. E. Prasetyawan, Yayuk Sri Rahayu	Iron Supplement compliance, food intake, and iron deficiency anemia Risk among female adolescents in Madiun Regency, Indonesia	cross-sectional research examined the relationship between iron supplement compliance, dietary intake, nutritional status, and iron deficiency anemia		compliance to iron supplementation strongly protects against iron deficiency anemia; however, poor dietary quality remains a challenge. Thus, strengthening supervised supplementation programs, improving school-based dietary quality, and implementing regular hemoglobin screening are recommended to reduce the risk of iron deficiency anemia among female adolescents
Renno	Improving	purposive sampling among those		Effective iron

Raymond Okto Zulfikar Endang Mariani, Catherine Gunawan Nova Lidia Sitorus Charisma Dilantika, Tonny Sundjaya, Bunga Pelangi and Ray Wagiu Basrowi. 2025. Open Public Health Public Health Indonesia	Iron Deficiency iron deficiency anemia (IDA) Prevention and handling Strategies in Indonesia: An Expert Opinion	who have expertise in females's and children's health, nutrition, clinical psychology, and education	respondents selected through purposive sampling among those who have expertise in females's and children's health, nutrition, clinical psychology, and education in a Exposure : 90-minute online Focus Group Discussion (FGD) was done. The main themes identified were the importance and urgency of iron deficiency iron deficiency anemia (IDA) status assessment, behavior modification-oriented health- related education, and iron deficiency iron deficiency anemia (IDA) prevention in pregnant females and female adolescents. Comparison : - Outcome : Data were transcribed and analyzed using NVIVO 12	deficiency iron deficiency anemia (IDA) prevention and handling strategies include ferritin-based iron status assessment prior to supplementation, behavior modification-oriented health-related education, dietary interventions, and iron supplementation compliance. Nevertheless, the government's commitment to support and fund the programs is also crucial in order to achieve the desired outcomes.
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Adolescent females in West Java, Indonesia, suffered from iron deficiency anemia, a serious health problem with a number of contributing variables and negative effects on their life quality. 286 female students between the ages of 15 and 19 participated in the cross-sectional survey conducted in Soreang District, West Java, Indonesia, according to data from Puspasari Research (2022). respondents having a history of blood transfusions, ongoing iron deficiency anemia therapy, or certain medical disorders were excluded. A 24-hour recall questionnaire was used to measure nutritional consumption based on sociodemographic information, health history, and physical activity levels. WHOQOL-BREF was used to assess life quality in four areas. anthropometric measurements, such as height, weight, BMI, and MUAC. examined blood samples for hematological parameters, including hemoglobin levels. According to the findings, the prevalence of iron deficiency anemia among respondents was 14.3%. Iron consumption, anthropometric parameters (weight, height, and MUAC), and the length of blood flow per menstruation were all categorized as moderate and substantial factors related to iron deficiency anemia. The social ties area of life quality was strongly influenced by iron deficiency anemia ($p < 0.05$). Additionally, there were no discernible differences between anemic and non-anemic respondents in the environmental, psychological, or physical health aspects of life quality. substantial difference in social interactions domain ($p = 0.024$) between the two groups. There were substantial differences between anemic and non-anemic subjects in terms of weight, height, and a number of hematological parameters (WBC, hemoglobin, HCT, MCV, and MCHC), all with $p < 0.05$. Pregnancy outcomes and future health for generations are negatively impacted by iron deficiency anemia's effects on productivity, health, and performance. This investigation underscores the need of treating both undernutrition and overnutrition in adolescents, as well as the necessity of health-related education on food intake and iron deficiency anemia prevention (Sari et al., 2022a; Subramanian et al., 2022).

According to Nasrul research, iron deficiency anemia was a serious major public health concern with a high prevalence rate that affected teenage girls in Banawa. Among the 231 girls from two schools, ages 12 to 15, the frequency of iron deficiency anemia was 71.0%. Although 61.0% of people used iron supplementation, this did not significantly lower the rates of iron deficiency

anemia ($p=0.743$). This investigation emphasizes the critical necessity for focused treatments to deal with iron deficiency anemia. With 84.4% of individuals having acceptable protein intake, 64.5% having adequate iron intake, and just 39.0% having adequate vitamin C intake, the other findings demonstrate that food intake, especially vitamin C, plays a critical role in iron deficiency anemia status among female adolescents. iron deficiency anemia status was significantly correlated with vitamin C intake ($p=0.001$). 78.7% of respondents who were anemic had inadequate vitamin C intake. With 61.0% of respondents taking iron supplementation and 70.2% of compliant respondents still having iron deficiency anemia, there was no correlation between iron supplement compliance and improved iron deficiency anemia status in the research group. This information implies that without substantial nutritional assistance, iron supplementation is insufficient on its own. This investigation found no substantial correlation between the individuals' dietary status and the occurrence of iron deficiency anemia illnesses. There was no substantial correlation between nutrition status and iron deficiency anemia ($p=0.819$), with 79.7% of respondents classified as having appropriate nutrition. This suggests that people with normal dietary status can still experience iron deficiency anemia (Sari et al., 2022b; Nasrul et al., 2025).

Research was done on IDA prevention and handling techniques. Ferritin-based iron status assessment prior to supplementation, behavior modification-oriented health-related education, dietary interventions, and iron supplementation compliance are effective treatments for reducing and managing iron deficiency iron deficiency anemia (IDA). Nevertheless, in order to accomplish the intended findings, the government's commitment to support and fund the initiatives is also essential (Helmyati et al., 2023; Raymond et al., 2025).

5 CONCLUSION

Based on the findings and discussion of the research that has been submitted, the conclusions can be drawn as follows :

1. Combining iron tablets with nutritional counseling or vitamin C often yields higher increases in hemoglobin levels than iron tablets alone.

2. Daily oral iron supplementation is standard for reducing and treating iron deficiency anemia. It significantly improves hemoglobin (Hb) and ferritin levels, especially in high-risk groups like female adolescents.
3. Effective iron deficiency iron deficiency anemia (IDA) prevention and handling strategies include ferritin-based iron status assessment prior to supplementation, behavior modification-oriented health-related education, dietary interventions, and iron supplementation compliance.

6 SUGGESTION

Based on the conclusions drawn, it is recommended : Conducting a review of articles on the implementation of iron tablet interventions based on research findings from other countries. The scope of the article was expanded to enrich the discussion and conclusions on optimizing the implementation of iron tablet administration in reducing iron deficiency anemia in female adolescents.

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