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*Original Study*

# Analysis of factors affecting the incidence of anemia in adolescent girls at Nawangsasi Health Center: A Cross-sectional Study

**Ema Puspitasari[1*], Chairil Zaman[1], Ali Harokan[1], Dewi Suryani[1]**
[1] Sekolah Tinggi Ilmu Kesehatan Bina Husada, Palembang, Indonesia

***Corresponding Author:**
**Ema Puspitasari**
Sekolah Tinggi Ilmu Kesehatan Bina Husada, Palembang, Indonesia

Email: ema_puspita36@yahoo.com

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## Abstract

**Background**
Anemia is one of the most common public health problems among adolescent girls, potentially leading to decreased concentration, impaired growth, and reduced immune function. The prevalence of anemia in this age group remains high, both globally and nationally.

**Objective**
This study aimed to analyze the factors influencing the incidence of anemia among adolescent girls in the working area of Nawangsasi Public Health Center, Musi Rawas District.

**Methods**
A quantitative study with a cross-sectional approach was conducted involving 72 adolescent girls selected using purposive sampling. Data were collected through interviews using a structured questionnaire and analyzed using chi-square tests and logistic regression.

**Results**
There were significant associations between nutritional status (p = 0.006), iron tablet consumption (p = 0.009), and dietary patterns (p = 0.019) with the incidence of anemia. The most dominant factor was dietary pattern (p = 0.026), with an odds ratio of 11.00 (95% CI = 1.33–90.61).

**Conclusion**
Improving dietary habits and increasing adherence to iron supplementation play a crucial role in anemia prevention among adolescent girls. Continuous nutritional education and behavioral monitoring through multisectoral collaboration are recommended to effectively reduce anemia prevalence in this population.

## Background

Anemia is a health condition characterized by low levels of hemoglobin or red blood cells, which results in the suboptimal delivery of oxygen to body tissues (Deivita et al., 2021). This condition can lead to fatigue, reduced concentration, impaired growth and development, and diminished physical work capacity (Sari, Herawati, Dhamayanti, & Hilmanto, 2022). Adolescent girls are particularly vulnerable to anemia due to physiological and behavioral factors such as menstruation, inadequate nutrient intake, and unhealthy lifestyle habits (Subba & Araveti, 2025). Moreover, adolescence is marked by rapid growth, which increases iron requirements; when intake fails to meet these demands, iron deficiency is likely to occur. The situation becomes more complex when anemia goes undetected during adolescence and persists into adulthood, potentially resulting in long-term health consequences for women and future generations (Misunas, Hindin, Phillips-Howard, & Sommer, 2024).

Global and national data confirm that anemia remains a critical public health issue. According to the World Health Organization (2025), approximately 29.9% of women aged 15–49 years worldwide are affected by anemia, equivalent to nearly half a billion individuals. In Indonesia, the Ministry of Health reported that around 22.7% of adolescents experience anemia, yet only 8.3 million out of 12.1 million adolescents comply with iron supplementation programs (Kementerian Kesehatan RI, 2024). In South Sumatra Province, the prevalence of anemia among females aged 15–24 years reaches 84.6%, with Musi Rawas Regency reporting 254 out of 1,078 adolescent anemia cases (Lestari, Arif, Riski, & Zuitasari, 2024).

Local data from the working area of Nawangsasi Public Health Center in Musi Rawas Regency show a significant increase in anemia cases among adolescent girls. In 2023, 13 cases were

recorded, which surged to 48 cases in 2024 (Puskesmas Nawangsasi, 2024). These figures indicate a worsening anemia problem in this population, posing potential long-term impacts on the quality of life and productivity of the younger generation. This situation calls for more targeted and evidence-based interventions (Yuan et al., 2025). As the first-level healthcare provider, public health centers play a strategic role in screening, educating, and monitoring the nutritional intake of adolescent girls within their coverage area (Werner et al., 2025).

Numerous factors have been identified as determinants of anemia among adolescent girls, with nutritional status being one of the most critical (Anbesu, Mulaw, Mare, & Kahssay, 2022). Adolescents with poor nutritional status or stunting are more likely to suffer from anemia than their well-nourished peers (Annaful, Amoah, Attu, Haik, & Tandoh, 2024). This is due to the body's dependence on sufficient energy and nutrient intake to ensure proper iron absorption. Adolescents experiencing stunting are at increased risk of anemia due to metabolic disturbances and depleted iron stores (Deivita et al., 2021).

In addition to nutritional status, iron tablet supplementation behavior is essential in preventing anemia. Iron tablets have long been used as an effective intervention to improve hemoglobin levels, particularly during menstruation, which increases blood loss (Safiri et al., 2021). However, adherence to iron tablet supplementation remains low. Non-compliance with iron tablet consumption is a contributing factor to the rising prevalence of anemia (Weyand et al., 2023). This is concerning given that routine iron supplementation is a key component of the national strategy to reduce anemia rates and enhance adolescent health (Lopez de Romaña et al., 2023).

Dietary patterns also play a crucial yet often overlooked role. Adolescent girls tend to have irregular eating habits, frequent consumption of high-fat, low-iron fast food, and insufficient intake of heme iron sources such as red meat (Le Dain et al., 2021). In this context, dietary knowledge and habits become vital. Iron-rich foods and vitamin C, which enhances iron absorption, are rarely included in adolescents' daily meals (Li, Zhao, Yu, & Ren, 2022). Poor eating habits are often exacerbated by dieting culture and social pressures to attain an ideal body image, leading to compromised nutritional intake (da Silva Lopes et al., 2021).

In light of the above, this study aims to analyze the factors influencing the incidence of anemia among adolescent girls in the working area of Nawangsasi Public Health Center, Musi Rawas Regency.

## Methods

### *Study Design*

This study employed a quantitative design with a cross-sectional approach aimed at identifying factors influencing the incidence of anemia among adolescent girls. The cross-sectional method enabled the researchers to evaluate associations between various variables at a single point in time. The research was conducted in the working area of Nawangsasi Public Health Center, Musi Rawas Regency, South Sumatra Province. The data collection period lasted for two weeks, from April 17 to May 2, 2025. This site was chosen based on the observed increase in anemia cases among adolescent girls over the past two years.

### *Sampling*

The study population comprised all adolescent girls who underwent health screening at Nawangsasi Public Health Center in 2024. A total of 72 respondents were selected using purposive sampling based on predefined inclusion and exclusion criteria. The inclusion criteria were adolescent girls who voluntarily agreed to participate and were in a healthy condition during data collection. The exclusion criteria included adolescents who were ill or unable to participate optimally in the interview process. This sampling technique was applied to ensure the sample was truly representative of the target population.

### *Instruments*

Data were collected using a structured questionnaire developed based on the study variables. The questionnaire covered several domains, including age, level of knowledge about anemia, nutritional status, iron tablet consumption, dietary patterns, and duration of menstruation. Each item was designed to comprehensively capture information from respondents regarding potential contributing factors to anemia. The instrument underwent

content validation by subject matter experts prior to deployment in the field.

*Data Collection*

Data collection was carried out through face-to-face interviews with respondents using the validated questionnaire. Interviews were conducted by trained members of the research team who had received technical instructions on administering the instrument. Prior to the interviews, researchers explained the study objectives and procedures in detail to prospective participants. Upon obtaining their consent and signed informed consent forms, interviews were conducted in a private and comfortable setting to ensure confidentiality. All responses were recorded systematically on the questionnaire form.

*Data Analysis*

The collected data were processed and analyzed using the latest version of SPSS software. Univariate analysis was used to examine the frequency distribution and proportion of each variable. Bivariate analysis was performed using the chi-square test to assess the relationships between independent variables (age, knowledge, nutritional status, iron tablet consumption, dietary patterns, and duration of menstruation) and the dependent variable (anemia incidence). Multivariate analysis using logistic regression was subsequently conducted to determine the most dominant factor influencing anemia incidence. Results are presented in frequency tables accompanied by interpretations of inter-variable relationships.

*Ethical Consideration*

This study adhered to established ethical principles and obtained prior ethical clearance. Before data collection, respondents were provided with detailed information regarding the study's objectives, benefits, risks, and their rights as participants. The researchers ensured that participation was entirely voluntary and free from coercion. Informed consent was obtained in written form from all participants before the interviews. Confidentiality of all data collected was strictly maintained, and the information was solely used for scientific purposes.

## Results

To provide an overview of the participants' characteristics and the distribution of key variables, Table 1 presents the frequency and percentage of each variable assessed in this study.

**Tabel 1.** Characteristics of Respondents

| Variables | Frequency (n) | Percentage (%) |
|---|---|---|
| **Anemia Status** | | |
| Anemic | 41 | 56,9 |
| Non-anemic | 31 | 43,1 |
| **Age** | | |
| Early adolescence | 69 | 95,8 |
| Middle adolescence | 3 | 4,2 |
| **Knowledge** | | |
| Poor | 36 | 50 |
| Good | 36 | 50 |
| **Nutritional Status** | | |
| Abnormal | 60 | 83,3 |
| Normal | 12 | 16,7 |
| **Iron Tablet Intake** | | |
| Not consuming | 54 | 75 |
| Consuming | 18 | 25 |
| **Dietary Pattern** | | |
| Poor | 12 | 16,7 |
| Good | 60 | 83,3 |
| **Menstrual Duration** | | |
| Abnormal | 14 | 19,4 |
| Normal | 58 | 80,6 |

The data offer initial insights into the profile of adolescent girls included in the analysis and the prevalence of anemia and its associated factors. Table 1 shows that among 72 respondents, 41 (56.9%) were anemic and 31 (43.1%) were not. Most participants were in early adolescence (69 or 95.8%). Knowledge about anemia was evenly split: 36 (50.0%) had poor knowledge, and 36 (50.0%) had good knowledge. Regarding nutritional status, 60 (83.3%) had abnormal status, and 12 (16.7%) were normal. Most respondents (54 or 75.0%) did not consume iron tablets, while 18 (25.0%) did. In terms of dietary pattern, 60 (83.3%) had good patterns, and 12 (16.7%) had poor patterns. Finally, 58 (80.6%) had normal menstrual duration, and 14 (19.4%) had abnormal duration.To identify the factors associated with the incidence of anemia among adolescent girls, a bivariate analysis was conducted to examine the relationship between independent variables and the dependent variable. The independent variables in this study included age, knowledge, nutritional status, iron tablet consumption, dietary patterns, and menstrual duration. The results of the bivariate analysis for each variable in relation to anemia incidence are presented in Table 2 below

**Tabel 2.** Analysis of the association between age, knowledge, nutritional status, iron tablet consumption, dietary patterns, and menstrual duration.

| Variabel | Kejadian anemia | | | | Total | *pValue* |
|---|---|---|---|---|---|---|
| | Anemia | | Tidak anemia | | | |
| | f | % | f | % | f | |
| **Age** | | | | | | |
| Early adolescence | 39 | 56,5 | 30 | 43,5 | 69 | 1,00 |
| Middle adolescence | 2 | 66,7 | 1 | 33,3 | 3 | |
| **Knowledge** | | | | | | |
| Poor | 21 | 58,3 | 15 | 41,7 | 36 | 1,00 |
| Good | 20 | 55,6 | 16 | 44,4 | 36 | |
| **Nutritional Status** | | | | | | |
| Abnormal | 39 | 65,0 | 21 | 35,0 | 60 | 0,006 |
| Normal | 2 | 16,7 | 10 | 83,3 | 12 | |
| **Iron Tablet Intake** | | | | | | |
| Not consuming | 36 | 66,7 | 18 | 33,3 | 54 | 0,009 |
| Consuming | 5 | 27,8 | 13 | 72,2 | 18 | |
| **Dietary Pattern** | | | | | | |
| Poor | 11 | 91,7 | 1 | 8,3 | 12 | 0,01 |
| Good | 30 | 50,0 | 30 | 50,0 | 60 | |
| **Menstrual Duration** | | | | | | |
| Abnormal | 6 | 42,9 | 8 | 57,1 | 14 | 0,37 |
| Normal | 35 | 60,3 | 23 | 39,7 | 58 | |

Table 2 shows a significant association between nutritional status (p = 0.006), iron tablet consumption (p = 0.009), and dietary patterns (p = 0.010) with the incidence of anemia. The majority of respondents with anemia had abnormal nutritional status (16.7%), did not consume iron tablets (66.7%), and had poor dietary patterns (50.0%).

**Tabel 3.** Final Logistic Regression Model of Independent Variables Associated with Anemia Incidence

| Variable | *pValue* | *OR* | 95,0% *C.I.for EXP*(B) | |
|---|---|---|---|---|
| | | | *Lower* | *Upper* |
| Dietary pattern | 0,02 | 11,00 | 1,33 | 90,61 |

Table 3 presents the final model of multivariate logistic regression analyzing the association between independent variables and anemia incidence among adolescent girls. The results indicate that dietary pattern emerged as the most influential factor, showing the strongest association with anemia incidence compared to other variables. Respondents with poor dietary

patterns were 11 times more likely to experience anemia than those with good dietary patterns (OR = 11.0). This finding underscores the critical role of healthy eating habits in preventing anemia among adolescents.

## Discussion

This study aimed to identify the factors associated with the incidence of anemia among adolescent girls in the working area of Nawangsasi Public Health Center, Musi Rawas Regency. The findings revealed that more than half of the participants (56.9%) were diagnosed with anemia. Bivariate analysis showed that nutritional status, iron tablet consumption, and dietary patterns were significantly associated with anemia, while age, knowledge, and menstrual duration showed no significant relationship. Further multivariate logistic regression identified dietary pattern as the most dominant factor, with an odds ratio of 11.00. These results highlight the importance of addressing modifiable lifestyle and nutritional factors in efforts to prevent anemia among adolescent girls.

The analysis revealed no significant association between age and the incidence of anemia among adolescent girls. This finding is consistent with a study by Priyanto (2018), which also reported no significant relationship between age and anemia. However, it differs from the findings of Indrawatiningsih et al. (2021), who observed a significant association between age and anemia. From a biological standpoint, age reflects developmental and physiological changes that may influence nutritional needs and susceptibility to anemia (Zhu et al., 2021). Nevertheless, as long as nutritional requirements are met and healthy lifestyles are maintained, age may not serve as a dominant factor in anemia onset. This study assumes that age does not directly influence anemia, especially when nutritional intake is adequate during all stages of adolescent development (Behera et al., 2024).

Knowledge is a cognitive factor that plays a key role in health decision-making, including anemia prevention. However, the present study found no significant relationship between knowledge and anemia incidence. This aligns with findings by Susanti and Nadiawati (2022), who also found no association between knowledge and anemia or compliance with iron supplementation. Although knowledge is essential, it may not automatically translate into behavioral change without sufficient motivation and environmental support (Slywitch et al., 2021). This suggests that adolescents may possess basic knowledge about anemia but not necessarily apply it in daily life. Therefore, continuous and interactive health education is essential to ensure that knowledge is internalized and translated into healthy behavior (Mildon et al., 2023).

In contrast to the previous variables, nutritional status showed a significant association with anemia. This finding is in line with research by Nurjannah and Putri (2021) and Apriyanti (2019), who reported that poor nutritional status increases the risk of anemia in adolescent girls. Nutritional status reflects the balance between nutrient intake and physiological needs, particularly for iron, vitamins, and proteins required for hemoglobin synthesis (Nadhiroh et al., 2023). Adolescents with poor nutritional status are more likely to have depleted iron stores, making them susceptible to anemia. As adolescence is a period of rapid growth, any imbalance in nutritional intake can directly impact red blood cell production. Thus, nutritional status should be a primary focus in anemia prevention strategies among adolescents (Gillespie et al., 2023).

Iron tablet consumption was also found to be significantly associated with anemia. This finding supports the results of Simamora (2024), who found that adolescents who regularly consumed iron supplements were less likely to develop anemia. Iron tablets are essential in supporting red blood cell production, especially in menstruating adolescents. Non-adherence to iron supplementation is a known factor contributing to the high prevalence of anemia in Indonesia (Kinyoki et al., 2021). Therefore, monitoring mechanisms and educational interventions in schools and families are necessary to foster consistent iron tablet consumption. The researchers suggest that school-based

interventions are a strategic approach to increasing adherence to iron supplementation among adolescents (Lopez de Romaña et al., 2023).

Moreover, dietary patterns were found to have the strongest association with anemia incidence and emerged as the most dominant factor. This finding is supported by Manila (2021), who reported that poor dietary patterns increased the risk of anemia. A diet lacking in iron-rich foods such as leafy greens, red meat, and other nutrient-dense items leads to insufficient iron intake (Lopez de Romaña et al., 2023). Adolescent girls often exhibit irregular eating patterns or follow restrictive diets, further contributing to iron deficiency. Therefore, the involvement of parents, schools, and healthcare providers is crucial in fostering healthy eating behaviors. This study underscores the need for comprehensive and continuous nutrition education as a preventive measure against anemia (Deivita et al., 2021).

Regarding menstrual duration, the study found no significant relationship with anemia. This is consistent with the findings of Yunita et al. (2023), who also reported no association between menstrual duration and anemia. Menstruation is a normal physiological process that varies among individuals, typically lasting 3–8 days per cycle (Slywitch et al., 2021). As long as the duration is within normal limits and accompanied by adequate nutrition, blood loss from menstruation is unlikely to result in anemia (Misunas et al., 2024). Thus, menstrual duration is not considered a dominant factor in anemia incidence unless accompanied by gynecological complications. Health promotion efforts should instead focus on improving dietary intake during menstruation rather than emphasizing duration (Juffrie et al., 2020).

Among all variables examined, dietary pattern was identified as the most influential factor. The multivariate analysis revealed that adolescents with poor dietary habits were 11 times more likely to experience anemia compared to those with healthy diets (OR = 11.00). This underscores the critical role of dietary behavior in preventing anemia. Adolescents who fail to consume a balanced and iron-rich diet are at increased risk of nutrient deficiencies, particularly iron, which directly impacts hemoglobin levels (Behera et al., 2024). Therefore, improving dietary patterns should be prioritized in adolescent health programs. The researchers recommend strengthening the role of families, educators, and healthcare providers in promoting healthy eating behaviors from an early age (Kinyoki et al., 2021).

In conclusion, this study provides a comprehensive understanding of the factors influencing anemia in adolescent girls. Nutritional status, iron tablet consumption, and dietary patterns were significantly associated with anemia, while age, knowledge, and menstrual duration were not. Dietary pattern emerged as the most dominant factor and should be the primary target of preventive interventions. These findings reinforce the importance of promoting balanced nutrition and healthy behaviors through multisectoral strategies, including nutrition education, iron supplementation, and regular monitoring of adolescent health. Sustainable prevention efforts should prioritize behavior change, particularly regarding diet, as a long-term approach to reducing anemia prevalence.

## Conclusion and Recommendation

This study demonstrated that nutritional status, iron tablet consumption, and dietary patterns were significantly associated with the incidence of anemia among adolescent girls. In contrast, variables such as age, knowledge, and menstrual duration showed no significant relationship. Among all factors examined, dietary pattern emerged as the most influential determinant of anemia. These findings emphasize that balanced nutritional intake and healthy eating behaviors are essential components in preventing anemia during adolescence. Overall, the results suggest that efforts to prevent anemia should primarily focus on improving adolescent girls' nutrition and dietary habits.

It is necessary to enhance educational initiatives targeting adolescent girls, emphasizing the importance of consuming a balanced diet and adhering to iron supplementation as part of a broader anemia prevention strategy. The

involvement of schools, families, and healthcare facilities is crucial in fostering a supportive environment for healthy behaviors among adolescents. Interactive and sustained health promotion programs can serve as effective approaches to establishing positive eating habits from an early age. In addition, regular monitoring of nutritional status is essential to ensure optimal adolescent health. Further research employing qualitative methods is also recommended to explore the social and cultural factors that may contribute to anemia among adolescent girls..

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## Declaration of conflict of interest
The authors declare no competing interests.

## Declaration on the Use of AI
No AI tools were used in the preparation of this manuscript.

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