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Correlation of Characteristics and Knowledge Level with the Prevalence of Anemia Among Female Adolescents

Novrita Tri Yulvia[1*], Qonita[2]

[1] Midwifery Professional Education Study Program, Bina Bangsa University, Serang City, Banten Province, Indonesia
[2] Bachelor's Degree in Midwifery, Bina Bangsa University, Serang City, Banten Province, Indonesia

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[*]***Corresponding author***
Email: *novritatriyulvia@gmail.com*

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ABSTRACT
Anemia is a prevalent health issue among adolescent girls, particularly during puberty, when iron requirements increase due to growth and menstruation. This study aimed to analyze the relationship between adolescent characteristics, knowledge levels, and the incidence of anemia among female students at SMP NU Jawilan, Serang Regency. Using a quantitative analytic design with a cross-sectional approach, data were collected from 57 students through questionnaires and hemoglobin measurements using a Hemocue device. The variables examined included knowledge level, menstrual cycle, menstruation duration, nutritional status, dietary patterns, and sleep patterns. Chi-Square tests revealed significant relationships between all variables and the incidence of anemia, with p-values less than 0.05. The findings indicate that inadequate knowledge, irregular or prolonged menstruation, poor nutritional status, unhealthy diets, and poor sleep habits are strongly associated with anemia among adolescent girls. These results highlight the need for targeted health education, nutritional interventions, and lifestyle improvements to reduce anemia prevalence in this population. School-based programs involving health workers, teachers, and parents are essential to foster better health behaviors and prevent anemia during adolescence.

Keywords: Anemia, Adolescent Girls, Nutritional Status, Menstrual Cycle, Knowledge.

ABSTRAK
Anemia merupakan masalah kesehatan yang umum terjadi pada remaja putri, terutama pada masa pubertas ketika kebutuhan zat besi meningkat akibat pertumbuhan dan menstruasi. Penelitian ini bertujuan untuk menganalisis hubungan antara karakteristik remaja, tingkat pengetahuan, dan kejadian anemia pada siswi di SMP NU Jawilan, Kabupaten Serang. Penelitian ini menggunakan desain kuantitatif analitik dengan pendekatan cross-sectional. Data dikumpulkan dari 57 responden melalui kuesioner dan pemeriksaan kadar hemoglobin. Variabel yang diteliti meliputi pengetahuan, siklus menstruasi, lama menstruasi, status gizi, pola makan, dan pola tidur. Hasil uji Chi-Square menunjukkan adanya hubungan yang signifikan antara semua variabel dengan kejadian anemia, dengan nilai $p < 0,05$. Temuan ini menunjukkan bahwa kurangnya pengetahuan, menstruasi tidak teratur atau berkepanjangan, status gizi buruk, pola makan tidak sehat, dan kebiasaan tidur yang buruk sangat berhubungan dengan kejadian anemia pada remaja putri. Oleh karena itu, diperlukan edukasi kesehatan yang terarah, intervensi gizi, dan perbaikan gaya hidup untuk menurunkan prevalensi anemia. Program berbasis sekolah yang melibatkan tenaga kesehatan, guru, dan orang tua sangat penting untuk membentuk perilaku hidup sehat dan mencegah anemia di masa remaja.

Kata Kunci: Anemia, Remaja Putri, Status Gizi, Siklus Menstruasi, Pengetahuan.

INTRODUCTION

Adolescence is a transitional stage between childhood and adulthood, encompassing the age range of 10 to 19 years, as stipulated in the Regulation of the Minister of Health of the Republic of Indonesia Number 25 of 2014. During this phase, adolescents undergo rapid physical, psychological, and social changes, making them vulnerable to various health issues. One of the frequently overlooked health problems among adolescents is inadequate nutritional intake, which can lead to anemia. Anemia in adolescents, especially among girls, is a serious concern due to its high prevalence and long-term implications for reproductive health and overall quality of life (Sari et al., 2022).

According to data from the World Health Organization, (2023), the global prevalence of anemia among women of reproductive age reached 29.9% in 2019, while in Indonesia it stood at 32%, with the highest prevalence among the 15–24 age group at 48.9% (Badan Penelitian dan Pengembangan Kesehatan, 2018). In Serang City, the prevalence of anemia among adolescent girls was reported to be as high as 92% in 2018. This indicates that anemia among adolescents remains a significant public health issue. Although the government has made efforts to prevent it, such as providing iron supplementation tablets, many adolescents still lack awareness about anemia and the importance of a balanced diet. A preliminary survey at SMP NU Jawilan, Serang Regency, revealed that 70% of female students were unaware of anemia, indicating a low level of knowledge among adolescents about this condition.

Clinically, anemia is defined as a condition marked by a decrease in hemoglobin levels, hematocrit, and red blood cell count. One of the main causes of anemia is iron deficiency, which is essential for hemoglobin synthesis. Iron deficiency may result from poor dietary intake, irregular menstrual patterns, and unhealthy habits such as skipping breakfast or maintaining an unbalanced diet (Gallagher, 2008). Among adolescent girls, anemia may also be exacerbated by excessive caffeine intake and insufficient consumption of iron-rich foods and vitamin C, which aids iron absorption (World Health Organization, 2014).

Several studies indicate that the incidence of anemia in adolescents is influenced by factors such as age, nutritional status, dietary habits, menstrual patterns, and socio-economic background. Research by Jaelani dan Simanjuntak, (2017) found a relationship between the duration of menstruation, breakfast habits, and intake of iron and protein with anemia incidence. Meanwhile, Basith et al., (2017) demonstrated that parental education and income also significantly affect the prevalence of anemia among adolescent girls. These findings underscore that addressing anemia in adolescents requires not only medical interventions but also a contextual understanding of the socio-economic and behavioral factors influencing nutritional status.

This study aims to analyze the relationship between adolescent characteristics and knowledge level with the incidence of anemia among female students at SMP NU Jawilan, Serang Regency, in 2025. By understanding the factors influencing anemia, this research is expected to serve as a basis for designing more targeted interventions to reduce anemia prevalence and improve the quality of life of adolescent girls in the region.

RESEARCH METHODS

This study used a descriptive-analytic approach with a cross-sectional design to analyze the relationship between adolescents' characteristics and knowledge levels with the incidence of anemia among female students at SMP NU Jawilan, Serang Regency, in 2025. The population included all 57 female students, and because the population was small and accessible, total population sampling was applied to ensure comprehensive data collection and minimize selection bias.

Data were obtained through a structured questionnaire developed based on theoretical indicators and previous research. The instrument consisted of sections on respondent identity, adolescent characteristics, and knowledge about anemia. The questionnaire was tested for validity and reliability, with correlation coefficients ranging from 0.42–0.78 (r-table = 0.30) and a Cronbach's alpha of 0.87, indicating good validity and high reliability.

Independent variables included knowledge level, menstrual cycle, menstruation duration, nutritional status, dietary pattern, and sleep pattern. Knowledge was measured using 20

questions, menstrual cycle and duration were self-reported, nutritional status was determined by BMI-for-age, dietary pattern by food frequency, and sleep pattern by average sleep duration. The dependent variable, anemia incidence, was identified using hemoglobin (Hb) measurement with a Hemocue device; Hb levels below 12 g/dL were categorized as anemic according to (Cappellini & Motta, 2015).

Data were analyzed quantitatively using descriptive statistics and the Chi-square test to assess the relationship between each independent v ariable and anemia incidence. A p-value < 0.05 at a 95% confidence level was considered statistically significant. Ethical approval was obtained from Health Research Ethics Committee of STIKes Karya Persada Kediri.

RESULTS

The results of the data analysis examining the relationship between adolescents' characteristics and knowledge level with the incidence of anemia among female students are presented in Table 1.

Table 1. The Relationship between Adolescents' Characteristics and Knowledge Level with Anemia Incidence.

Variable	Anemia of Female Students				Total		p-Value
	Anemia		Normal				
	n	%	n	%	n	%	
Knowledge Level							
Poor	12	80	3	20	15	100	0.013
Good	16	38.1	26	61.9	42	100	
Menstrual Cycle							
Irregular	16	84.2	3	15.8	19	100	0.001
Regular	12	31.6	26	68.4	38	100	
Menstruation Duration							
Abnormal	18	90	2	10	20	100	0.000
Normal	10	27	27	73	37	100	
Nutritional Status							
Poor	18	90	2	10	20	100	0.000
Good	10	27	27	73	37	100	
Dietary Pattern							
Poor	14	73.7	5	26.3	19	100	0.019
Good	14	36.8	24	63.2	38	100	
Sleep Pattern							
Poor	12	92.3	1	7.7	13	100	0.001
Good	16	36.4	28	63.6	44	100	

Based on Table 1, anemia prevalence was higher among respondents with poor knowledge (80%) compared to those with good knowledge (38.1%). Meanwhile, non-anemic cases were more common among those with good knowledge (61.9%) than those with poor knowledge (20%). The Chi-Square test yielded a p-value of 0.013 (< 0.05), indicating a significant relationship between knowledge level and anemia incidence among adolescent girls.

Anemia incidence was also higher among those with irregular menstrual cycles (84.2%) compared to those with regular cycles (31.6%). The Chi-Square test produced a p-value of 0.001, indicating a significant relationship between menstrual cycle regularity and anemia incidence. Respondents with abnormal menstruation duration (> 8 days) had a higher rate of anemia (90%) than those with normal duration (27%), with a p-value of 0.000, confirming a significant relationship between menstruation duration and anemia.

Regarding nutritional status, anemia prevalence was higher among those with poor nutritional status (90%) compared to those with good nutritional status (27%), with a p-value of 0.000, showing a significant relationship between nutritional status and anemia. For dietary patterns, anemia prevalence was higher among those with poor dietary habits (73.7%) compared

to those with good dietary habits (36.8%), with a p-value of 0.019, suggesting a significant association between dietary patterns and anemia.

Finally, sleep patterns were also associated with anemia, as 92.3% of respondents with poor sleep habits experienced anemia compared to 36.4% of those with good sleep habits. The p-value was 0.001, indicating a significant relationship between sleep patterns and anemia incidence.

DISCUSSION

The relationship between knowledge level and anemia in adolescent girls.

The Chi-Square test produced a p-value of 0.013 (< 0.05), indicating that the null hypothesis (Ho) is rejected. This suggests a statistically significant relationship between knowledge level and anemia incidence among adolescent girls at SMP NU Jawilan, Serang Regency, in 2025. Field findings revealed that a higher proportion of respondents understood the causes and prevention of anemia in general, as evidenced by the higher percentage of respondents with good knowledge (61.9%) compared to those with poor knowledge. It is assumed that the better the respondent's understanding of anemia, the lower the likelihood of developing the condition, as knowledge influences behavior. Adolescents who understand the causes of anemia are more likely to avoid risk factors that could lead to the disease.

Supporting this, a study by Fauziyah, (2024) on the relationship between knowledge about anemia and hemoglobin levels among adolescent girls at SMAN 5 Cimahi found that 45 respondents (5.5%) had good knowledge, 25 (3.9%) had moderate knowledge, and 11 (3.6%) had poor knowledge. Additionally, 65 adolescent girls (80.2%) had normal hemoglobin levels, while 16 (19.8%) were anemic. A statistically significant relationship was found (p-value = 0.03), confirming that knowledge level influences hemoglobin levels.

Low knowledge levels contribute to poor health behavior. Therefore, increasing awareness among adolescent girls is essential. Health workers are expected to provide ongoing health education to reduce anemia prevalence Basith et al., (2017). Knowledge about an object includes both positive and negative aspects, which shape one’s attitude. The more positive aspects a person knows about an object, the more favorable their attitude toward it (Wawan & Dewi, 2017).

The relationship between menstrual cycle and anemia in adolescent girls.

This study found a significant relationship between menstrual cycle regularity and anemia among adolescent girls at SMP NU Jawilan in 2025. Field observations showed that some students experienced irregular menstrual cycles. One student reported menstruating only two to three times a year, with heavy bleeding during those instances. She also had a thin body frame. This suggests that irregular or prolonged cycles with heavy bleeding increase the risk of anemia.

A study by Fita, (2025) on the relationship between nutritional status, menstrual cycle, and anemia among adolescent girls showed that 32 respondents (68.1%) with irregular cycles experienced anemia, while only 15 (31.9%) did not. A significant p-value of 0.000 indicates a strong relationship. Most respondents experiencing irregular menstruation were aged 15, with cycles shorter than 21 days or longer than 35 days, and menstruation lasting more than a week.

Typically, menstrual cycles range from 21 to 35 days. The cycle is calculated from the first day of one period to the first day of the next. Each adolescent girl may have a different pattern (Dineti et al., 2022). Nofianti dan Wahyudi, (2021) found that irregular cycles increase anemia risk due to extended or excessive bleeding. Hormonal imbalances, such as disruptions in FSH or LH, may result in abnormal estrogen and progesterone levels, causing irregular cycles (Astuti & Kulsum, 2020).

The relationship between menstruation duration and anemia in adolescent girls.

This study found a significant relationship between the duration of menstruation and anemia (p-value = 0.000). Field data indicated that some students experienced menstruation lasting more than 8 days with heavy bleeding. Prolonged menstruation increases iron loss, raising anemia risk since iron is essential for hemoglobin formation in red blood cells.

A study by Iis Hanifah dan Isnarti, (2018) in Probolinggo titled "The Relationship Between Menstruation Duration and Anemia Among Eleventh-Grade Female Students at MTs Zainul

Hasan Genggong" found a significant Spearman rank correlation (p = 0.006). The correlation coefficient indicated a moderate positive correlation.

Menstruation typically lasts 3–5 days but may extend to 2–8 days. Irregular menstruation can increase blood loss, potentially causing iron deficiency. Normal menstrual blood volume is around 80 ml over 5–7 days. Prolonged menstruation is a major cause of anemia due to substantial iron loss. Erythrocyte count is influenced by menstruation duration; the longer the duration, the higher the risk of significant blood loss and anemia (Hidayati, 2022).

The relationship between nutritional status and anemia in adolescent girls.

This study found a significant relationship between nutritional status and anemia among adolescent girls at SMP NU Jawilan in 2025 (p = 0.000). Field data based on BMI calculations revealed that some students were undernourished. Poor nutritional status may reflect low iron levels, thereby increasing anemia risk.

Supporting this, Muchtar et al., (2024) conducted a study at MTsN Barito Utara Palangka and found a significant correlation between BMI and anemia incidence (p = 0.019). Inadequate nutrition can lead to iron deficiency, which impairs hemoglobin production. Iron is a crucial component in red blood cell formation; low intake disrupts oxygen supply and leads to anemia. Girls with good nutritional status are less likely to suffer from anemia, as their dietary intake meets physiological needs. Nutritional demands rise during adolescence, and fulfilling them promotes a normal nutritional status with minimal risk of nutritional disorders (Hasyim, 2018).

The relationship between dietary patterns and anemia in adolescent girls.

This study found a significant relationship between dietary patterns and anemia (p = 0.019). Field results showed a greater proportion of respondents with good dietary habits (63.2%). Poor dietary patterns lead to inadequate intake of essential nutrients such as iron, folic acid, and vitamin B12, which support hemoglobin production.

Research by Manila and Amir, (2021) found a significant relationship between dietary patterns and anemia (p = 0.028). However, some respondents with good dietary patterns still experienced anemia (36.8%), indicating that other factors—such as low intake of vitamin B12, protein, and folic acid—may also play a role.

Adolescent girls' health behaviors strongly affect anemia status. Health behavior refers to a person's response to stimuli related to illness, healthcare systems, diet, and the environment (Notoatmodjo, 2017). Anemia prevention involves maintaining healthy behaviors, including proper dietary habits Fitriyani et al., (2023). Poor dietary quality and insufficient caloric intake reduce erythrocyte formation. Hemoglobin, a component of erythrocytes, decreases when energy intake is inadequate, leading to anemia (Natalita et al., 2011).

The relationship between sleep patterns and anemia in adolescent girls.

This study found a significant relationship between sleep patterns and anemia. Several students reported difficulty falling asleep early, with most sleeping after midnight. Poor sleep quality negatively affects hemoglobin levels, increasing anemia risk. A study by Yogie et al., (2024) analyzed this relationship using the Chi-Square test and found a significant result (p = 0.011), suggesting that inadequate sleep disrupts hemoglobin biosynthesis, leading to anemia. Conversely, a study by Sahashika and Setiyaningrum, (2024) at SMK Batik 2 Surakarta found no significant relationship between sleep quality and anemia. This suggests that factors other than sleep, such as menstruation, diet, medical history, physical activity, and food intake, may also influence anemia. Adolescents aged 12–18 should sleep 8–9 hours daily. Besides duration and quality, sleep depth also matters. Deep sleep occurs during NREM stages III and IV, which promote tissue repair and blood cell regeneration. Even with sufficient sleep duration and quality, inadequate sleep depth can still contribute to anemia (Natalita, Sekartini, & Poesponegoro, 2011).

CONCLUSION

This study concludes that several factors significantly influence the incidence of anemia among adolescent girls at SMP NU Jawilan, Serang Regency. Knowledge level, menstrual cycle, menstruation duration, nutritional status, dietary patterns, and sleep patterns all showed

significant associations with anemia. Better knowledge, regular menstruation, adequate nutrition, balanced diet, and good sleep habits were protective factors against anemia. These findings emphasize the importance of comprehensive health education focusing on nutrition, menstrual health, and lifestyle regulation to prevent anemia during adolescence.

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