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# Factors Related To The Incidence of Anemia in Adolescent Girls at Mitra Inalum Private High School

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### ABSTRACT

Anemia in adolescent girls is a significant health issue. This condition can be influenced by various factors such as nutritional status, sleep quality, menstrual cycle, and duration of menstruation. This study aims to analyze the relationship between nutritional status, sleep quality, menstrual cycle, and duration of menstruation with the incidence of anemia among adolescent girls at Mitra Inalum Private High School. The study uses a quantitative method with a cross sectional approach. Data analysis was conducted univariately and bivariately using the Chi-Square test with the help of SPSS software. The research population consists of 125 adolescent girls at Mitra Inalum Private High School in 2025. The research sample consists of 95 adolescent girls selected using random sampling techniques based on inclusion and exclusion criteria. The results of the chi-square test indicate no significant relationship between nutritional status and the incidence of anemia (-value = 1.00). There is a significant relationship between quality. The quality of sleep is associated with the occurrence of anemia (p = 0.000). There is a significant relationship between the menstrual cycle and the occurrence of anemia (p = 0.001). There is a significant relationship between the duration of menstruation and the occurrence of anemia (p = 0.000). This study concludes that quality of sleep, menstrual cycle, and duration of menstruation have a significant relationship with the occurrence of anemia in female adolescents at SMA Swasta Mitra Inalum. Meanwhile, nutritional status does not show a significant relationship.

## INTRODUCTION

Nutritional status is an individual's health condition that reflects the balance between food intake and the body's need for metabolism. Assessment of nutritional status in adolescents generally uses Body Mass Index (BMI). WHO data shows that globally around 6.2% of adolescents have lost weight, 25.1% are overweight, and 8.9% of them are obese (Vani et al., 2023). In Indonesia, the prevalence of nutritional status of adolescents aged 16–18 years based on BMI is 1.4% very thin, 6.7% thin, 78.3% normal, 9.5% obese, and 4.0% obese. In North Sumatra (aged 13–15 years), 7.3% were found to be undernourished (1.6% very thin and 5.7% thin) and 17.7% overnourished (12.9% overweight and 4.8% obese). Meanwhile, in Batu Bara Regency, the prevalence of being very thin is 0.83%, underweight is 4.43%, and obesity is 2.53% (A. W. Astuti et al., 2024).

Abnormal nutritional status can affect the menstrual cycle through disorders in the hypothalamic–pituitary system, thereby inhibiting the production of FSH and LH hormones. In addition, sleep quality also plays a role in menstrual regularity (Mouliinda, 2022). IDAI states that 25-40% of children and adolescents have sleep disorders. WHO (2018) reported that 80% of women in the world experience irregular periods, while Riskesdas 2018 recorded that 11.7% of Indonesian adolescents and 14.9% of adolescents in urban areas experience menstrual irregularities. The prevalence of menstrual disorders includes menstrual pain (89.5%), cycle irregularities (31.2%), and prolonged menstrual duration (5.3%). Another study showed that 93.2% of adolescent girls aged 10–19 years had menstrual cycle disruption (Nuraini et al., 2025).

Anemia is also a major health problem in adolescent girls. Globally, the prevalence of anemia in women of childbearing age is 29.9%, in non-pregnant women 29.6%, and in pregnant women 36.5%. In Indonesia, the national prevalence of anemia is 21.7%, with the rate higher in women (23.9%) than men (18.4%), and higher in rural areas (22.8%) than urban areas (20.6%) (9). Data from the Ministry of Health in 2020 shows that 33.7% of adolescent girls in Indonesia experience anemia. In North Sumatra, the prevalence of anemia aged 10–19 years reaches 25% (1,329,920 people) (Nuraeni et al., 2025).

In 2023, there were 1,180 cases of anemia in Batu Bara Regency, with 1,001 cases occurring in adolescent girls (605 cases in junior high school students and 396 cases in high school students). In Sei Suka District in 2024, there will be 421 cases of anemia (344 mild, 56 moderate, 3 severe). At Mitra Inalum Private High School, the results of the 2024 examination on 125 class X students showed 104 mild anemia, 19 moderate anemia, and 2 severe anemia.

The number of teenagers is also quite large. Globally, adolescents make up 18% of the world's population (±1.2 billion people). In Indonesia, out of a total population of more than 270 million people, 17% (±46 million) are adolescents aged 10–19 years. In North Sumatra in 2024, there will be 639,141 young women aged 15-19 years. In Batu Bara Regency there are 37,011 young women aged 15-19 years (7.98% of the total population), and in Sei Suka District as many as 1,496 people.

Based on the high prevalence of nutritional status disorders, sleep quality, menstrual disorders, and anemia in adolescent girls, especially at Mitra Inalum Private High School, it is important to investigate whether there is a relationship between nutritional status, sleep quality, cycle and menstrual length with the incidence of anemia in adolescent girls at Mitra Inalum Private High School.

## METHODS

This study uses a quantitative design with a cross sectional approach, namely data collection is carried out once at a time without follow-up. The research was carried out at Mitra Inalum Private High School, Batu Bara Regency, on May 16-17, 2025. The population in this study is all adolescent girls who experience anemia at Mitra Inalum Private High School in 2025 as many as 125 people. The sample size was determined using the Isaac and Michael (1981) formula with an error rate of 5%, so that 95 respondents were obtained. The sampling technique uses random sampling with predetermined inclusion and exclusion criteria.

Inclusion criteria included adolescent women who had menstruated, were not menstruating during the study, had no history of diseases such as malaria, dengue, or heavy bleeding and did not take routine medications, and were willing to be respondents. The exclusion criteria include adolescent girls who refuse to be respondents, are sick or have heavy bleeding, are menstruating during the study, and do not have permission from the school.

The independent variables in this study were nutritional status, sleep quality, cycle and menstrual length, while the dependent variable was the incidence of anemia. Data collection was carried out through questionnaires to obtain information about the age, cycle and duration of menstruation, as well as disease history. Nutritional status was measured using Body Mass Index (BMI) obtained from weight measurements using scales and height using stadiometers. Hemoglobin levels were checked using the Easy Touch GCHB tool through capillary blood samples taken from fingertips by midwives at the Sei Suka Health Center.

The data obtained then goes through the stages of editing, coding, data entry, and cleaning before being analyzed using the SPSS program. Data analysis included univariate analysis to describe the distribution of each variable as well as bivariate analysis using the chi-square test to determine the relationship between independent variables and the incidence of anemia.

## RESULTS
### General location overview of the research

Mitra Inalum Private High School is a high school fostered by PT Inalum (Indonesia Asahan Alumunium). Mitra Inalum Private High School is located in Tanjung Gading, Sei Suka District, Batu Bara Regency, North Sumatra. The school was established on January 9, 1988 and is under the auspices of the Inalum Foundation, also known as PT Inalum. SMA Mitra Inalum has an A accreditation with the number SK 1347/BAN-SM/SK/2021, which shows high educational standards. The study was conducted on students with anemia at Mitra Inalum Private High School who were between 15-17 years old.

### Univariate Analysis Results

**Table 1. Univariate Test Results**

| Variabel | Frequency (n) | Percentage (%) |
|---|---|---|
| **Body Mass Index** | | |
| Which | 23 | 24,2 |
| Normal | 72 | 75,8 |
| **Sleep Quality** | | |
| Bad | 52 | 54,7 |

| | | |
|---|---|---|
| Good | 43 | 45,4 |
| **Menstrual Patterns** | | |
| Normal | 81 | 85,3 |
| Abnormal | 14 | 14,7 |
| **Length of Menstruation** | | |
| Menori Hagia | 48 | 50,5 |
| Normal | 47 | 49,5 |
| **Anemia** | | |
| Moderate Anemia | 51 | 53,7 |
| Anemia Ringan | 44 | 46,3 |
| **Total** | 95 | 100,0 |

Based on table 1. The results of the univariate test showed that most of them had a normal Body Mass Index (BMI) of 72 people (75.8%), while 23 people (24.2%) were classified as thin. The most sleep quality was in the poor category, namely 52 people (54.7%), while 43 people (45.4%) had good sleep quality. The majority of normal menstrual patterns were 81 people (85.3%), and 14 people (14.7%) were abnormal. Menstrual length showed almost balanced results, namely 48 people (50.5%) experienced menorrhagia and 47 people (49.5%) had normal menstrual length. In the anemia variable, most respondents experienced moderate anemia as many as 51 people (53.7%), while 44 people (46.3%) experienced mild anemia. The total number of respondents in this study was 95 people (100%).

**Bivariate Analysis**

**Table 2. Chi-Square Test Results**

| Variabel | Category Anemia | | | | Total | | P-Value | OR (95%CI) |
|---|---|---|---|---|---|---|---|---|
| | Moderate Anemia | | Anemia Ringan | | | | | |
| | n | % | n | % | N | % | | |
| **Body Mass Index** | | | | | | | | |
| Which | 12 | 52,2 | 11 | 10,2 | 23 | 100,0 | 1,000 | 0,923 (0,360 – |
| Normal | 39 | 54,2 | 33 | 45,8 | 72 | 100,0 | | 0,2364) |
| **Sleep Quality** | | | | | | | | |
| **Bad** | 44 | 84,6 | 8 | 15,4 | 52 | 100,0 | 0,000 | 28,286 (9,360 – |
| Good | 7 | 16,3 | 36 | 83,7 | 43 | 100,0 | | 85,476) |
| **Menstrual Sklus** | | | | | | | | |
| Normal | 37 | 45,7 | 44 | 54,3 | 81 | 100,0 | 0,001 | 2,189 (1,726 – |
| Abnormal | 14 | 100.0 | 0 | 0 | 81 | 100,0 | | 2,776) |
| **Length of Menstruation** | 32 | 50,0 | 32 | 50,0 | 64 | 100,0 | 0,000 | 15,667 (5,24 – |
| Abnormal Normal | 19 | 61,3 | 12 | 38,7 | 31 | 100,0 | | 46,825) |
| **Total** | 51 | 53,7 | 44 | 46,5 | 95 | 100,0 | | |

Based on the results of the chi-square test, the Body Mass Index (BMI) variable had a p-value of 1,000 ($p > 0.05$), so there was no significant relationship between nutritional status and the incidence of anemia in adolescent girls. In contrast, the sleep quality variable showed a p-value of 0.000 ($p < 0.05$), which means that there is a significant relationship between sleep quality and the incidence of anemia. In the menstrual cycle variable, a p-value of 0.001 ($p < 0.05$) was obtained, so it can be concluded that there is a significant relationship between the menstrual cycle and the incidence of anemia. Similarly, in the variable length of menstruation, a p-value of 0.000 ($p < 0.05$) indicates a significant relationship between the length of menstruation and the incidence of anemia.

**DISCUSSION**
**The Relationship between Nutritional Status and the Incidence of Anemia in Adolescent Girls at Mitra Inalum High School**

According to the test findings, it shows that the significance score of nutritional status to anemia events is 1,000 > 0.05, which means that there is no significant relationship between nutritional status and anemia events in adolescent girls at SMA Mitra Inalum. The findings of this study are in accordance with the results of a study from Yunita, et al (2023) on the relationship between nutritional status, consumption of Fe tablets, and menstrual length to the event of anemia by adolescent girls which shows a significance value of

0.187 (p < 0.05), then it can be stated that if there is no relationship between nutritional status and the event of anemia by adolescent girls at SMP Ma‟arif Borobudur (Yunita et al., 2023).

The findings of this study are also in accordance with the results of a study from Wahyuni, et al (2024) on the relationship between nutritional status and AKG (Energy) to the event of anemia by adolescent girls based on the results of the Spearman Rank test of friends p value 0.815 > 0.05 so no relationship between nutritional status and the event of anemia by adolescent girls at SMPN 8 Samarinda (Wahyuni et al., 2024). However, the results of this study are not in accordance with the results of a study from Ridwan (2023), related to the relationship between nutritional status and nutritional knowledge to the event of anemia by adolescent girls at Triyasa Ujung Berung Junior High School Bandung. Where based on the results of the statistical test, it showed a significant value with a P Value of 0.020 which means that there is a forced relationship from nutritional status to anemia events by adolescent girls at Triyasa Ujung Berung Junior High School, Bandung (Fadia et al., 2023).

The researcher assumes that if there is no relationship between nutritional status and the incidence of anemia by adolescent girls at Mitra Inalum High School, it is possible because most of the respondents have good nutritional status, but still experience anemia. From (Ministry of Health, 2018), the event of anemia by adolescent girls can be seen from a number of aspects, such as iron deficiency, folic acid deficiency, Vit.B12 and protein. With direct anemia, especially due to the lack of red blood cell production/quality and blood loss, whether permanent or permanent. Adolescent anemia often occurs because adolescent girls need more and more nutritional supplements to support the developmental phase. Lack of dietary supplements is due to a number of aspects, one of which is dietary efforts that have an impact on the lack of consumption of dietary supplements, especially sources of iron.

In this study, although most of the interviewees had normal nutritional status, but they also experienced anemia, respondents with moderate anemia status were 12 individuals (52.2%), and with normal nutritional status were 39 individuals (54.2%). Students with mild anemia category with lean nutritional status were 11 individuals (10.2%) and normal nutritional status was 33 individuals (54.2%). Adolescent girls with normal nutritional status can find anemia if their eating habits are irregular, young women are also relatively fond of unhealthy foods such as junk food, fast food, high-calorie foods, high-fat foods and salt, as well as drinks with high sugar content.

**The Relationship between Sleep Quality and the Incidence of Anemia in Adolescent Girls at Mitra Inalum High School**

The results showed that if the significance score between the sleep quality variables and the event of anemia by adolescent girls at Mitra Inalum High School was 0.000 < 0.05 which means that Ha was accepted and Ho was rejected, then there was a significant relationship between sleep quality and the incidence of anemia of adolescent girls at Mitra Inalum High School.

The findings of this study are in accordance with the results of a study from Wardani, et al (2025) on the relationship between sleep quality and anemia events by adolescent girls at SMA Negeri 1 Godean Yogyakarta with a p-value score of 0.000 where a p value score of <0.05 can be stated that Ho is rejected and Ha is accepted so that there is a correlation of sleep quality to anemia events at SMA Negeri 1 Godean Yogyakarta (Wardani et al., 2025). The results of this study are also in accordance with the results of a study by Khiroh, et al (2024) on sleep quality related to anemia events by students of the Al-Fauzan Lumajang integrated Islamic boarding school where the results of the analysis showed a p value of 0.000<0.05 which means that there is a significant correlation of sleep quality to the incidence of anemia in MTs students of the Al-Fauzan integrated Islamic boarding school.

Adolescent girls with poor sleep quality can cause health disorders because the need for physical rest is not fully fulfilled and the body becomes tired because of it. Sleep quality is affected by various aspects such as excessive stress and worry, illness, lack of exercise, poor eating schedule, drinking alcohol, caffeine, nicotine, crowded conditions, temperature comparison, change of surroundings and side effects of medications. The school area can be a cause of stress because the dependents of so many and complicated lessons as well as the obligation to do various exercises and lessons in a tight time can cause stress for students. Stress is one of the core causes of fatigue syndrome in addition to body health factors.

In this study, data were obtained from 95 respondents at the level of moderate anemia with poor sleep quality of 44 individuals (84.6%), with good sleep quality of 8 individuals (15.4%). Students with mild anemia category with poor sleep quality were 7 individuals (16.3%) and with good sleep quality were 36 individuals (83.7%). Humans have varying sleep needs between each age, by the age of adolescence, humans can sleep in 7-9 hours every day, but the reality is in the range of 6 hours a day because of activities and social life factors. This aspect can have an impact on sleep time. Lack of sleep and poor quality sleep cause the repair process and the formation of red blood cells to be not optimal. This aspect can interfere with the production of hemoglobin which plays an important role in preventing anemia. In addition, sleep deprivation increases energy use and accelerates fatigue, which can also worsen anemia conditions. Therefore, it is important to be aware of the body's need for adequate rest (Helmyati et al., 2023).

**The Relationship between Menstrual Cycles and the Incidence of Anemia in Adolescent Girls at Mitra Inalum High School**

According to the test findings in table 4.8, a significance score of 0.000 < 0.05 was obtained, which means that Ha was accepted and Ho was rejected, thus meaning that there is a significant link of the menstrual cycle to the event of anemia of adolescent girls at Mitra Inalum High School. Menstrual cycles or patterns greatly affect the risk of anemia, especially in women of childbearing age. Menstruation is a physiological process that causes blood loss on a regular basis every month. If the menstrual cycle is irregular, too long, or the volume of blood that comes out is too much, the total blood and iron lost will also be greater. Excessive blood loss without adequate iron intake will lead to a decrease in hemoglobin levels in the blood. Hb is the main element of red blood cells that play a role in transporting air to parts of the body. If the Hb content is less than the standard limit, then an individual will later develop anemia.

In accordance with the findings of a study by Dineti, et al (2022) on the relationship between menstrual patterns and the incidence of anemia in adolescent girls in the coastal areas of Bengkulu City, where the P-value score is 0.000<0.05 which shows significant results that there is a significant association between menstrual patterns and the incidence of anemia in adolescent girls in the coastal areas of Bengkulu City36. It is also supported by the findings of a study from Astuti D & Kulsum U (2020) on the menstrual cycle of anemia by adolescent girls which shows that adolescents with a stable menstrual cycle have a lower risk of anemia than those who find an unstable menstrual pattern, with a significance value of 0.001 which means that there is a compelling association of menstrual patterns with anemia by adolescent girls (Dineti, 2022).

However, it is not in accordance with the findings of the study from Sriwani, et al (2022) regarding the relationship of the menstrual cycle to the event of anemia by adolescent girls at SMP Negeri 1 Tanjung Palas Tengah with 68 respondents where the results of the chi-square analysis showed a p-value score of 0.436 > 0.05 which means that there is no association of the menstrual cycle with the event of anemia by adolescent girls at SMP Negeri 1 Tanjung Palas Tengah, Bulungan Regency (D. Astuti & Kulsum, 2020). Based on the findings of the analysis in table 4.14, data were obtained among 95 people at the level of moderate anemia with Polymenorrhea as many as 10 people, against the normal menstrual cycle as many as 81 individuals, and against the oligomenorrhea menstrual cycle as many as 4 people.

To maintain a normal menstrual cycle, it is necessary to consume nutritious food and enough iron so that it helps prevent all kinds of menstrual blood loss, exercise regularly, manage stress, get enough sleep, and consult medical personnel if necessary. By keeping your menstrual cycle regular and normal, you minimize the risk of excessive blood loss, which is a major cause of iron deficiency anemia in women of childbearing age. A healthy lifestyle that supports hormonal balance and reproductive health will help the menstrual cycle run well and prevent anemia.

**The Long Relationship of Menstruation with the Incidence of Anemia in Adolescent Girls at Mitra Inalum High School**

Based on the test results, a significance value of 0.000 < 0.05 was obtained, which means that Ha was accepted and Ho was rejected, which means that there is a significant relationship between the length of menstruation and the event of anemia of adolescent girls at SMA Mitra Inalum. Anemia by women of childbearing age is often caused by excessive or prolonged menstrual blood loss. Every menstrual cycle, women lose blood and iron. If menstruation lasts longer than normal (generally >7 days), then the amount of blood lost increases, so that iron reserves in the body decrease. If this blood loss is not followed with iron supplements that are fulfilled by food, the formation of Hb can be disrupted and can result in anemia.

The results of this study are in accordance with the results of a study from Sari, et al (2020) on the relationship between menstrual length and nutritional status to the incidence of anemia in adolescents, where the results of the study obtained a p-value of 0.034 < 0.05, which means that there is a forced relationship from the length of menstruation to the event of anemia by adolescents with an OR value of 4.111 which means that adolescents with long periods of menstruation have a 4,111 chance of developing anemia compared to adolescent girls compared to long periods normal menstruation at SMA N 1 Martapura, Ogan Komering Regency, East Ulu (Sari et al., 2019). The findings of this study are also supported by the findings of a study from Marlena, et al (2023) regarding the relationship between menstrual length, lifestyle, and eating schedule to anemia events by adolescent girls at SMK Negeri 1 Lampung Jaya, where according to the findings of the chi square test in this study, a p-value score of 0.005 < 0.05 was obtained, which means that there is a compelling association of menstrual length to anemia, with an OR of 4,242, which means that adolescents with abnormal menstrual length are potentially 2.4 times more likely to have anemia compared to adolescents with normal menstruation (Marlena et al., 2023).

However, it is not in accordance with the study of Gazali, et al (2024) on the relationship between menstruation and anemia events in female students at the Randik Women's Dormitory, according to the findings of the Chi Square test, a p value score of 0.864 > (0.05) means that H0 is accepted to have no association between menstrual duration and Hb levels at the Randik Women's Dormitory in Yogyakarta and

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has a correlation value of 0.869 which means that there is no correlation between the menstrual cycle and hemoglobin levels and the degree of relationship correlation is very strong and forms negative correlation relationships. This means that the higher or longer the duration of menstruation, the lower the hemoglobin level (Gazali et al., 2024). Keeping menstruation within the normal range is very important to prevent anemia, especially by adolescents and women of childbearing age.

By keeping menstrual length within the normal range through a healthy lifestyle and stress management, the risk of excessive blood loss can be minimized. This directly helps prevent anemia due to iron deficiency, as the body does not experience excessive blood loss and can maintain healthy hemoglobin levels. If he cannot compare his blood, whether it is black blood or so on, he does not pray every month during the very usual menstrual phase of 6 or 7 days, then bathes and prays. Below are a number of hadiths that underlie it.

## CONCLUSION

Based on the findings of the study and the results of data analysis on factors related to the incidence of anemia in adolescent girls at Mitra Inalum Private High School, it can be concluded that there is no relationship between nutritional status and the incidence of anemia, which is indicated by a p-value of 1,000 (> 0.05). Conversely, there was a significant relationship between sleep quality and the incidence of anemia with a p-value of 0.000 (< 0.05). In addition, the menstrual cycle also showed a significant association with the incidence of anemia based on a p-value of 0.000 (< 0.05). Menstruation duration also has a significant relationship with the incidence of anemia, with a p-value of 0.000 (< 0.05). Thus, sleep quality, menstrual cycle, and menstrual length were associated with the incidence of anemia, while nutritional status did not show a significant relationship.

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