Papua Medicine and Health Science (PMHS)
Volume 2, Nomor 1, 2025
https://jurnal.fk-unipa.com/index.php/PMHS

The Effect of Sleep Habits on the Incidence of Anemia Among Adolescent Girls at SMKN 2 Majene

Rasmawati*[1], Murdiana[2]

[1] Program Studi Kesehatan Masyarakat,STIKes Bina Bangsa Majene, Indonesia
[2] Program Studi D3 Kebidanan STIKes Bina Bangsa Majene, Indonesia

ARTICLE INFO

Article history

Received: 03 May 2025
Revised: 05 June 2025
Accepted: 30 June 2025

Keywords:

Anemia, Sleep Habits, Adolescent Girls

ABSTRACT/ ABSTRAK

ABSTRACT. *Anemia is a condition characterized by a decrease in hemoglobin levels in the body. Hemoglobin is an iron-containing protein found in red blood cells that functions to transport oxygen from the lungs throughout the body. One of the factors that can influence hemoglobin levels is sleep habits. Sleep disturbances can lower sleep quality, which affects the process of cell regeneration, including hemoglobin production, thereby potentially triggering anemia. Sufficient and high-quality sleep is essential for the formation of new cells and the repair of damaged ones. This study aimed to determine the effect of sleep habits on the incidence of anemia among adolescent girls at SMKN 2 Majene. This research employed a quantitative design with a cross-sectional approach. The population consisted of all eleventh-grade adolescent girls at SMKN 2 Majene. A total of 42 respondents were selected using purposive sampling. Data were analyzed using the Chi-square test. The univariate analysis showed that 40 respondents (95.2%) had poor sleep habits. The bivariate analysis revealed a p-value of 0.042 (p < 0.05), indicating a significant effect of sleep habits on the incidence of anemia. These findings underscore the importance of maintaining good sleep habits to prevent anemia among adolescent girls.*

Kata kunci:

Anemia, Pola Tidur, Remaja Putri

ABSTRAK. Anemia merupakan kondisi yang ditandai dengan penurunan kadar hemoglobin dalam tubuh. Hemoglobin adalah protein yang mengandung zat besi di dalam sel darah merah yang berfungsi mengangkut oksigen dari paru-paru ke seluruh tubuh. Salah satu faktor yang dapat memengaruhi kadar hemoglobin adalah kebiasaan tidur. Gangguan tidur dapat menurunkan kualitas tidur, yang berdampak pada proses regenerasi sel, termasuk pembentukan hemoglobin, sehingga dapat memicu terjadinya anemia. Tidur yang cukup dan berkualitas penting dalam pembentukan sel-sel baru serta perbaikan sel-sel yang rusak. Penelitian ini bertujuan untuk mengetahui pengaruh kebiasaan pola tidur terhadap kejadian anemia pada remaja putri di SMKN 2 Majene. Penelitian ini menggunakan desain kuantitatif dengan pendekatan cross-sectional. Populasi dalam penelitian ini adalah seluruh remaja putri kelas XI di SMKN 2 Majene. Sampel berjumlah 42 responden yang dipilih menggunakan teknik purposive sampling. Analisis data dilakukan dengan uji Chi-square. Hasil analisis univariat menunjukkan bahwa sebanyak 40 responden (95,2%) memiliki kebiasaan pola tidur yang buruk. Hasil analisis bivariat menunjukkan nilai p-value = 0,042 (p < 0,05), yang berarti terdapat pengaruh signifikan antara kebiasaan pola tidur dan kejadian anemia. Temuan ini menunjukkan pentingnya menjaga kebiasaan tidur yang baik untuk mencegah anemia pada remaja putri.

Corresponding Author:
Rasmawati
Program Studi Kesehatan Masyarakat,STIKes Bina Bangsa Majene, Indonesia
Email: w.rasma25@yahoo.com

INTRODUCTION

Anemia is one of the most significant public health problems and is frequently experienced by adolescents, particularly adolescent girls. This condition is characterized by low hemoglobin levels in the blood, which leads to a decreased capacity of the body to transport oxygen to all tissues. One of the factors influencing hemoglobin levels is sleep habits. Sufficient and high-quality sleep plays a crucial role in the process of cell regeneration, including red blood cells, which are involved in hemoglobin production. Susanto et al. (2024) found a significant relationship between sleep quality and hemoglobin levels among adolescents, where poor sleep quality was associated with lower hemoglobin levels, ultimately affecting oxygen transport and overall health. This is in line with the findings of Koushik and Rao (2014), who emphasized that anemia is a serious public health issue among adolescent females, with a prevalence reaching 77.33%, thereby requiring early intervention and prevention.

Ideally, adolescents need at least eight hours of sleep per night to support growth and bodily recovery. However, modern lifestyles—such as the use of electronic devices before bedtime, academic pressure, and busy social activities—often reduce both the quality and duration of sleep. Going to bed late (after 11:00 p.m.) and sleeping less than six hours per night have been associated with decreased hemoglobin levels, as reported in several previous studies (Nadila et al., 2024; Lestari & Baringbing, 2024).

Based on preliminary observations conducted at SMKN 2 Majene, it was found that the majority of adolescent girls at the school slept less than 5–6 hours per night. Additionally, data from Banggae II Community Health Center indicated that SMKN 2 Majene had the highest number of anemia cases in the area, with a total of 42 female students recorded as having anemia in 2024.

These findings are supported by previous studies identifying a significant relationship between sleep quality and hemoglobin levels (Nadila et al., 2024; Lestari & Baringbing, 2024). Sleep disturbances such as nightmares, frequent awakenings at night, snoring, and fatigue due to busy daily activities may disrupt the body's biological processes, including hemoglobin production. Adequate and high-quality sleep enables the body to repair damaged cells, maintain metabolic balance, and support optimal biochemical functioning. Conversely, sleep deprivation may hinder these processes and lead to decreased hemoglobin levels below the normal threshold (Nadila et al., 2024).

Therefore, this study is essential to further explore the effect of sleep habits on the incidence of anemia among adolescent girls, particularly in the school setting, as part of promotive and preventive strategies aimed at improving adolescent health status.

RESEARCH METHOD

This study is a quantitative research aiming to examine the effect between the independent and dependent variables within a population. The research design used was cross-sectional, which allows for the simultaneous collection of data on both independent and dependent variables at a single point in time. This approach was employed to identify the relationship between sleep habits and the incidence of anemia. The population in this study consisted of all eleventh-grade adolescent girls at SMKN 2 Majene. The sample included 42

respondents selected using purposive sampling, a technique in which participants are chosen based on specific criteria established by the researchers. Data collection was carried out using a structured questionnaire to assess respondents' sleep habits, as well as hemoglobin level examinations to determine anemia status. The data obtained were analyzed using univariate analysis to describe the distribution of variables and bivariate analysis to test the relationship between the two variables using the Chi-square test.

RESULTS

Univariate Analysis

Univariate analysis was conducted to describe the distribution of respondents' age and anemia status. The results are presented in Table 1 below:

Table 1. Age Distribution and Anemia Status Among Adolescent Girls at SMKN 2 Majene (n = 42)

Variable	Category	Frequency (n)	Percentage (%)
Age	15 years old	1	2.4
	16 years old	11	26.2
	17 years old	30	71.4
Anemia Status	Anemia	33	78.6
	Non-anemia	9	21.4

Source: Primary Data, 2025

The univariate analysis showed that out of 42 respondents, the majority were 17 years old (71.4%), followed by 16 years old (26.2%), and 15 years old (2.4%). These findings indicate that most respondents were in middle adolescence.

Furthermore, based on anemia status, the majority of respondents (33 individuals or 78.6%) were found to have anemia, while 9 respondents (21.4%) were categorized as non-anemic. This suggests that the incidence of anemia is relatively high among adolescent girls at SMKN 2 Majene, emphasizing the need to consider contributing factors, one of which is sleep habits.

Bivariate Analysis

Bivariate analysis using the Chi-square test was conducted to examine the relationship between sleep habits and the incidence of anemia. The results are presented in Table 2.

Table 2. Relationship Between Sleep Habits and Anemia Incidence Among Adolescent Girls at SMKN 2 Majene

Variabel	Kategori	Kejadian Anemia						P Value
		Anemia		Tidak Anemia		Total		
		N	%	n	%	N	%	
Kebiasaan Pola Tidur	Baik	0	0,0%	2	4,8%	2	4,8%	**0,042**
	Buruk	33	78,6%	7	8,6%	40	95,2%	
	Total	33	78,6%	9	21,4%	42	100%	

Source: Primary Data, 2025

Out of 42 respondents, the majority (40 individuals or 95.2%) had poor sleep habits, while only 2 individuals (4.8%) had good sleep habits. Among those with poor sleep habits, 33 respondents (78.6%) had anemia, while 7 respondents (16.6%) did not. Conversely, both respondents with good sleep habits were categorized as non-anemic (4.8%).

The result of the Chi-square test revealed a p-value of 0.042. Since $p < 0.05$, it can be concluded that there is a significant relationship between sleep habits and the incidence of anemia among adolescent girls at SMKN 2 Majene. This indicates that adolescents with poor sleep habits are more likely to develop anemia compared to those with good sleep habits.

DISCUSSION

The results of this study indicate a significant relationship between sleep habits and the incidence of anemia among adolescent girls at SMKN 2 Majene, with a p-value of 0.042 ($p < 0.05$). This finding suggests that adolescents with poor sleep habits tend to have a higher risk of developing anemia compared to those with good sleep habits. These results reinforce the hypothesis that sleep patterns are an important factor influencing hemoglobin levels in adolescent girls.

Physiologically, sleep plays a crucial role in the process of hematopoiesis, which includes the formation of red blood cells and the synthesis of hemoglobin. Poor sleep quality has been associated with decreased hemoglobin levels due to various biological mechanisms, such as increased oxidative stress, hormonal imbalances, and excessive activation of the immune system. Sleep deprivation can disrupt the secretion of hormones such as testosterone and melatonin, both of which play roles in the process of hemoglobin production (Wang et al., 2020).

Previous studies have also shown that sleep disturbances significantly affect the function of hematopoietic stem cells. McAlpine et al. (2022) reported that sleep disturbances increase the proliferation of stem cells but reduce clonal diversity, ultimately impairing the efficiency of hemoglobin synthesis. This aligns with the findings of Chen-Edinboro et al. (2018), who found that insomnia symptoms were associated with a higher risk of non-iron-deficiency anemia in the elderly population, indicating that sleep disturbances directly affect hemoglobin levels in the blood.

Sleep disturbances also affect iron metabolism, which plays a key role in hemoglobin production. Ivaschenko and Kalinkin (2024) stated that among patients with sleep disorders, a moderate but significant association was found between ferritin and hemoglobin levels. This suggests that disrupted iron metabolism due to sleep deprivation may impair the availability of iron for erythropoiesis and hinder oxygen transport in the body.

In addition, sleep disorders such as obstructive sleep apnea (OSA) cause intermittent hypoxia, which ideally should stimulate increased erythrocyte production. However, in OSA patients, this condition does not lead to increased hemoglobin levels due to neocytolysis, the destruction of newly formed red blood cells upon return to normoxia, as well as elevated hepcidin levels resulting from chronic inflammation that inhibits iron absorption (Song et al., 2023).

A decline in sleep quality also affects the immune system and inflammatory processes in the body. Żerek and Sitarek (2024) emphasized that sleep disturbances increase inflammation and reduce immune cell function, which can impact hematological balance. Similarly, Rico-Rosillo and Vega-Robledo (2018) asserted that sleep plays a role in the regulation of the immune system, and its disruption may lead to changes in hemoglobin levels through inflammatory mediation.

Loprinzi (2015) found that sleeping less than seven hours per night was associated with an increase in Red Cell Distribution Width (RDW), an indicator of irregular red blood cell production. This supports the finding that insufficient sleep can trigger disturbances in erythropoiesis. Specifically among adolescents, Susanto et al. (2024) reported that 89.3% had poor sleep quality, and 39.3% of them had low hemoglobin levels. These findings highlight that adolescents are highly vulnerable to the physiological effects of sleep deprivation, particularly in terms of hematological health. Further support comes from El-Sawi and Edrees (2020), who stated that inadequate sleep leads to decreased hemoglobin levels, accompanied by metabolic and immunological disorders.

This study is also in line with the findings of Nadila et al. (2024), who identified a significant effect between sleep habits and hemoglobin levels, with a p-value of 0.006. Likewise, the study by Lestari and Baringbing (2024) confirmed this association with a p-value of 0.001, indicating that poor sleep habits are correlated with the incidence of anemia among adolescent girls.

Lifestyle factors such as staying up late, excessive use of electronic devices before bed, academic stress, and busy social activities are the main triggers of sleep disturbances among adolescents. This is supported by observations at SMKN 2 Majene, where the majority of respondents reported sleeping less than six hours per night. Sleep disturbances such as nightmares, frequent nighttime awakenings, and fatigue due to daily activities were also identified as primary causes of poor sleep quality among the respondents.

Therefore, it can be concluded that poor sleep habits contribute to an increased risk of anemia through complex biological mechanisms, including impaired hemoglobin synthesis, disrupted iron metabolism, and immune dysfunction. Health education on the importance of adequate sleep quality and duration should become an integral part of school-based promotive and preventive programs to reduce the prevalence of anemia among adolescent girls.

CONCLUSION

This study concludes that there is a significant relationship between sleep habits and the incidence of anemia among adolescent girls at SMKN 2 Majene. The majority of respondents had poor sleep habits and experienced anemia, indicating that inadequate sleep quality and duration may reduce hemoglobin levels in the blood. Physiologically, adequate and high-quality sleep plays a vital role in the process of cell regeneration, including the formation of red blood cells, as well as maintaining metabolic balance and immune function. Therefore, poor sleep habits can be considered a significant risk factor for anemia among adolescent girls.

It is recommended that adolescent girls improve and maintain healthy sleep habits by sleeping 7 to 8 hours each night and avoiding activities that may disrupt sleep quality, such as the use of electronic devices before bedtime, staying up late, and consuming caffeine. Adequate and high-quality sleep is essential for supporting growth, cellular recovery, and maintaining normal hemoglobin levels. Self-education on the importance of proper sleep patterns should be integrated into a healthy lifestyle to prevent anemia and support overall health during adolescence.

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