Relationship Between Protein Source Eating Habits and Sleep Duration with the Incidence of Anemia in Female Adolescents in Grade VII Study at SMPN 1 Kelumpang Hilir UPTD Puskesmas Serongga

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Anemia is one of the most common nutritional problems among adolescent girls, especially during periods of rapid growth. One of the main factors causing anemia is low intake of animal protein, which contains haem iron and plays an important role in hemoglobin formation. Adolescent girls have higher iron requirements, so they are at greater risk of anemia if their diet is insufficient. 49.7% of adolescent girls experience anemia. The anemia problem at SMPN 1 Kelumpang Hilir is 27.6%. This study used an analytical observational research design with a cross-sectional approach. The population in this study consisted of 171 female adolescents from SMP Negeri 1 Kelumpang Selatan. The study was conducted in November 2025. The sampling technique used was purposive sampling. The test used was the Spearman's rank correlation test. The results of the study showed that most of the adolescent girls had poor protein intake habits (60.0%), insufficient sleep duration (58.6%), and anemia (70.0%). The statistical test results showed a relationship between protein source eating habits and sleep duration with the incidence of anemia in female adolescents in grade VII at SMPN 1 Kelumpang Hilir UPTD Puskesmas Serongga. It is recommended that there be education on the proper consumption of TTD (avoiding tea/coffee) as well as improvements in protein intake and sleep patterns among adolescent girls. Researchers are further recommended to examine the variables of social support and knowledge levels.

Keywords: sleep duration, adolescent female anemia, sleep duration, protein intake habits

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1. Introduction

Adolescence is a crucial developmental phase in the human life cycle, marked by rapid and complex biological, cognitive, and socio-emotional changes. During this period, physical growth spurts, reproductive organ maturation, and hormonal changes occur, all of which directly impact energy and nutrient needs. An imbalance between nutritional needs and intake during this phase can lead to various health problems, one of which is anemia, which is common among adolescents, especially girls (Munthe et al., 2024). This condition makes adolescence a vulnerable period for nutritional and health disorders if not managed appropriately.

Anemia is a global public health problem that remains a serious concern, particularly among women of reproductive age. Globally, an estimated 29.9% of women aged 15–49 years experience anemia, with iron deficiency being the primary cause in more than half of cases. This high prevalence indicates that anemia is not only an individual problem but also a structural issue related to consumption patterns, access to nutritious food, and suboptimal nutritional knowledge (WHO, 2022). Adolescent girls are a particularly vulnerable group because, in addition to experiencing rapid growth, they also begin menstruating, which increases monthly iron loss.

In Indonesia, the prevalence of anemia among women of reproductive age remains high and has not shown significant decline. Data from the 2023 Indonesian Nutritional Status Survey (SSGI) recorded a prevalence of anemia among women of reproductive age of 15.5%. This figure indicates that despite various intervention programs, anemia remains a health problem that has not been effectively addressed (SSGI, 2023). This situation indicates a gap between health policies and the implementation of healthy lifestyles in the community, particularly among school-age groups.

The problem of anemia is also evident at the local level. Data from the Kotabaru Regency Health Office in 2022 showed that SMPN 1 Kelumpang Hilir had the highest anemia rate in the Serongga Community Health Center's coverage area, at 27.6%. This figure is considered high and indicates that more than a quarter of female students at the school are anemic. The high prevalence of anemia in junior high schools is a significant concern because it can impact student concentration, academic achievement, and long-term health (Kotabaru Health Office, 2022).

One factor contributing to anemia in adolescent girls is an unbalanced diet, particularly low protein intake. Protein plays a crucial role in the formation of hemoglobin and red blood cells, so a protein deficiency can inhibit erythropoiesis. Furthermore, protein also functions as a carrier of iron in the body. Adolescents with irregular eating habits or a tendency to consume low-protein foods are at higher risk of anemia (Munthe et al., 2024).

The type of protein consumed also influences anemia status. Animal protein contains heme iron, which has a much higher absorption rate, around 25%, compared to non-heme iron from plant sources, which has a lower absorption rate. This makes consuming animal protein such as meat, fish, and eggs crucial for preventing anemia, especially in adolescent girls who have higher iron needs (Sari et al., 2021). However, economic constraints and family dietary habits often result in inadequate animal protein intake.

In addition to nutritional factors, the lifestyles of modern adolescents also contribute to anemia, one of which is insufficient sleep. Teenagers tend to have irregular sleep patterns due to academic activities, gadget use, and staying up late. Lack of sleep can trigger oxidative stress in the body, which results in increased cell damage, including red blood cells. This condition can cause accelerated erythrocyte lysis and lead to decreased hemoglobin levels in the blood (Zulala, 2023).

Inadequate sleep duration also impacts hormone regulation and the body's metabolic system. Lack of sleep can disrupt the production of hormones that play a role in cell regeneration and the immune system, making the body more susceptible to various health problems, including anemia. In adolescent girls, this condition is exacerbated by blood loss during menstruation, which, if not balanced with adequate rest and nutrition, can worsen anemia (Zulala, 2023).

The combination of low protein intake and insufficient sleep puts adolescent girls at double risk for anemia. These two factors interact and can accelerate the decline in hemoglobin levels. Therefore, it is important to examine modifiable behavioral factors, such as diet and sleep habits, as part of anemia prevention efforts in school-age children (Sari et al., 2021).

Based on this description, this study is crucial to determine the relationship between protein intake and sleep duration and the incidence of anemia in seventh-grade female students at SMPN 1 Kelumpang Hilir. The results are expected to serve as a basis for developing school health intervention programs, improving nutrition education, and promoting sustainable healthy lifestyles to reduce the prevalence of anemia in adolescent girls from an early age (Munthe et al., 2024).

2. Research Methods

This study used an analytical observational study with a cross-sectional design, which aimed to analyze the relationship between independent and dependent variables simultaneously. This design was chosen because it could simultaneously describe respondents' anemia status, protein-eating habits, and sleep duration within a single observation period, making it suitable for identifying relationships between variables without intervening on the research subjects.

The study was conducted at SMPN 1 Kelumpang Hilir in November 2025. The study location was selected based on the high incidence of anemia among female students at the school compared to other schools within the Serongga Community Health Center's coverage area. Therefore, this location was considered representative for examining factors associated with anemia among junior high school girls.

The population in this study was all 171 seventh-grade female students at SMPN 1 Kelumpang Hilir. From this number, a sample of 70 female students was selected using purposive sampling. This technique was used by considering the inclusion and exclusion criteria established by the researcher, so that the sample taken was expected to be able to represent the characteristics of the population and be relevant to the research objectives.

Hemoglobin levels were measured using a digital device called Easy Touch to determine the respondents' anemia status. Students were categorized as anemic if their hemoglobin levels were below 12 g/dL, according to established standards. Protein intake habits were assessed using a Semi-Quantitative Food Frequency Questionnaire (SQFFQ) to describe the respondents' protein consumption patterns over a specific period. Sleep duration was measured through direct interviews and a structured questionnaire to obtain information on the students' daily sleep time.

The collected data was then statistically analyzed using the Spearman Rank test. This test was chosen because it aims to determine the relationship between variables on an ordinal or numeric scale that are not normally distributed. The statistical significance level used in this study isα= 0.05, where the analysis results are declared significant if the p-value is <0.05.

3. Results and Discussion

Results

Univariate Analysis

Table 1. Frequency distribution based on factors of protein source eating habits, sleep duration, and anemia in seventh grade female adolescents at SMPN 1 Kelumpang Hilir

No.	Anemia in adolescent girls	n	%
1.	Anemia	49	70.0
2.	No Anemia	21	30.0
	Amount	70	100.0
No.	**Habits of eating protein sources**	**n**	**%**
1.	Not enough	42	60.0
2.	Good	28	40.0
	Amount	70	100.0
No.	**Sleep Duration**	**n**	%
1.	Not enough	41	58.6
2.	Enough	29	41.4
	Amount	70	100.0

Based on the research results, it was found that the majority of respondents suffered from anemia, namely 49 people (70.0%). This prevalence rate of 70.0% indicates that health problems related to micronutrient deficiencies, especially iron, are very serious at SMPN 1 Kelumpang Hilir because it far exceeds the threshold for public health problems set by WHO. The data shows that the majority of respondents have a habit of consuming protein sources in the insufficient category, namely 42 people (60.0%). This finding indicates a serious dietary problem, where respondents tend to have monotonous eating patterns. A total of 41 respondents (58.6%) have insufficient sleep duration (less than 8 hours per night).

Bivariate Analysis

Table 2. The relationship between the habit of consuming protein sources and anemia in seventh grade female adolescents at SMPN 1 Kelumpang Hilir

Habits of eating protein sources	Anemia Incidentin adolescent girls				Total	
	Anemia		No Anemia			
	n	%	n	%	n	%
Not enough	38	90.5	4	9.5	42	100.0
Good	11	39.3	17	60.7	28	100.0
Total	49	70.0	21	30.0	70	100.0
P= 0.000 r = 0.547	α= 0.05					

Of the 42 teenage girls with kprotein-rich eating habitsless than most people experience anemia (90.5%) and from 28 female adolescents with kprotein-rich eating habitsgood, not experiencing anemia 60.7%. In percentage terms, it can be concluded that there is a relationship betweenThe relationship between protein-rich eating habits and anemia in adolescent girlsThe Spearman Rank correlation test results obtained a p-value (P) of 0.000, indicating that the P value <0.05, which means there is a relationship between the habit of eating protein sources. From the analysis of the closeness of the relationship, the r value is 0.547, which is strong, meaning that the better the habit of eating protein sources in adolescent girls, the lower the incidence of anemia.

Table 3. The relationship between sleep duration and anemia in seventh grade female adolescents at SMPN 1 Kelumpang Hilir

Sleep Duration	Incident Anemia in adolescent girls				Total	
	Anemia		No Anemia			
	n	%	n	%	n	%
Not enough	36	87.8	5	12.2	41	100.0
Enough	13	44.8	16	55.2	29	100.0
Total	49	70.0	21	30.0	70	100.0
P= 0.000 r = 0.462	α= 0.05					

Of the 41 female adolescents with insufficient sleep duration, most had anemia (87.8%) and of the 29 female adolescents with sufficient sleep duration, did not have anemia (55.2%) Appendix IX Page 85. In percentage terms, it can be concluded that there is a relationship between sleep duration and anemia in female adolescents. The results of the Spearman Rank correlation test obtained a P-value = 0.000 indicating that P <0.05, which means there is a relationship between sleep duration and anemia in female adolescents. From the analysis of the closeness of the relationship, the r value is 0.462, which is strong, meaning that the more sufficient the sleep duration in female adolescents, the smaller the incidence of anemia.

Discussion

The relationship between the habit of consuming protein sources and anemia in female adolescents in grade VII of SMPN 1 Kelumpang Hilir

Based on the research data, it was identified that the majority of respondents experienced anemia with a percentage reaching 70.0%. In line with these findings, it shows that the majority of respondents (60.0%) have a habit of consuming protein sources in the insufficient category. The results of statistical analysis using the Spearman Rank 5 correlation test produced a p-value of 0.000. Because the P value <0.05, H0 is rejected, which proves a significant relationship between the habit of consuming protein sources and the incidence of anemia in seventh-grade female adolescents at SMPN 1 Kelumpang Hilir UPTD Serongga Health Center. Structurally, hemoglobin is a combination of Heme (iron) and Globin (protein) groups.

Protein deficiency causes the body to lack the amino acid chains essential for globin synthesis. Protein is vital for iron mobilization because iron is toxic when freely circulating in the body. Animal protein sources such as meat, fish, and chicken contain Meat, Fish, and Poultry (MFP) Factor. This factor not only contributes heme iron, which has a high absorption rate (25%), but also plays a role in increasing the absorption of non-heme iron from plant sources (Almatsier, 2019).

The findings of this study are supported by a study by Alfani & Nuriannisa (2022), which stated that protein intake is essential for optimal hemoglobin formation through globin synthesis. Furthermore, these results align with research by Salsabil & Nadhiroh (2023), which emphasized that carrier proteins are crucial for nutrient metabolism. Protein deficiencies, both in quality and quantity, can disrupt the absorption and transport of other essential nutrients, ultimately leading to bone marrow failure to produce sufficient red blood cells.

The relationship between sleep duration and anemia in female adolescents in grade VII of SMPN 1 Kelumpang Hilir

Based on the data in Table 3, it can be seen that the majority of respondents (70.0%) suffer from anemia. Inadequate sleep duration is the most common characteristic found in adolescent girls, covering 41 individuals (58.6%), which indicates a link to the risk of anemia. Through the Spearman Rank correlation test with a 95% confidence level, a p-value of 0.000 (P<0.05) was obtained, so the null hypothesis was rejected. This finding confirms a significant relationship between the length of rest time and the incidence of anemia in seventh-grade female students at SMPN 1 Kelumpang Hilir, within the working area of the Serongga Community Health Center UPTD.

Biologically, the process of red blood cell formation, or erythropoiesis, is regulated by the hormone erythropoietin. Lack of sleep can disrupt circadian rhythms, which in turn inhibits growth hormone secretion and the metabolic processes that support red blood cell production in the bone marrow. This sleep deprivation puts the body in a state of physiological stress that inhibits red blood cell maturation. Short sleep (less than 7 hours) also triggers a surge in pro-inflammatory cytokines such as IL-6.

The results of this study are supported by a study by Rosdiana & Suryani (2025), which emphasized that quality sleep is crucial for hematopoiesis because it facilitates tissue repair and regulates iron metabolism. Sleep disturbances can inhibit hemoglobin formation, especially in adolescent girls who are in the growth phase and undergoing menstrual cycles. These findings also align with research by Yogie et al. (2024), which states that sleep patterns are significantly linked to the risk of anemia in adolescents. Poor sleep disrupts hemoglobin biosynthesis and requires significant energy expenditure, so adolescents with poor sleep patterns require higher iron intake to prevent anemia.

4. Conclusion

The results of this study indicate a relationship between protein-rich eating habits and sleep duration with the incidence of anemia in seventh-grade female students at SMPN 1 Kelumpang Hilir. The high prevalence of anemia, reaching 70.0%, indicates that anemia is a serious public health problem in the study area and requires special attention. This condition suggests that behavioral factors, particularly low protein consumption and inadequate sleep patterns, play a significant role in influencing hemoglobin status in school-aged female adolescents. Based on these findings, adolescent girls are advised to increase their animal protein intake and improve their sleep patterns by avoiding late nights. Furthermore, health workers and schools need to play an active role in providing health education, particularly regarding the proper consumption of iron-fortified tablets (TTD), such as avoiding them with tea or coffee to optimize iron absorption. This collaborative effort is expected to reduce the incidence of anemia and improve the health and quality of life of adolescent girls in a sustainable manner.

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