THE ROLE OF NUTRITIONAL STATUS ON HEMOGLOBIN LEVELS IN ADOLESCENTS

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Original Research Article

THE ROLE OF NUTRITIONAL STATUS ON HEMOGLOBIN LEVELS IN ADOLESCENTS

Jiarti Kusbandiyah[1], Wenny Rahmawati[1*], Agus Sulistyowati[2]

[1] STIKES Widyagama Husada Malang
[2] Politeknik Kesehatan Kerta Cendekia

*Correspondence:
Wenny Rahmawati
STIKES Widyagama Husada Malang
Jalan Sudimoro No 16 Mojolangu, Lowokwaru, Malang, 36259
Email: wenny@widyagamahusada.ac.id

Abstract

Background: Adolescents were one of the strong foundations for the future of the nation because of their role in development and progress of the country. Healthy physical and psychological conditions will form a strong and resilient adolescent character which is affected by adequate nutritional intake. So that if nutrients are not sufficient, it can cause disturbances in metabolic processes. Inadequate intake of nutrients such as protein and iron will aggravate the occurrence of anemia and lead to malnutrition. Indirectly, nutritional status will also affect the occurrence of anemia.

Objectives: This study was to examine the relationship between nutritional status and adolescent hemoglobin levels.

Methods: This study was an analytic study with Cross Sectional approach. Respondents were 46 students of SMP PGRI 01 Bantur in Malang regency conducted in August 2023. Independent variable was nutritional status using weight, height and Body mass index (BMI) and dependent variable was anemia using hemoglobin level. BMI was calculated using formula weight divided by height square. The analysis used both univariate and bivariate analysis. Bivariate analyzed using Spearman rank correlation test.

Results: Results showed 76,1% adolescents classified normal nutritional, 19,6% overweight and 2,2% underweight and obese. The hemoglobin level, 86,9% normal and 13,1% anemia. Based on the results of statistical tests using rank spearman test, the p value = 0.044 less than 0,05. It means there was a significant correlation between nutritional status and anemia.

Conclusion: There is a relationship between nutritional status with Hb levels in adolescents. Enrichment of nutritional intake will give big impact on nutritional and anemia status among adolescents.

Keywords: *Anemia, Hemoglobin, Body Mass Index, Adolescents*

INTRODUCTION

Adolescence is the best period to prepare healthy, intelligent, qualified, and productive adults and participate in maintaining, maintaining and improving their health (Norris *et al.*, 2022). Adolescent health

is a very important thing to consider because during this period adolescents experience significant physical, psychological, and social changes (Das *et al*., 2017). Healthy adolescents are characterized by weight, height, and body mass index that are appropriate for their age (WHO, 2023). The Indonesian Ministry of Health emphasizes that adolescent health is strongly influenced by a healthy diet and regular physical activity (Kemenkes, 2022). The most common nutrition-related health problem in adolescents is anemia (Weyand *et al*., 2023).

Anemia is a state of having fewer red blood cells than normal. It can be caused by blood loss or bleeding, iron (Fe) deficiency and hemolytic anemia (Deivita *et al*., 2021). Anemia also means a condition when there is a deficiency in the size number of erythrocytes or Hb content (Cairo *et al*., 2014). Iron deficiency can result from reduced iron intake, insufficient iron supply in the diet, and increased iron demand or chronic blood loss. If all of these things go on for a long time, then iron deficiency will cause anemia (De Andrade *et al*., 2014)(Lopez *et al*., 2016). Hemoglobin level is an indicator to determine if someone has anemia. In men, the normal hemoglobin level is 14-18% while in women the normal hemoglobin level is 12-14% (Camaschella., 2019).

The main cause of nutritional anemia in Indonesia is low Fe intake (Juffrie *et al*., 2020). Fe deficiency can cause disturbances or obstacles to growth, both body cells and brain cells (Leung *et al*., 2024). Lack of Hb levels in the blood can cause symptoms of lethargy, weakness, fatigue, and forgetfulness. As a result, it can reduce learning achievement, sports and work productivity (Samson *et al*., 2022). In addition, Fe nutritional anemia will reduce the body's resistance and result in easy infection (Deivita *et al*., 2021) (Asrullah *et al*., 2023). The results of Riskesdas in 2018, recorded that 26.8% of children aged 5-14 years suffered from anemia and 32% at the age of 15-24 years or 3 out of 10 adolescents suffered

from anemia (Kemenkes, 2022). Adolescents have a high risk of anemia, especially iron deficiency anemia. This happens because adolescence requires higher nutrients including iron which functions to optimize growth and development (Mukherjee, 2016).

The habit of teenagers who often consume unhealthy foods such as junk food, contemporary foods, fried foods, and chocolate can cause the absorption process in the body's nutrients to be disrupted. The disruption of the absorption process will cause the body to lack nutrients (Ma *et al*., 2023). The lack of nutrient intake, especially iron in the body, will affect hemoglobin synthesis. Reduced hemoglobin synthesis will cause hemoglobin to decrease. Insufficient intake of nutrients such as protein and iron will aggravate the occurrence of anemia and have an impact on the occurrence of malnutrition (Norris *et al*., 2022). Indirectly, nutritional status will also affect the occurrence of anemia. Body Mass Index (BMI) serves to monitor a person's nutritional status. BMI is a measurement of body weight adjusted for height, which is calculated using the method of body weight in kilograms divided by the square of height in meters (kg/m2) (WHO, 2023) (Das *et al*., 2017).

Objective(s): This study was to examine the relationship between nutritional status and adolescent hemoglobin levels.

METHODS
Study Design
The research conducted was an analytic method with a cross sectional approach using primary data.

Setting
The research was conducted in August 2023 and the research site was conducted at SMP PGRI 01 Bantur, Srigonco Village, Bantur District, Malang Regency.

Research Subject
Sampling using the total sampling method was 46 adolescents who are students at

SMP PGRI 01 Bantur. The object of research in this case was adolescents aged 12-15 years

Instruments

Variables of this research was weight, height, BMI and hemoglobin levels. We used different parameters for boys and girls in BMI. BMI was calculated using formula weight divided by height square Sampling was carried out using a weight scale to measure body weight, microtoise to measure height, and taking blood samples with which the Hb level was then checked with an Easy Touch brand digital Haemometer.

Data Analysis

Data processing was done manually using a laptop and data assessment in the form of writing and frequency distribution tables. The analysis used the Spearman's rho it was used using statistical software with a significance level α < 0.05.

Ethical Consideration

This research was conducted in collaboration between the Srigonco village government, Bantur sub-district and STIKES Widyagama Husada Malang and Politeknik Kesehatan Kerta Cendekia Sidoarjo (No.1562 IA-1/STIKESNIII/2023).

RESULTS

The respondents of this study were 46 students of SMP PGRI 01 Bantur. Based on gender, there were 21 male respondents (45.6%) and 25 female respondents (54.6%).

Table 1. Distribution Characteristic of Respondents by Sex, Age, Nutritional status, and Hb levels (F=46)

Characteristics of Respondents	Frequency (n)	Precentage (%)
Sex		
Boys	21	45.6
Girls	25	54.6
Age		
12 years	11	23.9%
13 years	13	28.3%
14 years	15	32.6%
15 years	7	15.2%
Nutritional status		
Underweight	1	2.2%
Normal	35	76.1%
Overweight	9	19.6%
Obese	1	2.2%
Hb levels		
Normal	40	86.9%
Anemia	6	13.1%

Table 2. Statistical test results of the relationship between nutritional status and Hb levels

Correlation Spearman's rho	p-value
Hb- Height	0.001
Hb- Weight	0.007
Hb-BMI	0.044

Based on age, respondents aged 14 years had the highest distribution, namely 15 respondents (32.6%), age 12 as many as 11 respondents (23.9%), age 13 years there were 13 respondents (28.3%) while those aged 15 years had the lowest distribution, namely 7 respondents (15.2%). The results of this study illustrated that normal nutritional status had the highest distribution in this study, namely 35 respondents (76.1%). Nutritional status in the overweight category was 9 respondents (19.6%), underweight and obese nutritional status had the lowest distribution of 1 respondent each. The normal hemoglobin level of respondents had the highest distribution of 40 respondents (86.9%) and 6 respondents experienced moderate anemia. The results of the study from all respondents illustrated that both male and female gender were dominated by normal nutritional status, namely 13 male respondents (61.9%) and 14 female respondents (56%). The results of this study indicate that the male gender who did not experience anemia was 19 respondents (90.5%). While the female gender who did not experience anemia was 21 respondents (84%).

The picture of the research results between nutritional status and Hb levels shows 1 respondent with underweight nutritional status experiencing anemia. 1 respondent with normal nutritional status with anemia (2.9%), 3 respondents with overweight nutritional status experienced anemia (33.3%) and 1 obese respondent also experienced anemia.

DISCUSSION

Based on the results of the study, the relationship between nutritional status and Hemoglobin levels in adolescents is known that the majority of respondents with normal nutritional status did not experience a decrease in Hb levels, namely 34 people (97.1%). According to Ukoha (2020), someone who has a normal nutritional status and is not anemic is because the food consumed already contains all the nutrients needed by the body, so there is a balance between the nutrients consumed and the nutrients needed by the body (Ukoha *et al.*, 2020) (Ghose *et al.*, 2016).

Respondents with underweight nutritional status and anemia are caused by insufficient nutritional intake in the body which causes nutritional deficiencies, especially iron. Lack of iron intake in the body will cause a lack of red blood cell building material. therefore, red blood cells cannot provide oxygen, causing anemia. This is in line with the results of research conducted by Khan, et al (2019) on risk factors for anemia in adolescent girls in Pakistan, the majority of anemic girls were underweighted by 34%. Macronutrient intake in anemic girls was lower than the recommended dietary allowance, micronutrient intake, such as iron and vitamin C in anemic girls was statistically lower than the average intake of non-anemic girls, suggesting that anemia is associated with low dietary intake of iron and vitamin C (Khan *et al.*, 2019).

Respondents with overweight and obese nutritional status may develop anemia due to poor diet. Adolescents who do not eat breakfast often replace it with excessive lunch or eat small meals such as fast food,

contemporary beverage foods and viral snacks that are higher in calories. The content of these foods includes high levels of fat, sugar and sodium (Na), while the content of fiber, vitamins A, C, E, calcium, iron, and folic acid is relatively low. So the intake of nutrients needed by the body is not fulfilled (Ma *et al.*, 2023) (Norris *et al.*, 2022).

The results showed that there were also more female adolescent respondents with anemia than male adolescent respondents. Adolescent girls have a ten times greater risk of suffering from decreased hemoglobin levels compared to young men. This is because one of the factors that influence the decrease in Hb levels in adolescent girls is age. Adolescent girls experience menstruation every month and are in a period of growth so that they need more iron intake, which is twice as much as usual (Kundu *et al.*, 2023) (Weyand *et al.*, 2023). Therefore, good nutritional status needs to be maintained so that the nutritional adequacy in the body is balanced, and hemoglobin levels in the blood are normal. On the other hand, poor nutritional status can lead to a decrease in hemoglobin levels in the blood (Mukherjee, 2016). Limitation of this study was only used 1 parameters of nutritional status, better in the next research using more than one parameter.

CONCLUSION

One of the factors that affect Hb levels in the blood is nutritional status. Because the body needs more nutrients especially iron, which is an important part of hemoglobin formation. If the body's iron intake is reduced, the material for forming red blood cells is also reduced so that red blood cells cannot perform their functions properly and result in anemia.

SUGGESTIONS

This study also has limitations including among others, respondents were only in one school area with a limited number of respondents, besides In addition, researchers only use nutritional status variables using nutritional status variables by using measures

of body weight, height and BMI, researchers did not assess nutritional intake and consumption patterns. History of chronic disease is only done by screening through interviews without looking at medical records directly.

DECLARATION OF CONFLICTING INTEREST

There is no conflict of interest.

AUTHOR CONTRIBUTION

Wenny Rahmawati: Writing-review and editing.

Jiarti Kusbandiyah: Collecting data and data analysis.

Agus Sulistyowati: Conception and project administration.

ORCID

Wenny Rahmawati
https://orcid.org/0000-0002-0441-2622

Jiarti Kusbandiyah
https://orcid.org/0009-0004-6284-1208

Agus Sulistyowati
https://orcid.org/0000-0002-5835-0084

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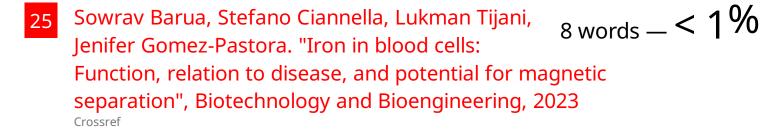   10 words — < 1%

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