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The Relationship of Nutritional Status and Anemia Status in Adolescent Women in Sampang District

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ABSTRACT

Background: Anemia is still a cause of health problems for adolescent girls and pregnant women. Anemia prevalence for reproductive age in the world is 29.9%. Anemia is caused by low hemoglobin (Hb) so that the body does not get enough oxygen-rich blood. Adolescents' vulnerability to anemia is mainly caused by the increased need for macronutrients and micronutrients, especially iron and folic acid, which are related to physical growth. Several studies have found a relationship between nutritional status and anemia. This study aims to determine the relationship between nutritional status and anemia status in adolescents.

Methods: A cross-sectional correlative analytical study with primary data from 372 samples. The sampling technique was cluster random sampling in 12 stunting locus villages in Sampang Regency in November 2023. The nutritional status variable was measured by BMI/Age and anemia status by Hb levels. Univariate data analysis in the form of frequencies and percentages and bivariate using the Spearman test.

Results: The average age of respondents is 15 years. The mean z-score value based on BMI/Age was -0.45 ± 1.76, the lowest value was -2.91 and the highest was 2.12. Based on the z-score value, 173 people (46.5%) showed normal nutritional status, then 24.7% were thinness, 20.2% were underweight, 4.6% were overweight and 4% were obese. The number of teenagers who were not anemic was 66.1%, 21.5% with moderate anemia, 7.3% with mild anemia and 5.1% with severe anemia. Bivariate results showed that there was a significant relationship between nutritional status and anemia ($p \leq 0.05$). Teenage girls who have thinness nutritional status and severe anemia are 42.1%, normal nutritional status and not anemic are 50.4%, normal nutritional status and mild anemia are 40.7%, and normal nutritional status and moderate anemia are 40. %.

Conclusion: There is a relationship between nutritional status and anemia. The thinness nutritional status of adolescent girls, make more severe anemia they have. Young women need to increase their consumption of macro and micronutrients, especially iron intake, to improve their nutritional status.

Keywords: *Nutritional Status, Anemia, Adolescents, BMI, Haemoglobin*

INTRODUCTION

Anemia is often a problem for adolescent girls and pregnant women due to low levels of hemoglobin (Hb) in the blood (1). Prevalence of anemia in women of

productive age in the world was 29.9% (2). Population groups for anemia include (1) children aged <5 years or 6-59 months (39.8% suffered from anemia in 2019), (2) women of reproductive age aged 15-49 years, (3) married women not pregnant aged 15-49 years, and (4) pregnant women aged 15-49 years. Anemia is a serious global public health problem. WHO estimates that 40% of children aged 6–59 months, 37% of pregnant women, and 30% of women aged 15–49 years worldwide suffer from anemia (3). Anemia causes the body not to get enough oxygen-rich blood because the number of red blood cells that function to bind oxygen is limited. Low oxygen levels in the body cause the body to feel weak, tired, lethargic, limp, short of breath, dizziness, headaches, and irregular heartbeat (4).

Adolescents in developing countries are generally affected by diet especially in micronutrient deficiencies, causing anemia. Nearly a quarter of teenagers suffer from anemia in the Southeast Asia region, ranging from 27% to 55% (5). In Indonesia, the prevalence of anemia aged 5-14 years is 26.8% and aged 15-24 years is 32% (6). East Java Province shows that anemia prevalence in adolescent girls is 42% (6). In Sampang Regency, as many as 60% of 172,007 teenagers experience anemia.

Adolescents' susceptibility to anemia is mainly due to the increased biological need for micronutrients such as iron and folic acid which are associated with physical growth. Women are a group vulnerable to anemia due to menstrual blood loss (7). Males regain adequate nutritional stores quickly in late adolescence, whereas females continue to be anemic due to increased micronutrient requirements from menstrual loss and teenage pregnancy (5). Anemia is caused by blood loss due to heavy menstruation, lack of nutritional intake, digestive disorders absorbing food, female gender, and pregnancy. The cause of lack of nutritional intake is one of the causes that can be prevented.

Physical environmental factors and food have an impact on nutritional status. Micronutrients such as folate, vitamin B12, and vitamin A are associated with anemia (8). Iron deficiency anemia can be affected by several factors, as lack of consumption of animal food sources as a source of iron that is easily absorbed (heme iron), while plant food (non-heme iron) is a high source of iron but is difficult to absorb so it is needed. A large portion to meet your daily iron needs. It can also be caused by a lack of nutrients that play a role in iron absorption, such as protein and vitamin C. Various factors can also influence the occurrence of iron nutritional anemia, including menstrual patterns, knowledge about anemia, and nutritional status. Vitamin B12 and folate deficiency anemia also often occurs in adolescents due to a lack of fulfillment of these nutrients (9). Good nutrition is expected to improve the anemia status of adolescents.

Loechl et al.'s research (8) stated that special interventions for women of reproductive age and preschool children in terms of providing nutrition increase hemoglobin levels. Cepeda-Lopez et al. (10) stated iron deficiency can also occur 2-4 times in obese women and children. This is due to an increase in hepcidin production which can inhibit iron absorption. Other research shows that there is a relationship between nutritional status and the incidence of anemia in adolescent girls (p value < 0.05) (11). Adolescent girls consume less food sources of iron and on average parents have a low level of education so that knowledge in fulfilling a balanced nutritional intake is lacking (11).

Based on the background above, researchers are interested in conducting research on the relationship between nutritional status and anemia status in adolescent girls in Sampang Regency, East Java. This study aims to determine the relationship between nutritional status and anemia status in adolescent girls.

MATERIALS & METHODS

This research uses a cross-sectional correlative analytical approach. Collecting primary data on nutritional status and anemia status variables in 12 villages in Sampang Regency. The twelve villages are Temberu Laok, Tolang, Masaran, Asem Jaran, East Jatra, Buker, Jrengik, Bajrasokah, Palenggiyen, Astapah, Sawah Tengah, Paopale Laok.

The research population was all teenage girls aged 10-19 years in 12 villages, totaling 4061 teenagers. The research sample was calculated using the Slovin formula, resulting in 361 samples. Researchers divided the sample into at least 12 villages so that each village collected data from 31 respondents. Sample for this study was 372 young women. The sampling technique is probability sampling with cluster random sampling. Research time in November 2023.

Nutritional status data was collected by taking anthropometric measurements of body weight, height, and Body Mass Index for Age (BMI/Age). Body weight was measured using a digital step scale with a capacity of 150 kg and an accuracy level of 0.1 kg. Height was measured using a microtoise with a capacity of 200 cm with an accuracy of 0.1 cm. Body Mass Index (BMI) is an anthropometric index comparing body weight and height squared (12). The variable nutritional status of adolescent girls is determined by calculating the z-score value of the BMI/Age index according to Minister of Health Regulation No.2/2020 which is categorized as thinness (< - 3SD), underweight (-3SD to ≤ -2SD), normal (-2SD to 1SD) overweight (1SD to 2SD), and obesity (≥2SD) (13).

The anemia status variable was collected by checking Hb levels using a simple Hb examination tool (EasyTouch Hemoglobin Tool). The anemia status of adolescent girls is determined from the results of Hb levels and is categorized into three, they were severe anemia (Hb<8 g/dL), moderate anemia (Hb=8-10.9 g/dL), mild anemia (Hb=11.0-11 .9 g/dL), and not anemic (Hb≥12 g/dL) (1).

STATISTICAL ANALYSIS

Quantitative data analysis techniques were carried out univariate and bivariate. Univariate analysis produces percentages, frequencies, and cross-tabulations for each variable. Bivariate analysis was carried out with the Spearman Rank statistical test using IBM SPSS Statistics 25.

RESULT

This study collected data from 372 respondents and found that the majority were 16 years old (18%) with the average age of respondents being 15 years old. The minimum age is 10 years, and the maximum age is 19 years. The average median BMI at 15 years old is 19.8. The mean z-score value or standard deviation (SD) obtained based on BMI/Age is -0.45 ± 1.76, the lowest value is -2.91 and the highest is 2.12. Based on the z-score value, it shows that the nutritional status of respondents was very thin 92 people (24.7%), underweight 75 people (20.2%), normal or ideal 173 people (46.5%), overweight 17 people (4.6%), obesity 15 people (4%). Judging from the classification of hemoglobin levels, the number of teenagers who were not anemic was 246 people (66.1%). 80 teenagers had moderate anemia (21.5%), 27 people had mild anemia (7.3%), and 19 people had severe anemia (5.1%). Univariate results of respondent characteristics and variables are displayed in table 1.

Table 1. Table of Univariate Results of Characteristics and Variables

Variable	Classification	n	%
Age (11-19 years old)	Minimum (10 years old)	19	5,1
	Maximum (19 years old)	25	6,7
	Mean (15,05 years old)	-	-
	Modus (16 years old)	67	18,0
	Median (15 years old)	44	11,8
Status Gizi	Thinness	92	24,7
	Underweight	75	20,2

	Normal Weight	173	46,5
	Overweight	17	4,6
	Obesity	15	4,0
	Total	372	100,0
Status Anemia	Severe	19	5,1
	Moderate	80	21,5
	Mild	27	7,3
	Normal	246	66,1
	Total	372	100,0

This research then carried out a bivariate analysis to determine the relationship between nutritional status and anemia status in adolescent girls using the Spearman test. From the bivariate analysis, the value obtained was p=0.022 or p≤0.05 so it could be concluded that there was a significant relationship between nutritional status and anemia status in young women in Sampang Regency. The skinnier a teenage girl's nutritional status is, the more severe anemia she will have. The results of cross-tabulation showed that 8 respondents (42.1%) had thinness nutritional status and severe anemia. Then the respondents who had normal nutritional status and were not anemic were 124 people (50.4%), normal nutritional status and mild anemia were 11 people (40.7%), and normal nutritional status and moderate anemia were 32 people (40%). The cross-table results are displayed in table 2.

Table 2. Cross table of nutritional status and anemia status in young women

Nutritional Status * Anemia Status	Severe Anemia	Moderate Anemia	Mild Anemia	Not Anemic	Total (n)	%	p value
Thinness	8 (42,1)	22 (27,9)	8 (29,6)	54 (22,0)	92	24,7	
Underweight	3 (15,8)	21 (26,3)	5 (18,5)	46 (18,7)	75	20,2	
Normal Weight	6 (31,6)	32 (40,0)	11 (40,7)	124(50,4)	173	46,5	
Overweight	2 (10,5)	4 (5,0)	2 (7,4)	9 (3,7)	17	4,6	
Obesity	0 (0,0)	1 (1,3)	1 (3,7)	13 (5,3)	15	4,0	
Total	19	80	27	246	372	100,0	0,022

DISCUSSION

Nutritional status is a balance between consumption, absorption, and utilization of nutrients. Good nutritional status is demonstrated by the balance of macro and micronutrients in the body. Micronutrients and vitamins are elements in making red blood cells or hemoglobin (14). This research shows that 46.5% of adolescent girls have normal nutritional status and as many as 66.1% of adolescent girls do not experience anemia. Adolescent girls who have normal nutritional status tend not to experience anemia with Hb levels ≥ 12 g/dL. However, if a teenage girl's nutritional status is in the very thin category, the teenager will increasingly experience severe anemia. Research by Indartanti & Kartini (9) also shows that 73.3% of teenagers have normal nutritional status. Research by Syafiq et al. (15) shows that an underweight body mass index is associated with the incidence of moderate to severe anemia. Muhayati & Ratnawati's (16) research also showed that 67.7% of respondents had an underweight body mass index and experienced anemia, while 32.3% did not experience anemia. 56.6% of teenagers with a normal BMI do not experience anemia. The results of bivariate data analysis using the Pearson Chi-Square test obtained a p value of 0.008 so that there is a relationship between nutritional status and the incidence of anemia (16). Other research shows that 58.7% of adolescent girls with normal nutritional status experience anemia (17). Yuhana's research also shows that there is a significant relationship between nutritional status and the incidence of anemia (p value <0.05) (18). According to research by Fitriani & Husnah (19), there is a relationship between nutritional status and the incidence of anemia in adolescent girls.

Most young women in this study were 15 years old. According to Krishnan et al. (5) teenagers aged 13-15 years are more at risk

of experiencing insufficient iron intake. Adolescents are a group that is still in the period of growth and development, so they still need relatively high nutritional needs (5). Teenagers are generally more physically active than other age groups, this is what causes teenagers to need more nutrition. Adolescents' food must contain nutrients and nutrients so that their nutritional and iron needs are met, and they do not experience deficiencies that trigger anemia (20). Factors that trigger nutritional problems in adolescence include the habit of eating the wrong food, a wrong understanding of nutrition such as a slim body which is the dream of teenagers so that nutritional needs are not met, and an excessive preference for fast food (9).

Nutritional status is a condition where macro intake (carbohydrates, protein, fat) and micro (vitamins, minerals, iron, vitamin C, serum ferritin, hemoglobin levels) are met (21). If one of the micronutrients is lacking, then the formation of Hb in the body will not be good and vice versa. Lack of iron in the human body can cause a decrease in the formation of hemoglobin in the blood (5,8,22,23). According to Astuti & Kulsum (24) the formation of hemoglobin really requires lots of nutrients so that Hb formation and body metabolism can be optimal. If there are no iron reserves in the body, the absorption of iron from food will be lower. As a result, the body will produce fewer red blood cells with less hemoglobin and ultimately anemia (23,24). Research by Indartanti & Kartini (9) on the results of logistic regression tests shows that there is a relationship between iron intake and the incidence of anemia. Nutritional status is influenced by the content of macro and micronutrients. In anthropometric measurements, BMI/Age is more dominantly influenced by macronutrients (carbohydrates, fats, proteins). Meanwhile, checking anemia is more influenced by micronutrients (iron) (9). Other studies also found that iron intake was significantly associated with anemia (23).

Anemia is a decrease in hemoglobin levels from normal limits so that it cannot fulfill its function of carrying sufficient oxygen to peripheral tissues. The normal value for female adolescent Hb levels is >12 grams/dL (25). Anemia can be caused by disturbances in the formation of erythrocytes by the bone marrow, loss of blood from the body (bleeding), one of which is menstruation, the process of destroying erythrocytes in the body prematurely (hemolysis), lack of intake of iron, vitamin C, vitamin B12 and folate. Teenagers have a habit of consuming less food sources of easily absorbed iron (heme iron) such as meat, fish, and poultry. Teenagers consume more food sources of non-heme iron such as tofu, tempeh, and nuts (9).

Iron is the most important component in the formation of hemoglobin. Each hemoglobin molecule will bind oxygen to be distributed throughout the body (26). Adolescent girls require high iron requirements, especially due to blood loss during menstruation (27). Several factors causing low iron are food availability, lack of knowledge, and wrong eating habits (28). Protein also plays an important role in transporting iron in the body to prevent iron deficiency. Iron absorption that occurs in the small intestine is assisted by proteins as transport vehicles, such as transferrin and ferritin. Transferrin contains ferrous iron which functions to transport iron to the bone marrow for the formation of hemoglobin (9,29). Lack of intake of vitamin C, vitamin B12 and folate can affect cellular regeneration and cause macrocytic anemia, where the size of red blood cells is larger than normal (9). Iron intake can be increased by consuming blood supplement tablets and/or eating foods that contain high levels of iron (30).

The limitation of this research is that it did not conduct research on a wider range of respondents and was only limited to 12 villages out of 186 villages in Sampang Regency. Apart from that, the researchers only used two methods of measurement, namely nutritional status with BMI/Age and

anemia status with a simple Hb examination without further blood tests to determine the components of the respondent's blood levels.

CONCLUSION

The average female teenage respondent is 15 years old. Almost of young women fall into normal nutritional status as many as 173 people (46.5%), then 92 people (24.7%) are thinness category, 75 people (20.2%) have underweight category, 17 people (4 .6%) in the obese category, and 15 people (4%) in the obese category. The number of teenagers who were not anemic was 246 people (66.1%), 80 people had moderate anemia (21.5%), 27 people had mild anemia (7.3%), and 19 people had severe anemia (5.1%). The Spearman test results showed that there was a significant relationship between nutritional status and anemia status in female adolescents ($p \leq 0.05$). The skinnier a teenage girl's nutritional status is, the more severe anemia she will have. There were 8 young women who had thinness nutritional status and severe anemia (42.1%), normal nutritional status and no anemia as many as 124 people (50.4%), normal nutritional status and mild anemia as many as 11 people (40.7%). %), as well as normal nutritional status and moderate anemia for as many as 32 people (40%).

Young women need to increase their consumption of macro (carbohydrates, fat, protein) and micronutrients (iron, vitamin C, vitamin B12, folate), especially iron intake, to improve their nutritional status. Iron intake can be increased by consuming blood supplement tablets and eating foods high in iron. For young women who have thinness nutritional status, they need to improve their nutritional status to normal by providing adequate macro and micro nutritional intake in their bodies.

Declaration by Authors

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