Tropical Health and Medical Research
Vol. 3, No. 2, August 2021, pp. 98-104
ISSN (Online) : 2684-740X
Journal homepage: http://tropicalhealthandmedicalresearch.com

Analysis of Adolescent Hemoglobin Levels on Knowledge, Body Mass Index, and Menstrual Patterns

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Abstract: Anemia can be related to several factors, including knowledge, body mass index, and menstrual patterns. Adolescent girls are a high-risk group who experience anemia. This study aims to analyze the hemoglobin levels of adolescent girls about knowledge, body mass index, and patterns menstrual. Information on the relationship between hemoglobin levels and these factors expects to be a reference for strategies to overcome anemia in adolescent girls. The sample of this research is the students of Martapura Indonesia vocational high school, totaling 45 people. Data collection includes weight and height measurements, hemoglobin examination (using Easy Touch GCHb), and questionnaires. Data analysis used bivariate analysis of chi-square test with 0.05 with 95% confidence degree. Results Respondents had fewer hemoglobin levels 47%, normal 53%. The body mass index value of respondents is less than 85%, normal 13%, excess 2%. The respondent's menstrual pattern obtained 26% abnormal data, 74% normal data. Knowledge of anemia of respondents with enough category 34%, good category 66%. The conclusion is that there is no relationship between hemoglobin levels and body mass index (p-value 0.281), menstrual patterns (p-value 0.073), and knowledge of anemia (p-value 0.402) in adolescent girls. Hemoglobin levels may more influence by the consumption pattern of foods containing iron, so it recommends that young women consume more iron-rich foods and avoid the simultaneous consumption of substances that inhibit their absorption, such as tea and coffee.
Keywords: Hemoglobin levels of adolescent girls; knowledge of anemia; body mass index; menstrual pattern

INTRODUCTION

Anemia due to iron deficiency is the most common nutritional problem experienced by a woman, especially in adolescent girls. According to the World Health Organization (WHO), adolescent girls are a high-risk group for anemia[1]. Anemia is more common in adolescent girls than adolescent boys. The behavior of adolescent girls who consume more plant-based foods results in insufficient iron intake for daily iron needs. The habit of young women who want to look slim makes them limit their daily food intake, which causes young women to be prone to anemia[2]. Adolescent girls need iron intake to replace the iron lost with the blood during menstruation[3].

In addition, the incidence of anemia in adolescent girls can also cause by

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knowledge about anemia, menstrual patterns, and body mass index. Knowledge about anemia and low nutrition will increase the incidence of anemia in adolescent girls[4]. Anemia also affects learning achievement due to decreased concentration[5]. High nutritional knowledge expects to change the behavior of adolescents in choosing nutritious foods according to a balanced menu pattern and their needs. They need to be given an education from an early age to change bad eating habits to not cause nutritional problems[6].

According to a study in Padang, Indonesia, there is a relationship between nutritional status and the incidence of anemia in adolescent girls. This is due to the consumption of food that does not meet the principles of balanced nutrition[7]. Nutritional status can be measured by looking at the body mass index (BMI), which is body weight (in kilograms) divided by the square of height (in meters).

Other studies have also shown that anemia can affect women's menstrual patterns. Sufficient hemoglobin levels or not anemia will help regular menstrual patterns. Conversely, if there is a lack of iron in the body, it can cause low hemoglobin levels, which can cause many complications in women; this happens because low levels of hemoglobin in the body result in a lack of oxygen supply hypothalamus. However, overall, there has not been a complete study of the effect of anemia and body mass index on menstrual patterns[8].

There has been researching on adolescent girls regarding the relationship between anemia and knowledge[4], BMI[9], menstrual patterns[10], but research by combining these three factors by taking the subject of grade 10 high school students vocational training to our knowledge has never done. This study aims to analyze the hemoglobin levels of adolescent girls about knowledge, BMI, and menstrual patterns.

MATERIALS AND METHODS

Research is an analytic survey with a cross-sectional approach. The sample of this research is the students of Martapura Indonesia vocational high school, totaling 45 people. This study carries out research ethics based on the Declaration of Helsinki. Respondents had previously understood Informed Consent and expressed their agreement to participate in the study.

This study uses primary data. Data collection includes measurement of weight and height, blood sampling, and questionnaires—primary data determination of Body Mass Index (BMI) done by converting weight and height measurement results. For determination of hemoglobin levels, easy touch (Easy Touch GCHb) uses namely the Blood Glucose/Cholesterol/Hemoglobin Test Tool with the principle of Electrode-based Biosensor. Questionnaire sheet to determine menstrual patterns (3 items) and knowledge (18 items) in adolescent girls.

The independent variables in this study were body mass index, menstrual pattern, knowledge of anemia. While the dependent variable in the study is hemoglobin levels. Normal value of student hemoglobin levels: 12 mm/Hg, less: <12 mm/Hg. Determination of Body Mass Index (BMI) Below 18.5: Underweight, 18.5 – 22.9: Normal weight, 23 – 29.9: Overweight, 30 and over: obesity. Knowledge assessed from the acquisition of questionnaire points totaling 18. poor category: 1-6, sufficient: 7-18, good: 13-18. Normal menstrual pattern: 21-35 days pattern, 2-8 days long, change pads 2-5 times per day.

Data analysis used bivariate analysis of chi-square test with 0.05 with 95% confidence degree.

RESULTS AND DISCUSSION

Respondents totaling 45 people have fewer hemoglobin levels 47%, normal 53%. The BMI value of respondents is less than 85%, Normal 13%, Excess 2%. The respondent's menstrual pattern obtained 26% abnormal data, 74% normal data. Knowledge anemia respondents with enough categories 34%, good categories 66%

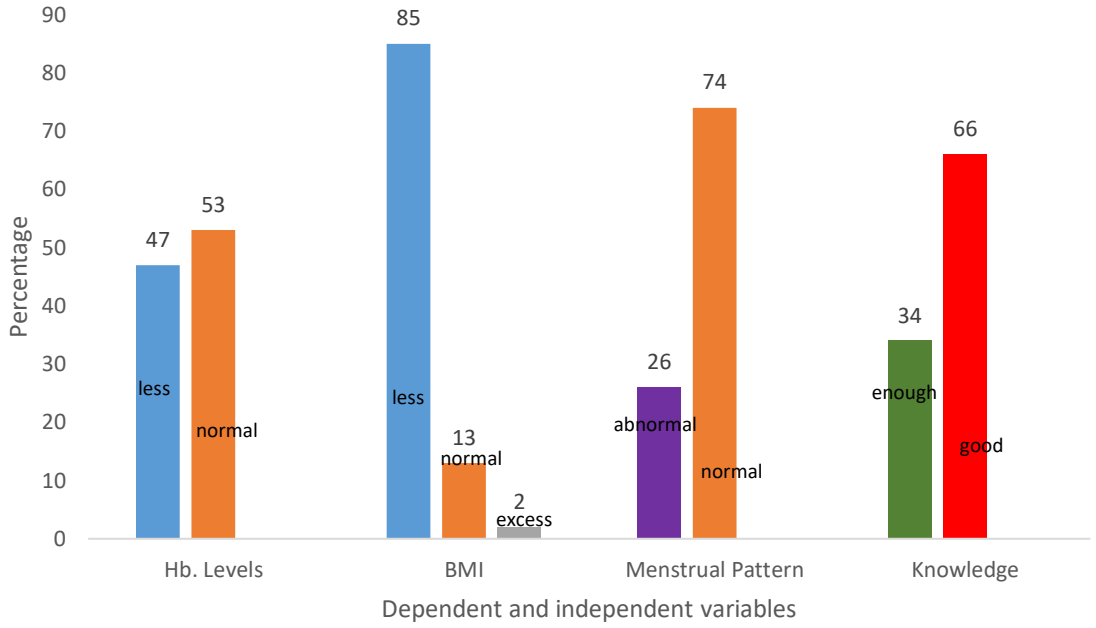

Figure 1. Presentation of Hemoglobin Levels, BMI, Menstrual Pattern, and Knowledge of Anemia in Adolescent Girls

Table 1. Relationship between Hemoglobin Levels and BMI of Adolescent Girls

		HB levels		Total	Fisher's Exact Test p-value
		Low	Normal		
BMI status	Less	16 (36%)	22 (49%)	38 (85%)	
	Normal	4 (9%)	2 (4%)	6 (13%)	0.281
	Excess	1 (2%)	0 (0%)	1 (2%)	
Total		21 (47%)	24 (53%)	45 (100%)	

Respondents who have low Hb levels with less BMI are 16 (36%), normal BMI 4 (9%), excess 1 (2%). Respondents with normal Hb levels with a BMI of 22 (49%), normal BMI 2 (4%), excess 0. Data analysis was using the Fisher's Exact Test. The result was 0.281 at an alpha of 0.05; this means that there is no relationship between Hb levels and the respondent's BMI status with a 95% confidence level.

Table 2. Correlation Hemoglobin Levels and Menstruation Pattern of Adolescent Girls

		HB levels		Total	Chi-square test
		Low	Normal		p-value
Pattern Menstrual	Abnormal	6 (13%)	6 (13%)	12 (26%)	
	Normal	15 (34%)	18 (40%)	33 (74%)	0.073
Total		21 (47%)	24 (53%)	45 (100%)	

Respondents who had low Hb levels with abnormal menstrual patterns were 6 (13%), normal menstrual patterns 15 (34%)). Respondents with normal Hb levels with abnormal menstrual patterns were 6 (13%) and 18 (40%). Data analysis was using the Chi-square test; the results obtained were 0.073 at an alpha of 0.05; this means that there is no relationship between Hb levels and the respondent's menstrual pattern with a 95% confidence level.

Table 3. Relationship between Hemoglobin Levels and Knowledge of Anemia in Adolescent Girls

		HB levels		Total	Chi-square test
Knowledge of anemia		Kurang	Normal		p-value
	Enough	8 (18%)	7 (16%)	15 (34%)	
	Good	13 (29%)	17 (37%)	30 (66%)	0.402
Total		21 (47%)	24 (53%)	45 (100%)	

Respondents with low Hb levels with sufficient knowledge of anemia are 8 (18%), and good knowledge of anemia is 13 (29%). Respondents with normal Hb levels with enough knowledge of anemia were 7 (16%) and good anemia knowledge 17 (37%). Data analysis was using the Chi-square test. The results were 0.402 at an alpha of 0.05; this means that there is no relationship between Hb levels and knowledge of anemia in respondents with a 95% confidence level.

The hemoglobin levels of adolescent girls in this study showed a low level of 47% (figure 1). Adolescent girls are more susceptible to anemia due to several things. Adolescents in their growth period require higher nutrients, including iron and menstrual patterns that cause young women to lose a lot of blood; many young women on a strict diet consume more plant-based foods. Which contains little iron, compared to animal foods, iron needs not met, and nutritional intake is not balanced.

The results showed no relationship between Hb levels and BMI status with a significance value of 0.281 (table 1). The same result was shown in the study of young women at the Melanie Samarinda Dormitory; namely, there was no relationship between Body Mass Index and the incidence of anemia with a significance value of 0.205 [9]. Another study on 7th-grade junior high school students showed the same results; there was no relationship between body mass index and anemia in adolescent girls with the chi-square test results P-Value: 0.876 [11]. However, this result contradicts the research of Daholal Jannah and Sumi Anggraeni (2021), which stated that there was a fairly strong relationship between nutritional status and the incidence of anemia in adolescent girls in

class XI in high school at 1 Pringsewu Performance in Lampung with Chi-square analysis, the p-value 0.000 [12].

Differences in results may occur, possibly due to the influence of other factors that cause anemia in adolescent girls. According to Zufrianingrum, 2016 hemoglobin levels are by age, physical activity, lifestyle, and body composition related to nutritional status[13]. In Sayes' research (2011), the prevalence of deficiency anemia at the university level for female students at King Abdul Aziz University found 23.9% of female students had iron deficiency anemia among female students who looked healthy. It found a significant correlation between anemia with nutritional intake and exercise[14].

The results showed no relationship between Hb levels and menstrual patterns with a significance value of 0.073. (table 2). The same result was shown in the State Islamic University of Sunan Ampel Surabaya research, namely that there was no influence of anemia and body mass index on menstruation for adolescent girls. The results of statistical analysis obtained p-value = 0.721 ($\alpha > 0.05$)[10]. However, this result contradicts the research of adolescent girls at the state high school Unaaha Kendari which states that there is a significant relationship between menstrual patterns and the incidence of anemia in adolescent girls (ρvalue = 0.000)[15]. Women who experience deficiency or excess nutrition will have an impact on decreasing the function of the hypothalamus so that there is no stimulation of the anterior pituitary to produce follicle-stimulating hormone (FSH). The FSH hormone functions to stimulate the growth of follicles in the egg.

In contrast, luteinizing hormone (LH) functions to ripen the egg to fertilizes. If the production of FSH and LH is disturbed, the menstrual pattern will be disrupted. According to Grooms et al. (2013), adolescents have an increased risk of anemia due to rapid growth and increased muscle mass. Students with heavy menstrual bleeding are at greater risk of developing anemia. Adolescent girls need iron to compensate for menstrual blood loss and increased growth[16].

Table 3 shows no relationship between Hb levels and menstrual patterns with significant values of 0. 402. The results of this study are different from the 2018 study by Safira Laksmita and Helmi Yenie, which showed a relationship between Young Women's Knowledge of Anemia and the Incidence of Anemia with a p-value of 0.034, OR 2.22 [17]. Our research uses a questionnaire on knowledge of anemia which outlines the definition of anemia, signs of anemia, causes of anemia, the relationship between anemia and hemoglobin, foods that increase iron, foods that inhibit iron absorption, and a lack of hemoglobin in the blood.

The limitation of the study is that the data taken for knowledge of anemia and menstrual patterns using a questionnaire from a google form so that it is subjective. The number of samples was limited to only 45 respondents because of the 71 respondents who were willing to have their hemoglobin levels checked, only 45 people.

CONCLUSION

The study concludes that there is no relationship between hemoglobin levels and body mass index, menstrual patterns, and knowledge of anemia in adolescent girls. Hemoglobin levels may influence by the consumption pattern of foods containing iron, so it recommends that young women consume more iron-rich foods and avoid concomitant consumption of substances that inhibit their absorption, such as tea and coffee.

ACKNOWLEDGMENT

The author would like to thank those who have helped carry out this research, especially for Poltekkes Kemenkes Banjarmasin, Poltekkes Research Unit, and Laboratory in Medical Laboratory Technologist Campus, who have facilitated this research.

CONFLICT OF INTEREST

The authors declare no conflict of interest and have not received any funds for this study.

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