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Amount of Menstrual Blood and Nutrient Intake with Hemoglobin Level

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Abstract

The most influential factor in the anemia is severe menstrual bleeding on each cycle. Heavy menstrual bleeding that can periodically reduce iron stores in the body so that the body has an iron deficiency and lead to anemia. This study in 2019 aimed to find out the relationship between menstrual blood counts and nutritional intake with hemoglobin (Hb) levels in girls. The study used a cross-sectional design with a sample of 169 young girls in middle school in Banyumas District, Central Java, Indonesia. The amount of menstrual blood was seen using a questionnaire menstrual pictogram. The nutritional intake studied was the intake of protein, fibre, iron, and vitamin C using an FFQ semi-quantitative questionnaire and Hb levels through the insertion of peripheral blood. Data analysis using is chi-square and Fisher exact tests. There was no significant relationship between the amount of menstrual blood with Hb levels (p = 0.54 CI 95% = 0.36-1.74), protein intake (p = 0.26), fibre intake (p = 0.78) and iron intake (p = 0.44). There was a significant relationship between vitamin C intake and Hb levels (p = 0.03 CI 95% = 1.04-4.10). There is a significant relationship between vitamin C intake and hemoglobin levels in young girls.

Introduction

Adolescence is a period of rapid growth and development physically, psychologically, and intellectually. Adolescents according to the Republic of Indonesia's Minister of Health Regulation No. 25 of 2014 are residents in the age range of 10-18 years. The number of Indonesian adolescents who are almost a quarter of Indonesia's population of around 63.36 million people (24.27%) is a big challenge because it can be seen as a manifestation of a better future for the nation if the quality of the teenagers is good too.

One nutritional problem in adolescents is iron deficiency anemia, one of which is characterized by low levels of Hemoglobin (Hb) in women, especially in adolescent girls. According to Indonesia data of Household Health Survey in 2012 the prevalence of anemia in adolescent girls aged 10-18 years reaches 77.1% (Ministry of Health of the Republic of Indonesia, 2012). This is included in severe problems of iron deficiency anemia because the prevalence reaches> 40%. But in 2011, Indonesia was ranked sixth out of 11 ASEAN countries, with approximately 22.5% of women in childbearing age affected by anemia (Stevens et al., 2013). Anemia can be have many causes, including nutritional deficiencies, acute and chronic infection, blood loss, cancer, and hemoglobinopathy Anemic condition in adolescence that retain until pregnancy could increase the risk of perinatal maternal mortality, low birth weight baby, early labor and other disorders (van den Broek & Letsky, 2000).

Adolescents in addition to physical changes also experienced a biological process that is menstruation. However, most adolescents experience menstrual-related disorders such as dysmenorrhea (89.5%), menstrual cycle irregularities (31.2%), and the length of menstrual duration (5.3%) (Cakir et al., 2007). Disruption in the menstrual cycle will directly affect the quality of life and daily activities, if left

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untreated will result in the body's continuous blood loss so that adolescents experience anemia (Mesarini & Astuti, 2013). According to Nelson & Ritchie (2015), the factors that most contribute to the incidence of anemia are heavy menstrual bleeding in each cycle and chronic bleeding in the disease. Severe bleeding during menstruation can periodically reduce iron stores in the body so that the body experiences iron deficiency and results in anemia (Fraser et al., 2015).

Banyumas Regency is one of the districts in Central Java that has a high ratio of adolescents compared to the overall population, reaching more than 25% (Central Bureau of Statistics, 2014). This makes adolescents as an age group that influences the quality of the population in 10-15 years ago. One group of adolescents with nearly 41.653 people is in adolescents who attend Vocational High Schools in Banyumas, with a high number of adolescents in the group and considering the high prevalence of anemia in Banyumas Regency which is 76% (Sari et al., 2016). We want to find out the relationship between menstrual blood counts and nutritional intake with hemoglobin (Hb) levels in girls.

Method

This research is a quantitative design with an observational method that uses a cross-sectional design. The study was conducted in July 2019 at Vocational High School in Banyumas. The study population was all students of Banyumas 1 Vocational High School, while the affordable population was students of class X and XII of Banyumas 1 Vocational High School. Sampling was chosen based on purposive sampling technique with a minimum sample of 160 people. Hemoglobin levels were measured by a professional laboratory using the Quick Check Hb tool by dripping 1-2 drops of blood from the respondent's finger on the strip then placing it on the instrument and reading for a few seconds. Hemoglobin category when <12 g/dl is less and ≥ 12 g/dl is normal.

The amount of menstrual blood is the volume of blood that comes out in one menstrual cycle obtained from the menstrual pictogram questionnaire. Respondents fill in by choosing a picture of a bandage in accordance with the bleeding experienced during the last menstrual period. each picture of the dressing will represent the amount of blood that comes out (Warrilow et al., 2004). The category of menstrual blood counts when ≤36.5 ml is mild, 36.5-72.5 ml is moderate, and > 72.5 ml is severe (Dasharathy et al., 2012). Nutrition intake taken is the intake of protein, fibre, vitamin C, and iron which is consumed by respondents on average per day. Nutritional intake was measured using the Semi-quantitative Food Frequency Questionnaire (SQ-FFQ) obtained by direct interviews with respondents keeping in mind the frequency and portion of food during the last 3 months. Later, this data converted in grams using Indonesian Household Size Tables and Indonesian Food Composition Tables and then compute with nutrisurvey software.

The data obtained will be processed in several stages. The first stage is for the frequency of data from each research variable. The second stage is looking at the relationship between the amount of menstrual blood and nutritional intake with hemoglobin levels using the chi-square test if the expected value is >5 but if <5 using the Fisher exact test. After that it calculates the odds ratio (OR) with a significance level of 0.05. Data were analyzed using SPSS Version 17. The research respondents were explained about the study protocol and if the respondent was willing to take part in the research it would fill in informed consent. This research was conducted by obtaining an ethical eligibility letter from the Ethics Commission of the Faculty of Medicine, Jenderal Soedirman University number : 3970/ KEPK/VIII/2019.

Result and Discussion

The subjects of the research were female students of class X and XI of Banyumas 1 Vocational High School. The number of research subjects who filled out informed consent was 169 people with an average age of respondents 17 years. Most of the respondents had a normal amount of menstrual blood (79.3%) and a normal Hb level (69.8%). Protein and vitamin C intake tend to be sufficient with a percentage of 81.8% for adequate protein intake and 54.4% for adequate vitamin C intake as well. But for fibre and iron intake, intake tends to be less 90.5% for fibre and 78.7% for iron.

The characteristics of the research subjects are in Table 1.

The prevalence of heeavy menstrual bleeding in women varies between 27.2% and 54.0%, making it a common disorder (Fraser et al., 2015). The prevalence of low Hb levels in adolescent girls in Banyumas Regency according to this study was 30.2%. The prevalence is not as high as the prevalence in the previous study in Banyumas Regency, which is 76% of young women anemic Sari et al. (2016) where it shows that the anaemia problem in Banyumas Regency has not become a public health problem because the limit to health problems is ≥40%. As many as 30.2% of young women are included in the category of heavy menstrual blood that is more than 72.5 ml during one menstrual (Dasharathy et al., 2012). Calculation of protein and vitamin C nutrient intake in young girls is mostly sufficient, but most teenagers have low fibre and iron intake, which is more than> 70% of young women.

Table 1. Characteristics of Respondents

Variable	M ± SD	n	%
Age (years old)	17±0.63		
Age of menarche (years old)	12.66±1.02		
Amount of menstrual blood (ml)	54.05±30.52		
More (>72.5 ml)		35	20.7
Normal (≤72.5 ml)		134	79.3
Hemoglobin level (g/dl)	12.75±1.91		
Low (<12 mg/dl)		51	30.2
Normal (≥ 12 mg/dl)		118	69.8
Protein intake (g/days)	111.1±78.72		
Low (<80 % RDA)		32	18.9
Adequate (≥80 % RDA)		137	81.1
Fibre intake (g/days)	13.44±12.34		
Low (<80 % RDA)		153	90.5
Adequate (≥80 % RDA)		16	9.5
Vitamin C intake (mg/days)	182.9±333.9		
Low (<80 % RDA)		77	45.6
Adequate (≥80 % RDA)		92	54.4
Iron intake (mg/days)	18.97±15.16		
Low (<80 % RDA)		133	78.7
Adequate (≥80 % RDA)		36	21.3

Source: Primary Data, 2019

Based on the chi-square test showed that there was no relationship between the amount of menstrual blood with Hb levels (p = 0.54 CI 95% = 0.36-1.74). The relationship between the amount of menstrual blood and hemoglobin levels is shown in Table 2. Based on the results obtained, it was found that there was no significant relationship between the amount of menstrual blood with haemoglobin levels. This is different from research with Jagannath et al. (2014) that heavy bleeding in menstruation is significantly related to the incidence of anaemia as seen from haemoglobin levels and according to Zakherah et al. (2011) women with normal menstrual blood levels have better haemoglobin levels compared to women with very large amounts of menstrual blood. Besides, the excessive blood loss during the menstrual period can cause physical health problems such as iron deficiency anemia (IDA) and fatigue (Knol et al., 2013).

Heavy menstrual bleeding can therefore cause a decrease in iron level and hemoglobin amount and lead to anemia in women if not treated (Hasson, 2012). The results of this study are in line with (Clancy et al., 2006) study explain that there is no significant relationship between the amount of menstrual blood with anaemia. In the Clancy et al. (2006) study looked at the amount of blood by looking at

Table 2. The relationship between the amount of menstrual blood with hemoglobin levels

Amount of menstrual blood	Hb Level				OR (95% CI)	p
	Low		Normal			
	n	%	n	%		
More	12	34.3	23	65.7	0.79 (0.36-1.74)	0.55
Normal	39	29.1	95	70.9		

Source: Primary Data, 2019

the thickness of the endometrium as blood loss during menstruation via transvaginal ultrasound and the condition of anaemia through measurement of red blood cells and hemoglobin. The study has the result that there is no relationship between endometrial thickness and Hb levels in healthy women.

Based on the chi-square test and Fisher exact, it shows that there is no relationship between the intake of protein, fibre, and iron with Hb levels. There was a significant relationship between vitamin C intake and Hb levels (p = 0.03 CI 95% = 1.04-4.10). The relationship between nutritional intake and Hb levels is shown in Table 3. Nutrition intake data collection using SQ-FFQ which is able to see the intake of protein, fibre, vitamin C, and iron consumed by adolescent girls because this method can assess specific nutrient intake and can provide information on the number of servings to the subject (Fraser et al., 2015) . There is no significant relationship between the intake of nutrients in protein, fibre, and iron on haemoglobin levels, but there is a significant relationship between vitamin C intake and haemoglobin levels.

Most of the protein intake in this research subject is sufficient but the quality or type of protein consumed cannot be known from the study. This can cause the quality of the protein absorbed by the body to differentiate between animal and vegetable proteins, in addition to energy sources derived from animals such as meat, fish, and poultry is classified as low in people with low social status (Osungbade & Oladunjoye, 2012). In this study, researchers did not examine the economic status of the subject but based on interviews with the school. Most students had low social-economic status.

Iron intake is an interesting finding because in this study subjects with low iron intake reached 78.7%. The average nutrient intake is only 11.89 mg/day while the need for daily nutrient intake in women aged 15-49 years is 26 mg (Departemen Kesehatan Republik Indonesia, 2012). Bioavailability of iron is better in animal food sources because it is more in the form of heme while in plant foods it is stored in non-heme form so that its bioavailability is lower (Fraser et al., 2015). Fibre consumption has a relationship with iron absorption because fibre consumption can inhibit the subject's iron from vegetable products (Fraser et al., 2015). However, the results of this study have a significant result between fibre intake and Hb levels in young women. This can be due to other factors not examined in the study such as phytic acid, polyphenols/tannins, and oxalate which can inhibit the absorption of vegetable products in the body (Hallberg & Nilsson, 1964).

Vitamin C intake in adolescent girls reaches an average value of 120 mg/day while the need for vitamin C in women of childbearing age is only 75 mg (Departemen Kesehatan Republik Indonesia, 2012). This high intake of vitamin C has an effect on the abortion of iron intake in the body, which increases the amount of iron absorbed by the body. High Hb levels are associated with high intake of ascorbic acid which is part of vitamin C in women aged 16-44 years (Péneau et al., 2008). Based on the results of research and discussion, the prevention and treatment of anaemia in young women can begin with good nutritional intake such as intake of vitamin C. Vitamin C intake can be sourced from several food ingredients, especially vegetables and fruits such as guava, oranges, tomatoes, and several other sources.

The weakness of this study is that there are other nutritional intakes that affect the Hb levels that have not been studied in this study such as folic acid, vitamin A, and vitamin B12. In addition, infectious diseases experienced by adolescents can also be related to haemoglobin levels, not yet examined in this study. Futhurmore, changes in serum

ferritin concentrations more accurate to know anemia status than iron stores because ferritin is an acute phase protein and is affected by inflammatory processes irrespective of the iron store status (Babaei et al., 2017). In further research, researchers hope that further research will be done using a total fluid volume method by weighing pads before and after use as well as additional studies on the intake of folic acid, vitamin A, vitamin B12 and anti-nutritional substances. Moreover, to add a serum ferritin indicator to the anemia status test.

Table 3. The Relationship between the Nutrient Intake with Hemoglobin Levels

Variable	Hb Level				OR (95% CI)	p
	Low		Normal			
	n	%	n	%		
Protein intake						
More	7	21.9	25	78.1	1.69 (0.68-4.20)	0.26[a]
Normal	39	29.1	93	67.9		
Fibre intake						
More	47	30.7	106	69,3	0.75 (0.23-2.45)	0.78[b]
Intake	4	25	12	75		
Vitamin C intake						
More	17	22	60	78	2.07 (1.04-4.10)	0.03[a]
Intake	34	36.7	58	63.3		
Iron intake						
More	42	31,6	91	68,4	0.72 (0.31-1.67)	0.44[a]
Intake	9	25	27	75		

[a] Chi-square test
[b] Fisher exact test
Source: Primary Data, 2019

Conclusion

There was no significant relationship between the amount of menstrual blood, protein intake, fibre intake, and iron intake with Hb levels. There was a significant relationship between vitamin C intake and Hb levels. We wish to acknowledge the field research team for their dedicated professionalism during the stages of data collection and analysis, and also offer our sincere gratitude to the participants, teachers, and principals from Banyumas 1 vocational high school. Researchers are also grateful to the Research Institution and Community Service Jenderal Soedirman University as the funders of this research.

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