THE INFLUENCE OF DIETARY INTAKE ON THE INCIDENCE OF ANEMIA FEMALE TEENAGERS IN SMP RURAL AREA PANCUR BATU DELI SERDANG DISTRICT

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ABSTRACT

Background: Anemia is one of serious micro-nutrient problems in Indonesia. Adolescent is one age-group with high nutritional risk. Prevalence of iron anemia in Indonesia as much as 72.3%.

Materials and Methods: The research used quantitative research method with cross sectional study design and aimed to find out the correlation of the knowledge of nutrition and eating pattern (intake of protein, iron, pholate acid, and vitamin C) with the incidence of anemia. The population was all female students SMP Rural Area Pancur Batu District Deli Serdang, and 100 of them were used as the samples selected by simple random sampling. The data were obtained from the examination of hemoglobin content, using digital acute check, questionnaires, 24 hour-food recall form, and eating frequency form. The data was analyzed using Chi Square.

Result: The result showed that The proportion of anemia for female teenagers in Junior High School Rural Area Pancur Batu Deli Serdang District was 58%, percentage of tenager with adequade intake the protein (56%), iron intake (22%), pholate (5%) acid, vitamin C (15%).

Conclusion: Female teenagers with insufficeient iron intake had bigger chance for anemia 8 times compared to those with sufficient iron intake.

Keywords: Dietary intake, anemia, and female teenagers

1.0 Introduction

Anemia is one of the serious micro nutrition problems with the highest prevalence experienced by Indonesia. One group that is prone to nutrition is teenagers. Teenagers are very prone to anemia than children and adults, because adolescents are at the period of growth and development so that more micronutrients and macro nutrients are needed (WHO, 2014).

Various direct causes of anemia include: deficiency in nutrient intake from food (iron, folic acid, protein, vitamin C, ribovlavin, vitamin A, zinc and vitamin B12), consumption of iron absorption inhibitors, infectious diseases, malabsorption, bleeding and increased need (Ramakrishnan, 2001). Infectious diseases can inhibit iron absorption in the body, because iron will be used as essential food for the growth of bacteria and microorganisms that will worsen the state of infection (Linder, 1992).

Nutrients such as protein, iron, folic acid and vitamin B12 and others are needed in the formation of red blood cells. The formation of red blood cells will be disrupted if the nutrients needed are insufficient. According to the Ministry of Health 2012, the prevalence of anemia in the world between 1993 and 2007 was 24.8% of the total world population (almost 2 billion of the world's population). The prevalence of iron deficiency anemia in infants under 40.5%, 50.5% pregnant women, postpartum mothers 45.1%, female adolescents 10-18 years old 57.1%, and age 19-45 years 39.5%. Of all the age groups, women have the highest risk of suffering from anemia, especially young women. The composition of the Indonesian population according to age group shows that the young population (0-14 years) is 29.04%, the productive age (15-64 years) is 66.31%, and the elderly (> 65 years old) are equal to 4.65%, (MOH 2012).

From the data obtained at 66.31%, anemic sufferers of productive age (15-64 years), including in adolescents, it is important to note that adolescence is a period of development and physical growth, psychological adolescence that is important to note. Adolescent growth and development are changes that involve quantitative and qualitative aspects which are characterized by an increase in physical size that can be measured, changes and maturations occur as adolescents get older (Farida et al, 2013)

The growth and development of adolescents is strongly influenced by the environmental conditions and nutrition of these adolescents. Adolescence is a period in which a childhood transition enters a preparatory period to become an adult and is marked by the adolescent being able to reproduce. Because that is categorized as productive age, it can produce.

Adolescence entered into the maturation and development of the reproductive organs marked by menstruation in the teenage reproduction, where young women will lose 50-80 ml of blood during menstruation every month on a regular basis as a sign that the uterus organs have function (Eva ellya, 2010). Therefore young women are susceptible to anemia, especially if the intake of nutrients needed is insufficient. Nutrition is a source of builders and body builders, where it is expected that the fulfillment of nutrients in the body will form a healthy body, healthy and optimal development and growth so that it has resistance to disease (Mensink et al, 2012).

Nutrition and food are not only for the growth and physical development of adolescents, but also for the fertility or fertility of female teenager later. If a female teenager experiences

nutritional deficiencies, such as iron, the female teenager will be at risk of anemia. Anemia will interfere with the daily activities of adolescent girls which are characterized by dizziness, headaches, weakness, fatigue, lethargy, lack of concentration in learning which results in a decrease in learning achievement and an influence on reproductive system health (Lask et al, 2013).

Especially female teenager should continue to pay attention to their iron needs, because young women experience menstruation every month. This is exacerbated by the consumption pattern of female teenager who sometimes go on a body management diet so that less iron intake can meet their needs (Arisman, 2004). Food selection in young women is often influenced by social pressure, friends and parents as role models who have a culture and the belief that the body must be slim (Pike & Dunne, 2015). Not a few surveys noted the inadequate iron intake of adolescents, especially female teenager due to improper eating patterns. Often skip breakfast on the grounds busy and choose to consume junk food (Mandleco LB. 2004). Based on the results of research Retnoningsih (2010) showed that there is a relationship between protein, iron and vitamin C intake with hemoglobin levels in female students aged 13-18 years in the cottage boarding school Fathimiyah Miftahul ilmi, Babakan, Ciwaringan, Cirebon Regency.

From these data illustrate that anemia problems, especially female teenager are still high. Anemia is still one of the factors behind the high maternal mortality rate in Indonesia, so prevention efforts are to know early on whether someone is anemic or not and immediately seek measures to overcome anemia.Based on the results of the preliminary survey conducted by the author, it was found out of 100 female teenage in Deli Serdang District Pancur Batu Middle School who were asked about their eating habits, there were 50 young women who said they did not have breakfast and they would eat during school breaks and after school they prefer to consume fast food such as meatballs, chicken noodles and dumplings for reasons faster and practically do not require a long time.

2.0 Materials and Methods

The type of research used in this study is descriptive with cross sectional design which aims to explain the effect of diet on the incidence of anemia in young women. The population of this study was 356 people of all female teenagers in Pancur Batu Middle School in Deli Serdang District. The sampling technique used was simple random sampling with a sample of 100 respondents. Data were obtained by examining Hemoglobin levels with digital acute check, filling out questionnaires, 24-hour food recall forms and meal frequency forms. Univariate data analysis uses frequency distribution while bivariate uses Chi Square test.

3.0 Result

3.1 General description of female teenager

Based on the results of the study obtained the distribution of young women based on age as shown in table 1.

Table 1. Distribution of female teenager According to Age

No	Age	N	Persentase
1	11 years	3	2
2	12 years	45	45
3	13 years	42	42
4	14 years	10	10
	Sum	**100**	**100**

Based on table 1 above, it can be seen that the majority of girls are 12 years old (45%) and 13 years old (42%).

3.2. Diet pictures

Diet can be measured by the level of adequacy of nutrients (energy, protein, and iron) consumed by respondents obtained from 24-hour food recall carried out for 2 consecutive days. From the results of 24-hour food recall, calculated the amount of energy, protein and iron consumption, then compared with the number of nutritional adequacy.

3.2.1. Overview of protein intake

Table 2. Distribution of Female Teenagers Based on Protein Intake

No	Protein intake	n	Persentase
1	Sufficient	56	56
2	Unsufficient	44	44
	Sum	100	100

From table 2 above, it can be seen that the majority of female adolescent protein intake in the category is sufficient (56%).

3.2.2. Description of iron intake

Table 3. Female Teenagers Distribution Based on Iron Intake

No	Iron intake	n	Persentase
1	Sufficient	22	22
2	Unsufficient	78	78
	Sum	100	100

From table 3 above, it can be seen that the majority of adolescent girls' iron intake in the category is not enough (78%).

3.2.3. Overview of vitamin c intake

Table 4. Female Teenagers Distribution Based on Vitamin C intake

No	Vitamin C intake	n	Persentase
1	Sufficient	15	15
2	Unsufficient	85	85
	Sum	**100**	**100**

From table 4 above, it can be seen that the majority of female adolescent vitamin C intake in the category is not enough (85%).

3.2.4. Overview of folate intake

Table 5. Female Teenagers Distribution Based on Folate Intake

No	Folate intake	n	Persentase
1	Sufficient	5	5
2	Unsufficient	95	95
	Sum	**100**	**100**

From table 5 above, it can be seen that the majority of adolescent adolescent folate intake in the category is not enough (95%).

3.2.5. Types and frequency of food consumption

The type and frequency of children's food is obtained by using the food frequency form, the results of the study can be seen in table 6.

Table 6. Female Teenagers Distribution Based on the Frequency of Eating

No	Kind of foods	N	Persentase
1	Main food		
	Often	83	83
	Rarely	17	17
	Sum	**100**	**100**
2	Animal side dish		
	Often	88	88
	Rarely	12	12
	Sum	**100**	**100**
3	Vegetative side dish		
	Often	51	51
	Rarely	49	49
	Sum	**100**	**100**

4	Vegetable		
	Often	43	43
	Rarely	57	57
	Sum	**100**	**100**
5	Fruits		
	Often	53	53
	Rarely	47	47
	Sum	**100**	**100**

The frequency of nutritional consumption of young women in this study was measured by looking at the frequency of young women in consuming sources of nutrients. Young women who often consume basic food sources, namely in the form of rice by 83.0%, often consume animal sources of 88.0%, animal dishes that are often consumed by young women are eggs and fish. Vegetable side dishes are often consumed by 51%, vegetable dishes that are often consumed are tempeh. Sources of vegetables are often consumed by young women by 43.0%, vegetables that are often consumed are beans and potatoes. Sources of fruits and often consumed by 53.0%, the fruits most often consumed are oranges and bananas.

3.2.6. Types and frequency of snacks

Table 7. Distribution of Respondents Based on the Frequency of Eating and Types of Snack Foods Respondents Consumed.

No	Kind of foods	Eating Frequency				Total	
		Often		Rarely			
		n	%	n	%	n	%
1	Meatballs	51	51	49	49	100	100
2	Chicken noodle	61	61	39	39	100	100
3	Frieds	50	50	50	50	100	100
4	Donuts	52	52	48	48	100	100

Based on table 7 above, it can be seen that the types of snacks that are often consumed by respondents are meatballs (51.0%), chicken noodles (61%), fried foods (50%), and donuts (52%).

3.3. Anemia

The results of the study on the incidence of anemia based on diet can be seen in table 8 below:

Table 8. Distribution of Anemia

No	Haemoglobin	n	%
1	Unnormal (Hb <12 gr/dl)	58	58
2	Normal (Hb > 12 gr/dl)	42	42
	Sum	**100**	**100**

Based on the results of the study, it was found that most of the hemoglobin levels of girls in Pancur Batu Middle School Deli Serdang District were normal (Hb >12 gr / dl) or 42% and the results of this study also found the prevalence of abnormal hemoglobin levels (anemia) was 58%. This prevalence rate is greater than the research conducted by Cholida (2010) on female students in Medan Public High School, which amounted to 37.7%. However, it was lower than Witrianti (2011) research of young women in the city of Bekasi with a prevalence of 31, 9%.

3.4. Relationship between diet and anemia

Table 9. Distribution of Anemia Based on the Female Teenagers Dietary

No	Dietary habit	Haemoglobin				n	%	P
		Normal		Anemia				
		n	%	n	%			
1	**Protein intake**							
	Sufficient	45	80,4	11	19,6	56	100	0,368
	Unsufficient	32	72,7	12	27,3	44	100	
	Sum	**77**	**153,1**	**23**	**46,9**	**100**	**100**	
2	**Iron intake**							
	Sufficient	21	95,5	1	4,5	22	100	0,02
	Unsufficient	56	71,8	22	28,2	78	100	
	Sum	**77**	**167,3**	**23**	**32,7**	**100**	100	
3	**Vitamin C intake**							
	Sufficient	5	100	0	0	5	100	0,587
	Unsufficient	72	75,8	23	24,2	95	100	
	Sum	**77**	**175,8**	**23**	**24,2**	100	100	
4	**Folate intake**							
	Sufficient	10	66,7	5	33,3	15	100	0,326
	Unsufficient	67	78,8	18	21,2	85	100	
	Sum	**77**	**145,5**	**23**	**54,5**	**100**	**100**	

Based on table 9 it is found that, a cross table between protein intake and anemia shows that out of 56 female teenagers whose protein intake is sufficient, there are 11 people (19.6%) who have anemia events. Where as, from 44 female teenagers whose protein intake was insufficient, there were 12 people (27.3%) who experienced anemia. The results of the *Chi-square* test showed a value of p = 0.368, it can be concluded that there was no relationship between protein intake and the incidence of anemia. This is because rural female teenagers in Pancur Batu prefer to consume eggs, tempeh and tofu. Sometimes female teenagers consume tofu and tempeh without rice, for example tempeh is provided 25 grams per piece. A portion of 50 gr should be a proportion of one meal but for those who like it can use 3 pieces, so 75 grams for one meal. But for those who do not like any slice, they are not eaten. This is in accordance with research conducted by Retnoningsih (2010), on young women in Ngrambe Subdistrict, Ngawi Regency, which is found there is no relationship between protein consumption and anemia. Burner's research (2013) which states there is no significant relationship between protein consumption with hemoglobin levels in preconception women. Protein in the human body acts as forming blood grains (hemopoesis), namely the formation of erythrocytes with hemoglobin in it. Protein can also help increase iron absorption. In the digestive tract iron undergoes a process of

reduction from the form of ferries to ferrous materials that are easily absorbed by the body. Animal protein can also help the absorption of vitamin C in the formation of red blood cells (Proverawati, 2012).

The cross table between iron intake and the incidence of anemia shows that out of 22 female teenagers who have sufficient iron intake, there is 1 person (4.5%) who has anemic events. Where as, from 78 female teenagers whose iron intake was insufficient, there were 22 people (28.2%) who experienced anemia. The results of the *Chi-square* test showed a value of p = 0.020 it could be concluded that there was a relationship between iron intake and the incidence of anemia. This is in line with the research by Pratiwi (2015) which shows that iron intake has a significant relationship with anemia status in Ciwandan MTS students. This can be caused by the respondents consuming less iron source foods such as red meat and many respondents consume tea containing tannin as an iron absorption inhibitor. Iron plays a very important role as the main ingredient in the synthesis of hemoglobin, when iron reserves in the body are reduced eating will have an impact on the synthesis of disturbed hemoglobin. Iron deficiency from food is usually the main factor. Iron intake comes from two forms, namely non-heme iron and heme iron. Heme iron is only found in animal flesh while non-heme iron is found in plant foods

The cross table between pholate acid intake and the incidence of anemia shows that out of 5 people (female teenagers with adequate pholate acid intake, none were found to have anemia. While, of the 95 female teenagers whose pholate acid intake was insufficient there were 23 people (24.2%). Results *Chi square* test shows the value of p = 0.587 it can be concluded that there is no relationship between fosfat acid intake and the incidence of anemia. From the recall results of female teenagers in Pancur Batu Rural Junior High School where female teenagers consume fosfat acid intake sources such as green vegetables are still lacking in a day and only 2-5 tablespoons (50-250g). Addition of fosfat acid intake can increase Haemoglobin levels. Fosfat acid intake supports the metabolism of several amino acids including histidine, serine, glycine and methionin. Fosfat acid intake is needed in various types of biochemical reactions. Fosfat acid deficiency causes decreased cell performance, including those that play a role in iron metabolism, namely the function of transferrin receptors. Fosfat acid intake is also needed for the formation of red blood cells and maturation in the bone marrow.

The cross table between vitamin C intake and the incidence of anemia shows that out of 15 female teenagers whose vitamin C intake is sufficient, there are 5 people (33.3%) who experience anemia events. Meanwhile, from 85 femle teenagers whose intake of vitamin C was not enough, there were 18 people (21.2%) who experienced anemia. Result *Chi square* test showed a value of p = 0.326, it can be concluded that there was no relationship between vitamin C intake and anemia. This is the same as research conducted by Proverawati (2012) which states there is no significant relationship between vitamin C intake and anemia status. Vitamin C can help the absorption of iron in preventing anemia, but if iron is consumed in a limited amount then the function of vitamin C as an enhancer of iron does not work.There is no relationship between vitamin C intake and anemia caused by female teenagers consuming less fruits sources of vitamin C due to the limited availability of fruit. Vitamin C has an important role in the absorption of non-heme iron which is found in many plant foods. Therefore if you consume less vegetables and fruits can inhibit the absorption of iron in the body, causing anemia

3.5 Influence of diet on female teenagers anemia

Based on the logistic regression test analysis showed that iron intake influenced of anemia in female teenagers (p = 0.048). Exp (B) of 8,250 so that it can be concluded that female teenagers whose iron intake is insufficient are 8 times more likely to experience anemia compared to female teenagers whose iron intake is sufficient. The results can be seen in table 10 below:

Table 10. Final Results of Logistic Regression Test Multiple

Variable	B	Sig.	Exp B
Iron intake	2,11	0,045	8,25
Constant	-3,045	0,003	0,048

4.0 Discussion

The high rate of female teenager who experience anemia can be caused by the low amount of nutrients consumed by female teenager such as energy, protein and iron. It can be seen from the results of research that show that the incidence of anemia in female teenager with a level of nutritional adequacy (energy, protein and iron) in the deficit category is far greater than that of female teenager with moderate and poor levels of nutritional adequacy. The lower the level of nutritional adequacy of female teenager is more likely to suffer from anemia.

Nutrients that can produce energy are obtained from carbohydrates, fats and proteins. The main function of carbohydrates is as an energy source, while helping to regulate protein metabolism. Adequacy of carbohydrates in the diet will prevent the use of protein as an energy source. So that the function of proteins in the process of transporting nutrients including iron into cells is not disturbed. This can be understood because according to the theory if protein intake from daily food is lacking, the synthesis of protein in the blood will be disrupted. In blood or other body fluids iron is transported by a protein called transferrin. Transferrin will carry iron in the blood which will be used in the synthesis of hemoglobin. If the transferrin level in the blood decreases, the transportation of iron cannot run properly and in the end the hemoglobin level in the blood also decreases (Arisman, 2004).

5.0 Conclusion and recommendation

The conclusion of this study that female teenagers experience anemia as much as 58%. There is an effect of diet, namely iron intake on the incidence of anemia in female teenagers in Pancur Batu Middle School in Deli Serdang District. With the value of Exp = 8.250, it means that girls who have insufficient iron intake have an 8 times greater likelihood of experiencing anemia compared to girls whose iron intake is sufficient. There should be early intervention to reduce the prevention and the handling of anemia on female teenagers was carried out by giving counseling and by involving those school parties, parents and Deli Serdang district health department. Hence, female teenagers know and realize the importance of dietary intake, specially to enhance the consumption of food containing enough iron substance intake.

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Declaration

The authors declare that this article is our original work and there is no conflict of interest.

Authors contribution

Author 1: Research concepts and designs, preparing research proposals, collecting data, analyzing data and writing manuscripts

Author 2: Research concepts and designs, supervising the research process, actively involved in data analysis , reviewing manuscripts and final editing.

Author 3 : Research concepts and designs, supervising the research process, actively involved in data analysis , reviewing manuscripts and final editing.

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