Original Article

Diet, Protein, Iron and Vitamin C Intake on Anemia Status of Adolescent Girls

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ABSTRACT

Background: *Anemia is a condition of the body in which the level of Hemoglobin (Hb) in the blood is below normal. Anemia in adolescents has an impact on decreased concentration, memory, and brain performance in adolescents, as well as stunted physical growth, first menstruation, decreased immunity and learning achievement. Objective to find out whether there is a relationship between diet, protein intake, iron intake and vitamin C intake on the anemia status of adolescent girl*

Methods: *This research was conducted in May 2023. This type of research is a descriptive study with a cross-sectional research design. The sample size in this study was 70 respondents. The data for this research were taken by direct interviews using a questionnaire and a 3 × 24 hour Recall form with the results of Univariate and Bivariate data*

Results: *The results of the study with univariate analysis showed that 4 students (5.7%) had anemia status. A good diet was 85.7%, protein intake was insufficient by 88.6%, iron intake was insufficient by 87.1%, and vitamin C intake was insufficient by 97.1%. The results of the cross-table analysis showed that female students with anemia had a poor diet of 75%, protein intake was 100%, iron intake was 100% insufficient, and vitamin C intake was insufficient by 100%.*

Conclusion: *Bivariate analysis shows an F change value of 0.000 (<0.05) meaning there is a significant relationship between the variables of diet, protein intake, iron intake and vitamin C intake on the anemia status of young women, and this relationship shows an R value: 0.603 meaning a relationship between the independent variables and the dependent variable is strong.*

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Introduction

The World Health Organization (WHO) states that anemia is a condition where the number of red blood cells is insufficient to meet the body's physiological needs (WHO, 2018).Anemia in adolescents has an impact on reducing concentration, memory and brain performance in adolescents, as well as hampering physical growth, first menstruation, decreasing immunity and learning achievement (WHO, 2011).

According to Nurmal, et al, 2015 in Desak et.al, 2019, anemia in teenage girls causes teenagers to get tired easily.

reducing concentration in learning which will affect school performance, decreasing endurance, being susceptible to disease and infection. The high incidence of anemia in adolescent girls that is not treated properly will continue into adulthood and be a major contributor to maternal mortality rates, premature babies and babies with low birth weight (Desak, et.al, 2019).

Anemia in teenagers is caused by teenagers's irregular eating patterns, not consuming healthy foods such as vegetables and fruit, frequent snacks, unhealthy fast food (Yenny et,al,2022).

According to Sulistioningsih, 2011, anemia can be caused by teenagers starting to choose the food they like, where teenagers are at the stage of independence, have lots of activities outside the home and are influenced by their peers.

Data of the prevalence of severe anemia was 1,078 people, the highest was in Musi Rawas Regency, namely 254 people. Muara Enim 160 people and Palembang 145 people (Health Service, 2019). Based on research by Sari (2016) at SMP Negeri 40 Palembang, it shows that the prevalence of anemia in adolescent girls is 40.5%. Based on the description, researchers are interested in conducting research on the description of eating patterns, protein intake, iron (Fe) and vitamin C on anemia status in young women at SMP Negeri 40 Palembang.

Methods

The type of research is descriptive research with a cross-sectional research design. The population of this research were all class VIII female students at SMP Negeri 40 Palembang. The sampling technique used proportional stratified random sampling and simple side random sampling technique. The sample in this study amounted to 70 people. This research was conducted in May 2023 for 4 days.

The tools and materials used are blood hemoglobin measuring instruments, namely using easy touch. Data was collected by direct interview using a questionnaire and 3 × 24 hour Recall form

Data were analyzed using SPSS multiple correlation test which is included in the parametric statistics section, so the assumption of data normality must be met. After analyzing the normality of the data, it was continued with multiple correlation analysis.

Results

The data obtained in this research was through direct interviews using a questionnaire and a 3 × 24 hour Recall form, namely age, diet, protein, iron and vitamin C intake. And anemia status was obtained from the results of blood checks.

Table 1. Characteristics of Respondents

Age	n	%
12 years	1	1,43
13 years	43	61,43
14 years	26	37,14
Total	**70**	**100**

Table 1. Show that 1 person (1.4%) was 12 years old, 43 were 13 years old (61.4%), and 14 years old were 26 people (37.1%).

Table 2. Anemia Status

Anemia Status	n	%
Anemia	4	5,7
Not Anemia	66	94,3
Total	**70**	**100**

Table 2 shows that 4 (5.7%) female students were anemic and 66 (94.3%) were not anemic.

Table 3. Diet

Diet	n	%
Good	60	85,7
Just	5	7,15
minus	5	7,15
Total	**70**	**100**

Table 3 shows that the majority of respondents' eating patterns were good, 60 people (85.7%), 5 respondents with adequate eating patterns (7.15%) and 5 respondents with poor eating patterns (7, 15%).

Table 4. Protein Intake

Protein *intake*	n	%
good	8	11,4
less	62	88,6
Total	**70**	**100**

Table 4 shows that the majority of respondents' protein intake was poor, 62 people (88.6%), while 8 respondents' protein intake was good (11.4%).

Table 5. Iron Intake

Iron Intake	n	%
good	9	12,9
les	61	87,1
Total	**70**	**100**

Table 5 shows that the majority of respondents' iron intake was deficient, 61 people (87.1%), while 9 respondents' iron intake was good (12.9%).

Table 6. Vitamin C Intake

Vitamin C Intake	n	%
Good	2	2,9
les	68	97,1
Total	**70**	**100**

Table 6 shows that the majority of respondents' vitamin C intake was deficient, 68 people (97.1%), while 2 respondents' vitamin C intake was good (2.9%).

Table 5. The results of data analysis using the normality test showed the following results One-Sample Kolmogorov-Smirnov Test;

		DIet	Protein INtake	Iron Intake	VIC Intake
N		70	70	70	70
Normal Parameters[a,b]	Mean	2.7000	1.2286	1.2571	1.0286
	Std. Deviation	.59831	.64091	.67428	.23905
Most Extreme Differences	Absolute	.463	.525	.520	.533
	Positive	.308	.525	.520	.533
	Negative	-.463	-.361	-.351	-.452
Test Statistic		.463	.525	.520	.533
Asymp. Sig. (2-tailed)		.000[c]	.000[c]	.000[c]	.000[c]

From the analysis above, it shows that the data is normally distributed. followed by multiple regression analysis

Table 6. ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.372	4	.343	9.292	.000[b]
Residual	2.399	65	.037		
Total	3.771	69			

Table 7 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.603[a]	.364	.325	.19213

a. Predictors: (Constant), VIC Intake, DIet, Iron Intake, Protein Intake

Bivariate analysis shows an F change value of 0.000 (<0.05) meaning there is a significant relationship between the variables of diet, protein intake, iron intake and vitamin C intake on the anemia status of young women, and this relationship shows an R value: 0.603 meaning a relationship between the independent variables and the dependent variable is strong.

Discussion

The respondents sampled in this study were class VIII students at SMP Negeri 40 Palembang and had met the criteria, based on the results of data collection they had been grouped into 3 categories, including 1 person aged 12 years, 43 aged 13 years, and those aged 14 years as many as 26 people.

In this study data on the anemia status of female students was grouped into 2 categories. The data obtained showed that the majority of respondents were not anemic, 66 people (5.7%) and 4 people (5.7%) were anemic. Anemia often occurs in adolescent girls compared to adolescent boys. This happens because young women lose iron (Fe) during menstruation so they need more iron (Fe) intake. The behavior of young women who consume more plant foods results in their iron intake not being sufficient to meet their daily iron needs (Triwinarni, 2017).

Anemia causes health problems that can be experienced by all age groups. Iron deficiency, even though it is not accompanied by anemia, iron deficiency and mild anemia, is enough to cause symptoms, such as lethargy, weakness, tiredness, tiredness and inattention (5L). This is caused by a decrease in oxygen levels needed by body tissues, including muscles for physical activity and the brain for thinking, because oxygen is carried by Hemoglobin.Iron deficiency sufferers His immune system will also decrease, as a result he is susceptible to infectious diseases (R. Ministry of Health, 2015).

The diet of most young women is good. There were 60 people (85.7%) in the good category, with 5 people (7.15%) in the adequate category and 5 people (7.15%) in the poor category. This is caused by less varied food choices, young women choose food based on taste without paying attention to its nutritional value, such as a lack of consumption of rice, meat, fish, vegetables, nuts and fruit and often consuming instant noodles which results in energy needs not being met appropriately. What is needed by the teenage body is 2,100 kcal and energy is a source of erythrocyte formation, then teenage girls experience menstruation every month, so that teenage girls are unable to meet the iron content needed by their bodies for the process of forming hemoglobin which causes Hb levels to continue to decrease and results in anemia. In research conducted by Oktavianis (2023) regarding the relationship between lifestyle and the incidence of anemia in teenagers, it was stated that 16 anemic teenage girls (50%) out of 65 respondents had poor eating patterns. From the results of interviews conducted, this could happen because young women limit their food consumption for diet reasons and the habit of not eating breakfast.

This is because young women still do not consume enough animal protein, especially red meat and liver. Young women more often consume animal protein such as eggs, chicken and fish. And vegetable proteins, namely tofu and tempeh, are more difficult to absorb into ferrous form. Protein is very important in the transport of iron in the body. Iron absorption is assisted by protein in the form of transferrin which occurs in the small intestine. Transferrin will carry iron to the bone marrow which is then used to make hemoglobin which is a component of red blood cells. Iron transport

will be hampered if protein intake is lacking, thereby increasing the risk of iron deficiency. Irregular eating patterns, one of which is not consuming enough animal protein, causes hemoglobin levels to fall and results in anemia. In research conducted by Permatasari (2020) regarding the relationship between iron intake and the anemia status of adolescent girls in the city of Bogor, it was stated that 26 anemic adolescent girls (15.1%) of the 172 respondents had insufficient protein intake. Meanwhile, in this study 4 people (100%) of adolescent girls who were anemic had insufficient protein intake.

This is caused by young women having less food intake and less diverse food sources of iron. Lack of iron as an important mineral for transporting oxygen in hemoglobin is the main cause of anemia. The main difficulty in meeting iron needs is the low level of iron absorption, especially from plant foods (only 1-2% absorbed). Low iron intake often occurs in people who eat a less diverse diet. The habit of consuming foods that can interfere with iron absorption, such as coffee and tea consumed at the same time at mealtimes, can cause iron absorption to be lower. However, insufficient iron intake will not directly affect hemoglobin levels because the body has iron reserves in the liver. In research conducted by Hidayati (2023) regarding the relationship between protein and iron intake and the incidence of iron deficiency anemia in adolescent girls at SMP Negeri 31 Padang, it was stated that 19 anemic adolescent girls (57.6%) of the 33 respondents had iron intake. not enough. Meanwhile, in this study 4 people (100%) of adolescent girls who were anemic had insufficient iron intake.

Based on the results of food recall interviews, respondents rarely consume vegetables and fruit. Fruits and green vegetables are a good source of vitamin C. The role of vitamin C in preventing anemia is to increase the absorption of non-heme iron up to four times. Absorption is easier because vitamin C converts ferrous iron into ferrous form. Vitamin C can help absorb iron, but if the iron consumed is insufficient then the function of vitamin C will not work. In research conducted by Dewi (2022) regarding nutritional knowledge, vitamin C and iron intake in relation to anemia in adolescent girls in Bantul, Special Region of Yogyakarta, it was stated that 23 anemic adolescent girls (63.89%) of the 186 respondents had an intake of Vitamin C is lacking. Meanwhile, in this study 4 people (100%) of adolescent girls who were anemic had insufficient vitamin C intake.

This study is in line with research conducted by Elna (2018), there is a very significant relationship Between intake of iron, protein and vitamin C and the incidence of anemia among young women at Yamas Vocational School, East Jakarta. Because all p values value <0.05. In line with the results of the research conducted by Paputungan (2016), namely that there is a significant relationship between intake Protein on the incidence of anemia (p value = 0.001) at SMPN 8 Manado. Sufficient protein is needed for hemoglobin synthesis to occur well, because protein has an important role in absorption and transport of iron, so that low protein intake cannot support the process of hemoglobin formation, low levels Hemoglobin in the blood is an indicator of anemia. Linked proteins with iron. (Roziqo, 2016) Absorption of iron in non-heme form increases fourfold if vitamin C plays a role in moving iron from transferrin in plasma to liver ferritin. Vitamin C is needed for iron absorption, with Thus vitamin C plays a role in the formation of hemoglobin, so accelerate healing of anemia (Adriani, 2012) . The high prevalence of iron deficiency anemia in Indonesia due to low

iron intake in daily diet, lack of food sources that contain it protein and vitamin C. Iron absorption rate contained in vegetable sources (Adriani, 2012).

Conclusion

The anemia status of adolescent girls at SMP Negeri 40 Palembang was mostly in the anemia category, 4 people (5.7%) and 66 people (94.3%) not anemic. Most of the eating patterns of young women at SMP Negeri 40 Palembang are in the good category, namely 85.7%. The average intake of young women at SMP Negeri 40 Palembang is in the low category. This Study shows a significant relationship between the independent variables diet, protein intake, iron intake and Vitamin C intake on the dependent variable Anemia status of adolescent girls simultaneously

Authors Contributions

Each member of the research team played a distinct role in the development of the manuscript: one member contributed to conceptualization and design, another member conducted data collection and analysis, and a third member contributed to interpretation of results and manuscript revision. All authors have read and agreed to the final version of the manuscript.

Conflicts of Interest

We hereby confirm that no relationships or activities that could be perceived as conflicts of interest have been associated with this research, ensuring its complete objectivity and credibility.

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