Consumption Inhibitor and Enhancer Iron is Related to Anemia Status in Students of SMAN 6 Denpasar

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ABSTRACT

Background: Anemia is a condition in which a total shortage of red blood cells or hemoglobin levels less than normal or decreased levels of red blood cells. (Nabilla dkk., 2022). This study aims to determine the consumption of iron inhibitors and enhancers in relation to anemia status in female students of SMAN 6 Denpasar Selatan. **Methods**: The type of research used was observational with a cross sectional design. The research samples were 62 students, class XI at SMAN 6 South Denpasar. Data collection were carried out by taking hemoglobin levels in female students and interviews using the SQ FFQ questionnaire on the consumption of iron inhibitors and enhancers. The data collected included anemia status, consumption of inhibitors and consumption of iron enhancers in female adolescents. To determine the relationship between anemia status and consumption of iron inhibitors and enhancers by pearson's correlation analysis. Anemia categories are divided into 2, ie; not anemia (≥12 g/dL) and anemia (<12 g/dL). **Results**: Based on the research, there were 48 female students who were not anemic status and 14 female students who were anemic status. The lowest hemoglobin level was 9.1 g/dL, the highest was 17.8 g/dL, the average was 15 g/dL. Consumption of tea (96.7%) and spinach (100.0%), and consumption of oranges (100.0%) and chicken meat (100.0%) in the last 1 month. The results showed that there were a relationship between consumption of iron inhibitors and anemia status in young women with p value = 0.034 (p<0.05). For the analysis test results of consumption of iron enhancers with anemia status in young women showed a relationship (p-value = 0.001).

Keywords : Anemia Status, Inhibitor Consumption, Enhancer Consumption

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INTRODUCTION

Anemia is situation that blood red cell or hemoglobin less than normal. Hemoglobin category less than normal on man is <13,5 g/dL and women <12,0 g/dL. According to Department Health Republic Indonesia (1998), the reason anemia occur is need substance nutrition which more height like substance iron, The factor cause of anemia such as less intake nutrition, infection, status nutrition, menstruation and non direct factor such as social economy, education, level knowledge as well as substances that inhibit the absorption of iron found in food. Iron substance iron which low in food can cause deficiency substance iron, If there is occur for a along time can cause depletion savings substance iron in body. The factor can help absorption substance iron must considered by evaluate of intake substance iron. Amount food which digested important for recognize that encourage and inhibit absorption substance iron. A number of material which increase absorption substance iron such as micronutrients. It's can consume together with iron substance is called *enhancer* such as vitamin C and protein animal, and a number of substance. The inhibits iron absorption of iron substance is called *inhibitor* such as tannin, oxalate. and phytic acid. The research results of Riskesdas 2007, the prevalence of anemia in Indonesia was 11.3% and increase 21.7% in 2013. Compared to the data latest of Risjkesdas 2018, enhancement prevalence anemia was 48.9%. Riskesdas data in 2016 of Bali, anemia prevalence on teenagers daughter as big as 27,1%. On the other hand the prevalence anemia in Denpasar in 2017 was 45,9% on teenagers daughter age 12-18 years.

METHOD

The research was conducted at SMAN 6 South Denpasar in December 2022. This type of research was observational with *cross-sectional* design. The research population were female students aged 16-17 years.. The sample consisted of 62 people with sampling techniques in the form of *proportional simple random sampling.* The data collected such as characteristic data, anemia status, consumption inhibitor of iron and enhancer iron consumption. The processing identity data were presented with frequency tables and processed descriptively. The data of anemia status into two categorized ie; anemia and not anemia. Frequency of *inhibitor* consumption and *enhancer* consumption was processed by using Semi Quantitative Food Frequency Questionare (SQ-FFQ). Hypothesis analyzed carried out by rank spearman correlation test

RESULTS

Sample Characteristics

This study used high school students in class XI, female, aged 16-17 years. There were 41 people (66.1%) aged 16 years, and 21 people (33.9%) aged 17 years. Measuring of Anemia status by cecking of hemoglobin (Hb) level. In this study the lowest hemoglobin level was 9.1 g/dL, the highest was 17.8 g/dL, the average was 15 g/dL. The complete data can be seen in Table 1.

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Table 1

Sample Distribution according of Anemia Status

o Status Anemia	Observation result	
	n.	%
No anemia (≥12g/dl)	48	77,4
Anemia (<12 g/dl)	14	22,6
Total	62	100,0

Based on the research results, of the 62 samples of female students, there were 48 female students (77.4%) who did not suffer from anemia (hemoglobin level ≥12 g/dl) and 14 female students (22.6%) who were declared anemic (hemoglobin level < 12 g/dl). The 14 female students who were anemic, there were 8 students with mild anemia (12.9%), and 6 students who were declared moderately anemic (9.7%).

Iron Consumption Inhibitor

The inhibitor food source that can inhibits the absorption of iron in the body. Food that is classified as food *inhibitor* includes beverage such as tea and coffee, oxalic acid (spinach), and phytic acid (nuts). The complete data can be seen in Table 2

Table 2

Sample Distribution according to Iron Inhibitor Consumption in the Last 1 Month

o	Consumption *Inhibitor* Iron	Observation result	
		n.	%
	Coffee	38	61,2
	Tea	60	96,7
	Spinach	62	100,0
	Nuts	62	100,0

Based on the research results, of the 62 samples, 38 people (61.2%) consumed coffee, 60 people (96.7%) consumed tea, 62 people (100.0%) consumed spinach, and 62 people (100.0%) consumed coffee. 100.0%) consumed nuts. The following in Table 3 shows the number of samples consuming the source *inhibitor* iron

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Table 3

Sample Distribution Based on Iron Inhibitor Frequency Consumption

o	Consumption *Inhibitor* Iron	Observation result	
		n.	%
	Often	19	30,6
	Sometimes	31	50,0
	Less	12	19,4
	Total	62	100,0

Based on the results of this research, there were 62 samples who consumed the source of inhibitor 19 people (30.6%) included iron in the frequent category, in the category of occasionally consuming sources of inhibitor iron as many as 31 people (50.0%), and in the category of consuming less source of inhibitor iron by 12 people (19.4%).

Iron Enhancer Consumption

Source of *enhancer* Iron is a food that contains substances can help iron absorption in the body. . The type *enhancer* Iron is a source of animal protein such as chicken, fish, eggs, chicken liver and source of vitamin C (papaya, oranges, mango). Complete data can be seen in Table 4

Table 4

Sample Distribution According to Consumption *Enhancer* Iron In The Last 1 Month

o	Consumption *Enhancer* Iron	Observation result	
		n.	%
	Pawpaw	58	93,5
	Orange	62	100,0
	Please	62	100,0
	Chicken meat	62	100,0
	Counts	62	100,0
	Fish	58	93,5
	Chicken liver	57	91,9

Based on the research results, of the 62 samples, 58 people (93.5%) consumed papaya, 62 people (100.0%) consumed oranges, 62 people (100.0%) consumed mango, 62 people (100.0%) consumed %) consumed chicken meat, as many as 62 people 9100.0%) consumed eggs, as many as 58 people (93.5%) consumed fish,

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and as many as 57 people (91.9%) consumed chicken liver

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Table 5

Sample Distribution Based on Consumption Frequency *Enhancer* Iron

o	Consumption *Enhancer* Iron	Observation result	
		n.	%
	Often	21	33,9
	Sometimes	29	46,8
	Less	12	19.4
	Total	62	100,0

Based on the research results, there were 62 samples consuming the source*enhancer* iron in the frequent category was 21 people (33.9%), the category sometimes consumed source*enhancer* iron in 29 samples (46.8%), and in the category of consuming less source*enhancer* iron by 12 people (19.4%).

Consumption Relation Inhibitor Iron with Anemic Status

It is known that from a sample of 48 female students who were not anemic, they were categorized as frequently consuming food inhibitor iron as many as 31 people (83.8%), in the category of sometimes consuming sources inhibitor iron by 17 people (73.9%), in the category of consuming less sources inhibitor iron as many as 0 people (0.0%). Meanwhile, the 14 samples of female students who were anemic were included in the category of frequently consuming sources inhibitor iron as many as 6 people (16.2%), in the category of sometimes consuming sources inhibitor iron as many as 6 people (26.1%), and in the category of consuming less sources inhibitor iron as many as 2 people (100.0%). Complete data can be seen in Table 6

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Table 6

Sample Distribution Based on Consumption Frequency*Inhibitor* Iron and Anemia Status

Consumption*Inhibitor* Iron	Status Anemia						p
	Not Anemic		Anemia		Total		
	n.	%	n.	%	n.	%	
Often	31	83.8	6	16.2	37	100	0,034
Sometimes	17	73.9	6	26.1	23	100	
Less	0	0.0	2	100.0	2	100	

Based on research results by Pearson analyzed obtained p value = 0.034 (p<0,05) which means there is a significant relationship between consumption inhibitor iron with anemia status.

Enhancer Iron Consumption Frequency Relation with Anemic Status

According 48 female students who were not anemic, they were categorized as frequently consuming food enhancer iron as many as 21 people (100.0%), in the category of sometimes consuming sources enhancer iron by 25 people (86.2%), in the category of consuming less sources enhancer iron as many as 2 people (16.7%). Meanwhile, the 14 samples of female students who were anemic were included in those who sometimes consumed the source enhancer iron as many as 4 people (13.8%), and in the category of consuming less source*enhancer* iron as many as 10 people (83.3%). Complete data can be seen in Table 7

Table 7

Sample Distribution Based on Enhancer Iron Consumption Frequency and Anemia Status

Iron *Enhancer* Consumption	Status Anemia						P
	Not Anemic		Anemia		Total		
	n.	%	n.	%	n.	%	
Often	21	100.0	0	0.0	21	100	0,001
Sometimes	25	86.2	4	13.8	29	100	
Less	2	16.7	10	83.3	12	100	

Based on statistical by Pearson analyzed the p value obtained = 0.001, which means there was a significant relationship between consumption of enhancer iron with anemia status.

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DISCUSSION

Based on the 62 respondents, it was found that 48 female students (77.4%) were not anemic, while 14 students (22.6%) were anemic. Of the 14 samples who were anemic, 6 people (16.2%) consumed it *inhibitor* Iron is in the frequent category, as many as 6 people (26.1%) consume it *inhibitor* iron in the sometimes category, and in the Less category by 2 people (100.0%). Source *inhibitor* those consumed most were spinach and nuts by 62 people (100%) while those consumed least were coffee by 38 people (61.2%). Inhibitors are substances that inhibit iron absorption, leading to anemia. There is a significant relationship between consumption of iron inhibitors and anemia status (p=0.034). Analysis of the relationship between female students' intake of iron inhibitors and anemia status revealed a significant relationship, because most female students liked to eat spinach. Nuts and other foods inhibit the absorption of iron.

Most female students who suffer from anemia do not consume enough food *enhancer* iron by 10 people (83.3%) and those who were not anemic were included in the category of occasionally consuming food sources *enhancer* iron as many as 25 people (86.2%). Four female students who were anemic (14%) consumed food sources *enhancer* with the category sometimes. The sources of enhancers most consumed were oranges, mangoes, chicken meat and eggs as many as 62 people (100%) and the least consumed were chicken livers as many as 57 people (91.9%). Consumption *enhancer* iron and the anemia status of female adolescent students were significantly related (p=0.000).

In this study, it was concluded that there was a relationship between consumption *inhibitor* and *enhancer* iron with anemia status. Based on the results, the analysis of the relationship between consumption patterns *inhibitor* It was found that there was a significant relationship between iron and anemia status in young female students because most of the female students liked to consume spinach, nuts, and other sources of iron *inhibitor.* The food ingredients contained in oxalic acid are most commonly found in vegetables, one of which is spinach. Oxalate content in the body can inhibit the absorption of iron, making it difficult to absorb. Based on the results of the analysis of the relationship between consumption patterns *enhancer* It was found that there was a significant relationship between iron and anemia status in adolescent girls because the majority of female students who were anemic did not consume the source *enhancer* iron such as vitamin C and animal protein. Where vitamin C plays a role in helping the absorption of iron into the body. Vitamin C acts as an astringent *enhancer* which functions to help increase the absorption of non-heme iron by changing the ferrous form to ferrous so that it is easily absorbed by the body. By converting iron into ferrous iron it will be more easily absorbed into the body. Animal protein plays a role in the formation of red blood cells containing

CONCLUSIONS AND SUGGESTIONS

The hemoglobin levels of female students at SMAN 6 Denpasar averaged 15 g/dL, the highest was 17.8 g/dL and the lowest was 9.1 g/dL. With an anemia rate of 22.6%. Frequency of consumption *inhibitor* iron in the last month in the frequent category was 30.6% and less was 19.4%. Frequency of consumption *enhancer* iron in the last month in the frequent category was

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33.9% and less was 19.4%. There is a relationship between anemia status and consumption *inhibitor* iron in female students of SMAN 6 Denpasar. There is a relationship between anemia status and consumption *enhancer* iron in female students of SMAN 6 Denpasar. It is recommended that research subjects be more obedient in consuming foods that play a role in helping the absorption of iron (chicken meat, eggs, fish, chicken liver, papaya, oranges, mangoes) and avoid factors that can trigger anemia and are expected to reduce sources of iron. Foods that can inhibit iron absorption, for example (tea, coffee, spinach, nuts).

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