INHIBITOR AND ENHANCER FACTOR CONSUMPTION RELATION WITH ANEMIA IN ADOLESCENT GIRLS

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ABSTRACT

Adolescence is a golden period with optimal growth and development. At this time, teenagers have very important physical and psychological needs. Moreover, if there is malnutrition, one of the problems is anemia. Anemia is a global public health problem that affects adolescent girls, women of childbearing age, pregnant women, and children in developed and developing countries. This study aims to analyze the correlation between inhibitor and enhancer consumption and anemia in adolescent girls. This is a cross-sectional study conducted in Semarang City. Early adolescents ages 10 – 15 years old, and fulfill the inclusion and exclusion criteria were selected using a questionnaire. Consumption of inhibitors and enhancers of iron was measured using a semi-qualitative food frequency questionnaire. Anemia status was measured using a digital hemoglobin meter device. The Chi-square test and Fisher's exact test were used to analyze the research data. The result of this study shows there is no significant correlation between the consumption of inhibitors and enhancers of iron toward anemia status among adolescent girls with p-values 0.158 and 0.744 > α (CI:95%) respectively. Adolescents should be concerned about what they consume, and information about what food can enhance and obstruct iron should be socialized so they can be wiser to reduce consumption inhibitors and increase consumption enhancers of iron.

Keywords: inhibitor; enhancer; iron; anemia; adolescent girl.

Introduction

Adolescence is a golden period with optimal growth and development. At this time, teenagers have critical physical and psychological needs. Moreover, if there is malnutrition, one of the problems is anemia. Anemia is a global health problem that affects adolescent girls, women of childbearing age, pregnant women, and children in developed and developing countries [1–3]. Teenagers are said to be anemic if their hemoglobin level is less than 12 g/dl[4].

Anemia in Indonesia in women of childbearing age (15–49 years) increased from 21.6% in 2018 to 22.3% in 2019[5]. Women are more susceptible to anemia than men. The need for iron as a micronutrient in women is 3 times greater than in men. Every month, women experience menstruation which causes the loss of menstruation. That's why women need iron to restore conditions that men don't experience [6].

Anemia can cause various bad impacts on adolescent girls and women of childbearing age, including reducing the body's resistance so that anemia sufferers are easily susceptible to infectious diseases; decreased fitness and agility of thinking due to lack of oxygen to muscle cells and brain cells; decreased learning achievement and work productivity/performance[7].

Enhancers are a type of food that can increase iron absorption. Food ingredients that are enhancers include oranges, papaya, and animal protein sources such as beef, chicken, and fish. Inhibitors are types of food that can cause iron absorption to be hampered. Foods that include inhibitors are cereals, nuts, tea, coffee, cocoa, oregano, milk, yogurt, and cheese[8]. This study aimed to analyze the consumption of inhibitor and enhancer factors of iron toward anemia status among adolescent girls.

Methods

This is a cross-sectional study that was set in December 2023 and used 10 to 15-year-old adolescent girls at the middle school level in SMPTQ Pangeran Diponegoro, Semarang City. The number of respondents in this study was 92 out of 108 fit with inclusion and exclusion criteria and were already calculated using a formula.

Anemia status was measured using a digital hemoglobin meter device. This study used a semi-quantitative Food Frequent questionnaire to measure the history of enhancer and inhibitor consumption of iron. Data analysis was done by the Chi-Square Test and Fisher's Exact Test depending on the condition of the data. This study already conducted the ethical research that was approved by the Ethics Committee of Poltekkes Kemenkes Semarang on December 2023, Number 1802/EA/KEPK/2023.

Results and Discussion

Table 1. represents the characteristics of respondents in this study showing that the majority are 14 years old (47.8%), have a normal BMI (54.3%), have unnormal MUAC (57.6%), and period length (51.1%), also more than half of them have a breakfast habit (65.2%). The majority of respondents have a normal hemoglobin level (75%).

This study finds that most adolescent girl has a habit of consuming inhibitor factors of iron

and have a normal hemoglobin level or are not in an anemic condition (54.3%). The result of the chi-square test based on Table. 2 shows there is no statistical correlation between consuming inhibitor factors of iron and anemia (p-value $0.158 > \alpha$ (CI:95%)). The relative risk score is 2.095 which means respondents who have a habit of consuming inhibitor factors of iron have a 2.095-time risk of anemia compared with respondents who don't have that habit. In the questionnaire, we find that more than half of respondents have a habit of consuming tea more than 4 times a week.

Table 1. Characteristic of Respondents

Characteristics	n	%
Ages		
12	24	26.1
13	24	26.1
14	44	47.8
BMI		
Normal	50	54.3
Unnormal	42	45.7
MUAC		
Normal	39	42.4
Unnormal	53	57.6
Period length		
Normal	45	48.9
Unnormal	47	51.1
Breakfast Habit		
Yes	60	65.2
No	32	34.8
Anemia Status		
Yes	23	25
No	69	75

The latest study found that consuming inhibitor factors for iron have a correlation with anemia in a study conducted in 2021 (p-value $0.004 < \alpha$ (CI:95%)). However, this latest study has shown that adolescents who frequently consume inhibitor factors of iron are at a 4.94-point higher risk of developing anemia[9].

Inhibitors of press assimilation incorporate phytate, which may be a compound found in plant-based diets that illustrate a dose-dependent impact on press retention. Polyphenols are found in dark and homegrown tea, coffee, wine, vegetables, cereals, natural products, and vegetables and have been illustrated to hinder press assimilation. Not at all like other inhibitors such as polyphenols and phytates, which

anticipate as it were non-heme press assimilation, calcium represses both heme and non-heme press at the point of beginning take-up into enterocytes. Creature proteins such as casein, whey, egg whites, and proteins from plants (soy protein) have appeared to repress press assimilation in people. Oxalic corrosive is found in spinach, chard, beans, and nuts and acts to tie and hinder[10].

Table 2. Correlation of Inhibitor Factors of iron consumption and Anemia Status among adolescent girl

Inhibitor factors of iron consumption	Anemia Status				Total		p-value	RR
	Yes		No					
	n	f	n	f	n	f		
Rare	3	3.3	19	20.7	22	23.9		
Often	20	21.7	50	54.3	70	76.1	0.158*	2.095
Total	23	25	69	75	92	100		

*Chi-square Test

Table 3 shows that the majority of the respondents have a habit consume enhancer factors of iron often and have normal hemoglobin levels or are in non-anemic condition (64.1%). The statistical analysis using Fisher's exact test shows that there is no significant correlation between consuming enhancer factors of iron to anemia among adolescent girls (p-value 0.158 > α (CI:95%)). The score of relative risk represents that respondents who rarely consume enhancer factors of iron have a 1.173 risk of having anemia. Another finding of this study is a lot of respondents have a habit of consuming Tempe more than 4 times a week.

Same as the latest study found there is no significant correlation between enhancer consumption toward anemia among adolescents (p-value 0.18 > α (CI:95%)). OR score in this previous study is 0.49. It means that enhancer consumption was not a risk factor for anemia, but it was a preventing factor for anemia. Adolescents who have a habit of consuming enhancer factor of iron will be spared from anemia[9].

Fermented foods that already contain high levels of organic acids may be a suitable means of iron fortification[11].

Enhancers of press retention are ruled by the impact of ascorbic corrosive (vitamin C), which can overcome the impacts of all dietary inhibitors when it is included in a count of calories with tall non-heme press accessibility (more often than not a feast overwhelming in vegetables). Ascorbic corrosive shapes a chelate with ferric (Fe3+) press within the moo pH of the stomach, which persists and remains solvent within the antacid environment of the duodenum[10].

Table 3. Correlation of Enhancer Factors of iron consumption and Anemia Status among adolescent girl

Enhancer factors of iron consumption	Anemia Status				Total		p-value	RR
	Yes		No					
	n	f	n	f	n	f		
Rare	4	4.3	10	10.9	14	15.2		
Often	19	20.7	59	64.1	78	84.8	0.744*	1.173
Total	23	25	69	75	92	100		

*Fisher's Exact Test

Conclusion

There is no significant correlation between the consumption of iron inhibitors and enhancers toward anemia status among adolescent girls. Adolescents should be concerned about what they consume, and information about what food can enhance and obstruct iron should be socialized so they can be wiser to reduce consumption inhibitors and increase consumption enhancers of iron.

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