

The Influence of Nutrient Intake and Blood-Boosting Tablet Consumption on Anemia among Female Students of Tebing Tinggi Vocational High School

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ABSTRACT

Adolescent girls have a tenfold higher risk of developing anemia compared to boys. This is due to factors such as monthly menstruation and increased iron requirements during growth. This study aims to analyze the influence of nutrient intake, vitamin C and the consumption of iron supplements, on anemia among female students at SMKN schools in Kota Tebing Tinggi. The study follows an observational analytic design with a cross-sectional approach. The findings of the study did not show any significant influence the consumption of iron supplements on the anemia status of female students at SMKN schools in Kota Tebing Tinggi. However, there was a significant impact of vitamin C intake on the anemia status of female students. It is recommended that schools raise awareness among female students about the importance of balanced nutrition in preventing anemia through counseling, campaigns, promoting understanding about the consumption of iron supplements, and providing support to maintain consistency in their consumption.

INTRODUCTION

Anemia is a health problem experienced by all age groups in Indonesia, and it is related to the Global Nutrition Target and the Sustainable Development Goals. The World Health Organization (WHO) recommends reducing the prevalence of anemia among women of reproductive age. The Indonesian government addresses anemia prevention and control among adolescent girls through the provision of iron-folic acid supplementation (IFA) in schools. Adolescence is a transitional period from childhood to adulthood, and according to WHO, individuals aged 10-19 years are considered adolescents. The Ministry of Health Regulation in Indonesia defines adolescents as individuals aged ten to eighteen years.

Nutritional issues in adolescent girls, particularly anemia caused by iron deficiency, have been a concern. Adolescent girls have a ten times higher risk of experiencing anemia compared to boys due to menstruation and higher iron requirements. Other factors such as imbalanced dietary intake and a tendency to restrict food also contribute to anemia in adolescent girls. Having an Hb level less than 12 g/dL indicates anemia in adolescent girls and women of reproductive age. Irregular eating patterns, limited intake of iron-rich foods, lack of knowledge, environmental influences, and nutritional status can lead to anemia. Iron deficiency and other micronutrient deficiencies such as vitamin B12, vitamin A, and vitamin C also play a role in the occurrence of anemia.

Anemia prevention involves consuming iron-rich foods, folate, vitamin A, vitamin C, and zinc, as well as receiving iron supplementation through iron-folic acid tablets (IFA). The government has provided free IFA tablets to adolescent girls in junior high school and senior high school to meet their iron needs. The administration of one tablet per week for 52 weeks has been effective in preventing anemia and improving iron stores. An initial survey conducted at SMKN 2 Kota Tebing Tinggi showed that 5 out of 30 female students (16.66%) had anemia with hemoglobin levels below 12 g/dL. Although the students received iron-folic acid supplementation (IFA) from the school, many of them did not consume them regularly due to forgetfulness or dislike. Data from the Tebing Tinggi Health Office indicated that 65.3% of students in grades VII to XII consumed IFA tablets, surpassing the target of 54%. Information from the School Health Effort (UKS) teacher and the Nutrition Officer at the Tanjung Marulak Community Health Center revealed that IFA tablets were distributed to schools every month and given to students in grades X to XII. The health center sometimes directly provided IFA tablets to students in classrooms and monitored their consumption. Based on a 24-hour food recall, the energy intake of the students ranged from 823.37 kcal to 2087.02 kcal. Additionally, there was variation in the intake of vitamin C. The students tended to skip breakfast and dinner due to a lack of appetite in the morning and concerns about weight gain (body image).

The impact of anemia on adolescent girls, especially those in vocational schools (SMK), can affect their ability to enter the workforce. Work productivity among adolescents is influenced by their nutritional status. However, there is a lack of research on anemia and the consumption of iron-folic acid

supplementation (IFA) in Kota Tebing Tinggi, while the prevalence of anemia among adolescent girls remains high in Indonesia. Therefore, the researchers aim to investigate anemia, the consumption of iron-folic acid supplementation (IFA), and the nutritional intake of adolescent girls in SMK Negeri Kota Tebing Tinggi.

THEORETICAL REVIEW

According to Briawan (2014), one of the causes of nutritional anemia is vitamin C deficiency, although it is generally assumed that fifty percent of anemia cases are caused by iron deficiency. Other factors that can cause anemia include low iron absorption in the body, malaria, presence of parasites such as worms, infectious diseases, and genetic problems such as hemoglobinopathies and sickle cell trait. Iron deficiency can occur due to increased iron requirements in the body. Anemia is primarily caused by inadequate intake of iron-rich foods and is the most common nutritional disorder found in adolescent girls.

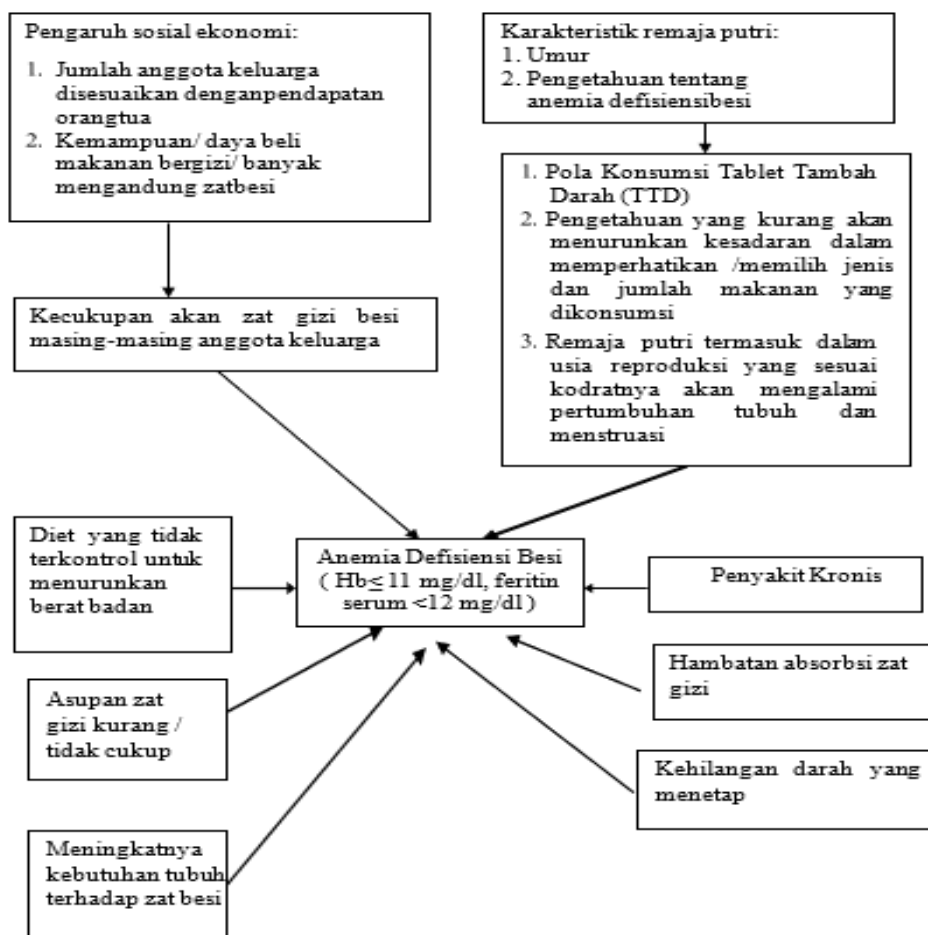


Figure 1. Anemia

Conceptual Framework

Based on the theoretical framework, the author developed a conceptual framework for the study with independent variables consisting of nutrient intake and Iron-folic acid supplementation (IFA) (IST). The dependent variable is the occurrence of anemia in adolescent girls.

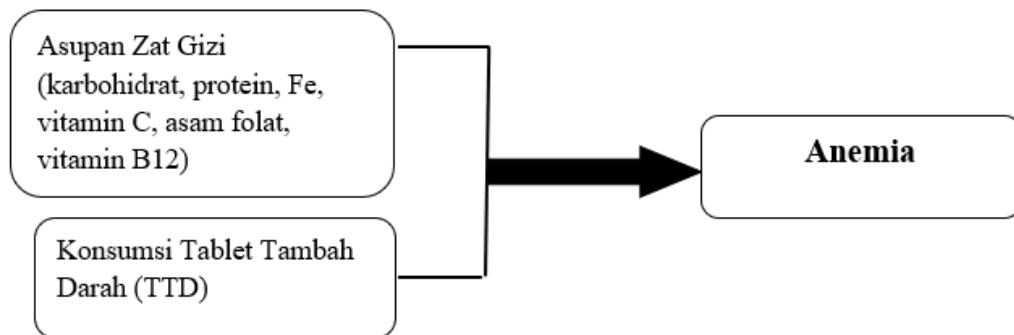


Figure 2. Conceptual Framework

METHODOLOGY

This study utilizes an analytical observational approach with a cross-sectional research design to analyze the relationship between the dependent variable (anemia status) and independent variables (vitamin C intake and iron supplementation tablet consumption). The research was conducted in four public vocational high schools in Tebing Tinggi City, involving all female students as the sample, totaling 288 students. The primary data includes respondent profiles, vitamin C intake, iron supplementation tablet consumption, and hemoglobin levels, while the secondary data consists of general school information obtained through direct interviews and school archives. The relationship between variables will be analyzed using the chi-square correlation test.

RESULTS

Research Location

Kota Tebing Tinggi is located in the province of North Sumatra, approximately 78 kilometers from the city of Medan. Its geographic coordinates are 3°19'00"-3°21'00" north latitude and 98°11'-98°21' east longitude. Tebing Tinggi City is situated in the Tebing Tinggi District, Serdang Bedagai Regency, with boundaries such as PTPN III Rambutan to the north, PT. Socfindo Kebun Tanah Besih to the east, PTPN III Kebun Pabatu to the south, and PTPN III Kebun Gunung Pamela Bandar Bejambu to the west.

Table 1. Research Location

School	Address
SMK Negeri 1 Tebing Tinggi	Jl. Letda Sujono No.20612, Bulian, Kec. Bajenis, Kota Tebing Tinggi
SMK Negeri 2 Tebing Tinggi	Jalan Gunung Leuser, Tanjung Marulak, Kec. Rambutan, Kota Tebing Tinggi
SMK Negeri 3 Tebing Tinggi	Jl. Nangka, Rambung, Kec. Tebing Tinggi, Kota Tebing Tinggi
SMK Negeri 4 Tebing Tinggi	Jl. Abdul Hamid No.103, Tebing Tinggi, Kec. Padang Hilir, Kota Tebing Tinggi

Responden Age

There are four age categories observed, namely 15, 16, 17, and 18 years old. A total of 68 respondents (23.6%) are 15 years old, 136 respondents (47.2%) are 16 years old, 74 respondents (25.7%) are 17 years old, and 10 respondents (3.5%) are 18 years old. In total, there are 288 respondents who serve as the sample for this study. Additionally, the results of the statistical analysis show that the mean age of the respondents is 16.09 years, with a standard deviation (SD) of 0.79. This indicates that the age of the respondents tends to be around 16 years with a relatively low level of variation.

Table 2. Responden Age

Age	n = 288	%
15 Year	68	23,6
16 Year	136	47,2
17 Year	74	25,7
18 Year	10	3,5
Mean ± SD	16,09 ± 0,79	

Vitamin C Intake

Data on the nutritional intake of female students in SMK Negeri Kota Tebing Tinggi was obtained through a 24-hour food recall method conducted twice. This method involves the students recalling and reporting the food and beverages they consumed during those periods. Regarding the intake of vitamin C, 279 individuals (96.9%) had insufficient intake, while only 9 individuals (3.1%) had sufficient intake.

Table 3. Vitamin C Intake

Vitamin C Intake	N = 288	%
Kurang	279	96.9
Baik	9	3.1

Consumption of Iron-Folic Acid Supplementation

Analysis was conducted to determine the consumption of iron-folic acid supplementation (IFA), taking into account the quantity consumed on a weekly basis, during menstruation, and during school holidays. The table illustrates the results of the analysis on the consumption of iron-folic acid supplementation (IFA) among the 288 respondents. From the table, it can be observed that 26 respondents (9%) consumed the iron-folic acid supplementation (IFA) regularly, while 262 respondents (91%) consumed them irregularly.

Table 4. Consumption of Iron-Folic Acid Supplementation

Consumption of Iron-Folic Acid Supplementation	n = 288	%
Regular	26	9
Irregular	262	91

Anemia Status

Based on the data collected, the hemoglobin levels of the female students in SMK Negeri in Tebing Tinggi City were measured to determine the prevalence of anemia. The data resulted in a proportion of anemia prevalence, as shown in the table. Out of the total 288 respondents, 112 of them were found to have anemia, contributing to 38.9% of the total number of respondents. On the other hand, 176 respondents (61.1%) did not have anemia. The average hemoglobin level measured was 12.8 ± 6.2 , indicating variation in the hemoglobin levels among the respondents. This information provides an overview of the prevalence of anemia among the female students in SMK Negeri in Tebing Tinggi City.

Table 5. Anemia Status

Anemia Status	n = 288	%
Anemia	112	38.9
Non Anemia	176	61.1

The Relationship between Vitamin C Intake and Anemia Status

Information regarding the relationship between vitamin C intake and anemia status among female students of SMK Negeri in Tebing Tinggi City. The data in this table can be used to observe the correlation between vitamin C consumption and the prevalence of anemia among the female student population.

Table 6. Vitamin C Contingency and Anemia Status in a Sample of Schoolgirls at Vocational High Schools in Tebing Tinggi City

Vitamin C Intake	n = 114	n = 174	p
	Anemia	Non Anemia	
Insufficient	114	162	0.004
Adequate	0	12	

The table shows the relationship between vitamin C intake and anemia status among the respondents. In the group with insufficient vitamin C intake, there were 114 respondents who experienced anemia and 162 respondents who did not have anemia. In the group with adequate vitamin C intake, there were no respondents with anemia, while 12 respondents did not have anemia. The statistical test result shows a p-value of 0.004. If the p-value is less than the alpha level (0.05), it can be concluded that there is a significant relationship between vitamin C intake and anemia status among female students of SMK Negeri in Tebing Tinggi City. In other words, vitamin C intake is associated with an increased risk of anemia among these female students.

The Relationship between the Consumption of Iron-Folic Acid Supplementation (IFA) and the Status of Anemia

The information regarding the relationship between the consumption of iron-folic acid supplementation (IFA) and the status of anemia among the female students of SMK Negeri in Kota Tebing Tinggi is presented in the table. This data can be used to examine the association between the consumption of iron-folic acid supplementation (IFA) and the prevalence of anemia in the population of female students.

Table 7. Contingency Table of Consumption of Iron-Folic Acid Supplementation (IFA) and Anemia Status among Female Students in Vocational High School in Tebing Tinggi City

Consumption of Iron-Folic Acid Supplementation (IFA)	n = 112		n = 176		p
	Anemia	Non Anemia	Anemia	Non Anemia	
Irregular	101	159			0.436
Regular	13	15			

Based on the presented table, there is data on the consumption of iron-folic acid supplementation (IFA) and the status of anemia among the respondents. In the group of respondents who consume iron-folic acid supplementation (IFA) irregularly, there are 101 respondents who have anemia and 159 respondents who do not have anemia. Meanwhile, in the group of respondents who consume iron-folic acid supplementation (IFA) regularly, there are 13 respondents who have anemia and 15 respondents who do not have anemia. After conducting statistical analysis using the chi-square test, a p-value of 0.436 was obtained. If the p-value is greater than the alpha level of 0.05, it can be concluded that there is no significant association between the regularity of iron supplementation tablet consumption and the status of anemia among the female students of SMK Negeri in Kota Tebing Tinggi.

DISCUSSION

The Relationship between Vitamin C Consumption and Anemia Status among Female Students of SMK Negeri in Kota Tebing Tinggi

Based on the conducted research, it was found that in the group of respondents with good vitamin C consumption, there is a significant difference between the number of respondents who do not have anemia - 12 respondents - and those who have anemia - no respondents have anemia. Thus, the results of this study clearly indicate that good vitamin C consumption has a significant association with the occurrence of anemia among the respondents under investigation. These findings suggest that adequate intake of vitamin C has the potential to protect the respondents from the risk of anemia. Vitamin C plays a crucial role in the absorption of non-heme iron, which can improve iron status in the body and prevent anemia. Therefore, promoting the consumption of vitamin C-rich foods such as fruits and vegetables can be an effective strategy in the prevention and management of anemia.

Based on the findings of the conducted research (Trisnawati, 2014), good vitamin C consumption is significantly associated with the absence of anemia among female students of SMK Negeri in Kota Tebing Tinggi. Adequate intake of vitamin C can protect the students from the risk of anemia by enhancing iron absorption in the body. Therefore, promoting the consumption of vitamin C-rich foods such as fruits and vegetables can be an effective strategy in the prevention and management of anemia (Choiriyah, 2015). Vitamin C also plays a crucial role in the absorption of non-heme iron, which can improve iron status in the body and prevent the occurrence of anemia (Almatsier, 2010).

The results of this study indicate that adequate vitamin C intake plays a vital role in preventing anemia among adolescent girls. By increasing the consumption of vitamin C-rich foods, such as fruits and vegetables, adolescent girls can enhance iron absorption and maintain optimal nutritional balance, thereby reducing the risk of anemia and promoting overall health (Departemen Gizi dan Kesehatan Masyarakat, 2007; Safyanti and Andrafikar, 2018).

The Relationship between Consumption of Iron-Folic Acid Supplementation (IFA) and Anemia Status among Female Students of SMK Negeri in Kota Tebing Tinggi

Based on the conducted study, it was found that there was no significant difference between the number of respondents who did not have anemia (159 respondents) and those who had anemia (101 respondents) in the group of respondents with irregular consumption of iron-folic acid supplementation (IFA). This finding indicates that, in the context of this study, irregular consumption of iron-folic acid supplementation (IFA) does not have a significant relationship with the occurrence of anemia among the respondents.

Irregular consumption of iron-folic acid supplementation (IFA) may not provide optimal benefits in preventing or managing anemia (Briawan et al.). To achieve better results, it is important to consistently and correctly consume iron-folic acid supplementation (IFA) according to the instructions. Other factors such as unmet nutritional needs and underlying health issues can also contribute to the occurrence of anemia.

Supplementing with iron through iron-folic acid supplementation (IFA) is an effective solution in preventing and addressing anemia among adolescent girls and women of childbearing age. However, for optimal results, the consumption of iron-folic acid supplementation (IFA) needs to be accompanied by a balanced and adequate diet, including sufficient intake of protein and iron. It is also recommended to consume iron-folic acid supplementation (IFA) with water and consume vitamin C-rich fruits such as oranges, papayas, mangoes, and guavas to enhance iron absorption. It is important to avoid consuming iron-folic acid supplementation (IFA) together with coffee, milk, or tea, as they can reduce iron absorption.

One challenge faced is the lack of compliance in consuming iron-folic acid supplementation (IFA). Better supervision and motivation are needed to improve compliance in consuming iron-folic acid supplementation (IFA) as recommended (Briawan et al.). Increasing public awareness of the importance of consuming iron-folic acid supplementation (IFA) correctly and providing adequate support in supervision and motivation at home are also necessary. Thus, it is hoped that the consumption of iron-folic acid supplementation (IFA) can provide greater benefits in preventing and managing anemia among adolescent girls and women of childbearing age.

CONCLUSIONS AND RECOMMENDATIONS

There is a significant relationship between vitamin C nutrient intake and the occurrence of anemia in female students at SMKN in Tebing Tinggi City ($p < 0.05$, $p = 0.015$). On the other hand, there is no significant relationship between the consumption of iron-folic acid supplementation (IFA) and the occurrence of anemia in female students at SMKN in Tebing Tinggi City ($p > 0.05$, $p = 0.426$).

To the school authorities, it is necessary to provide information and education about the importance of balanced nutrient intake to prevent anemia. This can be done through health counseling, seminars, or relevant educational materials. Encourage the female students to consume nutrient-rich foods and provide facilities that facilitate access to nutritious meals at school. Additionally, organize health education programs involving nutrition experts to provide accurate information on nutrient consumption and the use of iron supplementation. The students need to raise awareness about the importance of balanced nutrient intake and seek assistance from nutritionists or relevant medical professionals if they have concerns about their nutritional status or anemia. With knowledge, education, and assistance from professionals, the students can understand the importance of maintaining good health and preventing anemia through a healthy diet and appropriate care.

FURTHER STUDY

This study relied on the food recall method or the students' recall of food intake and consumption of iron-folic acid supplementation (IFA). This method is prone to memory bias or reporting errors. The use of more objective data collection methods, such as direct observation or biomarker measurements, can provide more accurate and reliable results.

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