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RISK FACTORS FOR THE INCIDENCE OF ANEMIA IN YOUNG WOMEN

Faktor Risiko Kejadian Anemia Pada Remaja Putri

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ABSTRACT

Background: The prevalence of anemia in adolescents is still high in Jambi Province at 60.45%. Anemia can cause a decrease in body resistance and fitness, thereby inhibiting adolescent productivity. **Purpose:** Research objectives to determine the prevalence of anemia and risk factors for the incidence of anemia in young women. **Methods:** Cross-sectional research design, located in State Senior High School 8 of Jambi City from January to April 2019. Population 552 girls, with a sample of 83 girls in classes X and XI. The proportioned stratified random sampling technique was taken. The research variables were knowledge, breakfast, tablets, blood consumption, nutritional status, enhancing foods and iron absorption inhibitors, infectious diseases, and heavy meal frequency. The dependent variable was anemia. Interviews and secondary data from the measurement of Hb were conducted for primary data collection. Data would be analyzed with chi-square analysis. **Results:** The incidence of anemia among young women was 42.17%. There was relationship of knowledge (PR=2.05; 95% CI=1.30-3.24), blood tablet supplementation (PR=2.95; 95% CI =1.02-8.54), Breakfast (PR=3.03; 95% CI=1.41-6.48), and frequency of heavy eating (PR = 0.52; 95% CI=0.28-0.97) with the incidence of anemia. **Conclusion:** Factors associated with anemia among young women are knowledge, consumption of tablets plus blood, breakfast, and frequency of heavy eating.

ABSTRAK

Latar Belakang: *Prevalensi anemia remaja masih tinggi, di Provinsi Jambi sebesar 60,45%. Anemia dapat menyebabkan menurunnya daya tahan tubuh dan kebugaran, sehingga menghambat produktivitas remaja.* ***Tujuan:*** *untuk mengetahui prevalensi anemia dan faktor yang menjadi risiko dari kejadian anemia atau kurang*

darah pada remaja putri. **Metode:** *Desain penelitian yang digunakan adalah cross-sectional, dan bertempat di SMA Negeri 8 Kota Jambi dilakukan selama Januari – April 2019. Populasi 552 remaja putri, dengan sampel 83 remaja putri kelas X dan XI. Teknik pengambilan sampel menggunakan proportioned stratified random sampling. Variabel penelitian adalah pengetahuan, sarapan, konsumsi tablet tambah darah, status gizi, makanan peningkat dan penghambat penyerapan zat besi, penyakit infeksi, dan frekuensi makan berat dengan variabel dependen adalah anemia. Pengumpulan data primer dilakukan wawancara dan data sekunder hasil pengukuran Hb. Data dianalisis dengan uji chi square.* **Hasil:** *Kejadian anemia remaja putri sebesar 42,17%. Ada hubungan pengetahuan (PR=2,05; 95% CI=1,30-3,24), konsumsi tablet Fe (PR=2,95; 95% CI=1,02-8,54), Sarapan (PR=3,03; 95% CI=1,41-6,48), dan frekuensi makan berat (PR=0,52; 95% CI=0,28-0,97) dengan terjadinya anemia pada remaja.* **Conclusion:** *Faktor yang memiliki hubungan dengan terjadinya anemia atau kurang darah pada remaja putri yaitu pengetahuan, konsumsi tablet tambah darah, sarapan, dan frekuensi makan berat.*

INTRODUCTION

Anemia is a condition that affects teenagers worldwide, but particularly in underdeveloped nations like Indonesia. The WHO ranked anemia as the tenth-biggest health issue in 2016, particularly among young and pregnant women. According to the WHO, up to 40% of pregnant women and 42% of children under 5 are anemic (1). Based on the 2019 World Health Organization presentation, an indicator of anemia can be seen from the number and size of erythrocytes and below-normal hemoglobin concentration, which will interfere with the capacity of blood to distribute oxygen throughout the body. The most common cause of anemia is iron deficiency. The high prevalence of anemia usually occurs due to the low food intake the body needs, especially iron, which is the main component of hemoglobin, which functions to synthesize hemoglobin (2). Globally, the prevalence of anemia in low- and middle-income countries (LMIC) varies. In 2018, the highest anemia was in West African, Middle Eastern, and South Asian countries, as much as 50.31% (3). Anemia was closely related to death in mothers and babies during pregnancy and childbirth, including the risk of abortion, giving birth prematurely, and low birth weight (LBW) (4).

Indonesia has experienced an increase in prevalence rates in young women. Based on data from Riskesdas Indonesia in 2007, the occurrence of anemia in young women with an age range of 13-18 years was 19.70%. This number has increased, which in 2013 increased to 22.70%. In 2018, this number has increased to 32% prevalence in young women (5).

A study conducted by Ekasanti et al (2) showed that the factors that influence the incidence of anemia in female adolescents are mother's education, economic factors, diet, inhibitor factors, enhancer factors, intake and content of iron (Fe), intake protein in the body, energy intake, vitamin C content in the body, vitamin A content in the body, food inhibition and increased absorption of iron. Adolescent girls who are anemic experience more problems with nutrition (iron, calcium, folate, and vitamin A) than girls who are not anemic (6).

Based on this background, this study aims to determine the prevalence of anemia and what factors cause anemia in young women at SMA Negeri 8 Jambi.

METHODS

This study used an observational study with a cross-sectional study design. This research was conducted at SMA Negeri 8 Jambi City during January-April 2019. The population in this study were all students at SMA 8 Jambi City, totaling 878 students. The sampling technique used was

simple random sampling by calculating the Lwanga and Lemesshow formula for as many as 83 students consisting of 35 and 48 not anemic. The inclusion criteria in this study were young women aged 15-18 years and students in grades X and XI. Exclusion criteria were female students who were menstruating, fasting, had blood phobia, and had hemophilia, thalassemia, and leukemia, which were known from interviews with respondents or existing medical record data. Sampling was carried out using proportional stratified random sampling.

The level of anemia is known by measuring the Hb level using a multitest (7-10.9 g/dL); anemia status is categorized into anemia and not anemia. Anemia is a condition of the body where the Hb level in the blood is lower than average. The risk factors measured included knowledge, namely the ability of young women to understand problems related to anemia by being categorized as poor (correct answer <55%) and sufficient or good (correct answer => 55%), consumption of blood supplement tablets, namely consumption of supplement tablets blood in respondents categorized into not consuming and consuming. In contrast to nutritional status, the state of nutritional balance of young women, as seen from BMI, is categorized as lacking, excess, and routine. Another independent variable is breakfast, an activity of eating in the morning around 05.00-08.00, carried out by respondents categorized into no/sometimes and yes breakfast. Consumption of foods that inhibit iron absorption, namely tea and cereals, is categorized as yes and no. Foods that increase iron absorption, such as chicken meat and fruit containing vitamin C, are also categorized as yes and no. Infectious diseases are diseases such as diarrhea, worm infections, tuberculosis, malaria, and HIV suffered by young women by being categorized as infected and not infected. The variable frequency of heavy meals is categorized as < 3 times/day and ≥ 3 times/day. In this study, risk factors were measured with a questionnaire that had previously been tested for validity and reliability. The data analysis used was univariate and bivariate analysis using the chi-square test using the SPSS data analysis application. This research has not been done before regarding the various factors that lead to anemia. Research ethics Number B/502/UN21.16/PT.01.04/2019 was obtained from Jambi University to collect research data further.

RESULTS

The results of this study indicate that the average age of the respondents is 15.88 years, with the youngest being 15 years and the oldest being 18 years. The average Hb level was 12.26, with the lowest Hb being 9.30 and the highest being 16.20, while the average body weight was 53.07 kg, with the lowest being 34.70 kg and the highest being 89.90 kg. The respondent's height was 155.76 cm, with the lowest height 145 cm and the highest of 169.20 cm. The frequency of heavy eating was obtained an average of 2.66 times, with the lowest eating frequency being two times and the highest being five times, and the knowledge score had an average of 66.75 (Table 1). Based on the analysis results, it was found that more female adolescents at SMA Negeri 8 Jambi City were not anemic (57.80%). However, those who experienced anemia were still relatively high (42.20%), as shown in Table 2.

The knowledge level of young women at SMAN 8 Jambi City regarding anemia is quite good, namely 89.20%. Research data shows that many young women still do not consume iron supplement tablets, at 78.30%. Regarding the nutritional status of young women, the majority were in the normal category at 69.90%, but there were also quite a lot of those with excess nutritional status (26.50%). Many young women still need to or rarely have breakfast (61.40%).

Contrary to eating items that prevent iron absorption, the findings indicate that consumption is also relatively high (51.80%). In contrast to food consumption data that increases iron absorption, female adolescents consume more, namely 72.30%. Most young women had no history of infectious diseases, at 78.30%. The highest frequency of heavy eating for young women was ≥3x/day, which was 60.20% (Table 2).

The bivariate analysis results showed a difference in the proportion of anemic adolescent girls with less knowledge of 77.80% and sufficient/good knowledge of 37.80%. This is proven by the results of the statistical tests in Table 2, which show a relationship between young women's knowledge and the incidence of anemia at SMAN 8 Jambi City in 2019. Young women with less knowledge are at risk of 2.05 times higher than young women who are knowledgeable enough or good (PR=2.05; 95% CI=1.30-3.24).

Table 1
Description of Risk Factors for Anemia in Young Women

Variable	Means	95% CI	Median	Min	Max	SD
Age of Respondents	15.88	15.71 – 16.05	16.00	15.00	18.00	0.77
Hb levels	12,26	11.93 – 12.59	12,26	9.30	16,20	1.52
Weight	53.07	50.82 – 55.32	49.90	34,70	89.90	10.30
Height	155.76	154.60 – 156.80	155.80	145.00	169,20	5.00
Meal Frequency	2.66	2.83 – 2.80	3.00	2.00	5.00	0.61
Knowledge Score	66.75	64.25 – 69.24	70.00	35.00	85.00	11.43

Table 2
Distribution of Determinant Factors Affecting the Incidence of Anemia in Young Girls at SMAN 8 Jambi City

Variable	Anemia status				Total		PR(95%CI)	*p-values*
	Anemia		Not Anemia					
	n	%	n	%	n	%		
Knowledge								
Not enough	7	77,78	2	22.22	9	10.84	2.05 (1.30– 3.24)	0.03*
Pretty good	28	37.84	46	62.16	74	89.16	1.00	**
TTD consumption								
No	32	49.23	33	50.77	65	78.31	2.95 (1.02-8.54)	0.01*
Yes	3	16.67	15	83.33	18	21.69	1.00	
Nutritional status								
Not enough	2	66.67	1	33,33	3	3.61	1.43 (0.61–3.33)	0.60**
Excess	6	27.27	16	72.73	22	26.51	0.58 (0.28–1.22)	0.19
Normal	27	46.55	31	53.45	58	69.88	1.00	
Breakfast								
Not often	29	56.86	22	43.14	51	61.45	3.03 (1.41–6.48)	0.00*
Yes	6	18.75	26	81.25	32	38.65	1.00	
Inhibitor Food								
No	17	39.53	26	60.47	43	51.81	0.87 (0.53-1.45)	0.77
Yes	18	45.00	22	55.00	40	48.19	1.00	
Enhancer Food								
No	7	30.43	16	69.57	23	27.71	0.65 (0.33-1.28)	0.27
Yes	28	46.67	32	53.33	60	72.29	1.00	
Infectious Diseases								
Infected	9	50.00	9	50.00	18	21.69	1.25 (0.72–2.16)	0.62
Not Infected	26	40.00	39	60.00	65	78.31	1.00	
Heavy Meal Frequency								
< 3x/day	9	27.27	24	72.73	33	39.76	0.52 (0.28–0.97)	0.04*
≥ 3x/day	26	52.00	24	48.00	50	60.24	1.00	
Total	35	42.17	48	57.83	83	100.00		

*Significant (P < 0.05)
**Fisher's Exact Test

There was a difference in the proportion of female adolescents who experience anemia and do not consume blood supplement tablets of 49.20% and those who consume iron supplements of 16.70%. This is also evidenced by the relationship between the consumption of iron tablets and the incidence of anemia in young women at SMA Negeri 8 Jambi City in 2019. Young women who consume iron tablets have a 2.95 times greater risk than those who do not consume iron supplements

(PR=2.95; 95% CI=1.02-8.54) (Table 2).

The proportion of nutritional status in female adolescents who experience anemia differs between undernutrition status of 66.70%, excess of 27.30%, and standard of 46.60%. However, there was no relationship between nutritional status and the incidence of anemia in young women at SMA Negeri 8 Jambi City. Adolescent girls with poor nutritional status will have a risk of 1.43 times greater than those with normal nutritional status

(PR=1.43; 95% CI=0.61-3.33). Adolescent girls with excess nutritional status are a protective factor in the incidence of anemia (PR = 0.58; 95% CI = 0.28-1.22) (Table 2).

There was a difference between the incidence of anemia in young women who do not have breakfast daily (56.90%) and those who do not/rarely have breakfast (18.60%). This is proven by the relationship between breakfast and the incidence of anemia in young women at SMAN 8 Jambi City in 2019. Adolescent girls who do not/rarely have breakfast have a 3.03 times higher risk than those who eat breakfast daily (PR=3, 03; 95% CI = 1.41-6.48). There is no difference in the proportion of young women who consume foods that inhibit iron absorption (39.50%) and those who do not consume (45%). This shows no relationship between consuming foods that inhibit iron absorption and the incidence of anemia in young women at SMA Negeri 8 Jambi City. Adolescent girls who consume inhibitory foods are a protective factor (PR=0.87; 95% CI=0.53-1.45) (Table 2).

The proportion of female adolescents who were anemic and did not consume foods that increased iron absorption was 30.40%, while female adolescents who consumed foods that increased iron absorption was 46.70%. There is no relationship between the consumption of foods that enhance the absorption of iron and the incidence of anemia in female adolescents at SMA Negeri 8 Jambi City in 2019. Female adolescents who do not consume iron-enhancing foods are a protective factor (PR=0.65; 95% CI=0.33- 1.28) (Table 2).

There is no difference in the proportion of anemic young women with a history of infectious diseases by 50% and those who do not have a history of infectious diseases by 40%. This shows no relationship between infectious diseases and the incidence of anemia in female adolescents at SMA Negeri 8 Jambi City in 2019. Female adolescents with a history of infectious diseases are at risk 1.25 times higher than those who do not have a history of infectious diseases (PR = 1.25, 95% CI = 0.72-2.16) (Table 2).

There is a difference in the proportion of adolescent girls who are anemic and have a frequency of heavy meals <3X/day of 27.30% and those who have a frequency of heavy meals of ≥3X/day of 52%. This is proven by the relationship between the frequency of heavy meals daily and the incidence of anemia in female adolescents at SMA Negeri 8 Jambi City in 2019. Adolescent girls who have a frequency of heavy

meals <3X/day are a protective factor in the incidence of anemia (PR = 0, 52; 95% CI = 0.28-0.97) (Table 2).

DISCUSSION

Knowledge

The results of this research are the same as those conducted by Azzahroh and Foppy (7), which show that knowledge influences the risk factors for anemia in young women in Jambi City. Young women with less knowledge have a 3.30 times greater risk of experiencing anemia than young women with good knowledge (p-value 0.00). However, this differs from the research conducted by Kamruzzaman (8), which said there was no significant relationship between low to moderate knowledge in young women with anemia status.

Knowledge is defined as a collection of information that is easy to understand through a lifelong learning process and is used to adjust to an environment (9). Knowledge is obtained from education, and information is obtained from various things. Good knowledge will increase the willingness to apply knowledge so that students will prevent them from experiencing anemia (10).

Consumption of Blood Supplements Tablets

In this study it was found that the consumption of iron supplements in young women was still low, and showed significant results with the incidence of anemia. This is in line with research conducted by Restuni that there is a relationship between consumption of iron supplement tablets and the incidence of anemia in young women at SMPN 2 Merangin (11). Another study stated that young women who do not adhere to taking iron tablets have a 5.25 times higher risk of developing anemia compared to those who adhere to taking iron tablets. Another study showed that there was a significant effect between young women who obediently consumed Fe tablets with adolescent anemia . Other studies argue that the consumption of Fe inhibitor tablets or blood supplements has a statistically significant relationship to the incidence of anemia in female adolescents with a *p- value* = 0.00 (6). Research from Agustina et al also states that regular consumption of supplemental blood can reduce the incidence of anemia in young women (12).

Consuming Fe tablets obediently every day at the right dose can prevent anemia, and even prevent anemia from recurring. A dose of 60 mg

per day will affect the increase in Hb levels by 11 g%/month. Consumption of iron supplement tablets can help and stimulate the production of red blood cells to replace blood loss during menstruation and prevent anemia due to iron deficiency (13).

Nutritional Status

Iron deficiency is one of the causes of anemia. Lack of nutritional intake in young women is generally due to a lack of macronutrients (carbohydrates, protein, fat) and micronutrients (vitamins and minerals). Lack of macro and micronutrients will cause the body to become thin, short, constantly sick, and anemic. The results of a study conducted by Kaimudin et al (14) stated that nutritional status was significantly related to the incidence of anemia in young women in Kendari city, Southeast Sulawesi, Indonesia. This is in line with research conducted by Rudi et al (15), which stated that having an OR value of 2.57 means that the risk factor for anemia is 2.57 times higher with poor nutritional status than with normal nutritional status. The test results also show that there is a relationship between nutritional status and the incidence of anemia in young women.

The risk of anemia is higher for girls who are underweight and lower for girls who are obese or overweight compared to standard nutritional status (8). Adolescents with low body weight have BMI or poor nutrition, so hemoglobin levels tend to be lower, which results in anemia.

Nutritional status affects the concentration of hemoglobin in the human body. The worse the nutritional status of female adolescents who experience menstruation every month, the lower the hemoglobin level in the blood will be. Nutritional status has a positive correlation with the concentration of hemoglobin levels in the blood. The worse a person's nutritional status, the more it affects the hemoglobin level in the body (16). Nutritional status is the dominant factor associated with anemia in female adolescents. There is a significant relationship between BMI/U and the incidence of anemia in young women, where young women with abnormal BMI/U have a risk of 5.40 times (17).

Breakfast

Research conducted by Kalsum and Halim showed that adolescents who have breakfast are a risk factor for anemia; adolescents who do not have the habit of having breakfast before their

activities have twice the chance of developing anemia compared to those who have a habit of having breakfast every morning (18). The statistical test results also showed a relationship between breakfast habits and the incidence of anemia in adolescents at SMAN 8 Muaro Jambi. A similar study conducted by Arisnawati et al (19) stated that young women who do not have breakfast every day would have eight times higher chances than those who do breakfast every day; the test results also show that there is a relationship between breakfast habits and the incidence of anemia in young women at SMA Al-Hikmah 2 Benda Sirampog Brebes. Breakfast provides daily energy and good nutrition for the body. Breakfast is an important activity to do before physical activity. Breakfast contributes 25% of the daily nutritional needs (20).

Iron Absorption Foods

This study found that some female students consumed foods that inhibited iron absorption every day by 51.8%. Consuming drinks, including tea, coffee, cappuccino milk, and yogurt, inhibit iron absorption. At the same time, the types of food consumed include cheese, chocolate, cereals, wheat, and peanuts. All drinks and food consumed are usually consumed more at school, on the canteen menu, and snacks sold.

Foods that inhibit iron absorption are food and drinks such as milk and nuts. Food and beverage ingredients that become inhibitors of iron absorption, also commonly called inhibitors, are ingredients such as phytate (corn, bran, soy protein, milk, nuts, chocolate), polyphenols (including tannins) in coffee, tea, and vegetables, spinach, nuts, substances lime or calcium, phosphate (in milk and cheese) (19). Research conducted by Zhang et al (21) found a significant relationship between adolescents who consume milk regularly and the incidence of anemia in young women.

Iron Absorption Enhancing Foods

Foods that increase iron absorption include foods and drinks that aid the amount of iron absorption in the food and drinks we consume daily when they are digested in the body (22). A study conducted by Samson et al (23) stated that there is no relationship between consumption of iron-blocking foods and anemia status in adolescents

This is not in line with the research conducted by Kalsum and Halim who obtained an OR value

of 1.57, which means that adolescents who do not consume foods that increase iron absorption have a 1.57 times greater risk of developing anemia than adolescents who consume foods that increase iron absorption (18). Statistical tests showed that there was no relationship between consumption of foods that increased iron absorption and the incidence of anemia in young women at SMAN 8 Muaro Jambi (19). Another study by Rusdi et al (24) showed that the results of statistical tests had an effect on giving red seed juice on serum hemoglobin and fertinin levels of anemia sufferers in young women with a *p value* = <0.00.

The results of this study do not follow Wirakusumah's theory that the form of iron in food helps influence the absorption of iron, namely heme and non-heme iron. This heme iron will be more easily absorbed than non-heme iron, while non-heme iron absorption is influenced by inhibiting and enhancing factors. For example, meat and vitamin C are the main factors that encourage the absorption of non-heme iron. This push factor has more influence on the absorption of non-heme iron that is difficult to digest than the trigger factor. Factors inhibiting iron absorption, the availability of iron in the body, and the bioavailability of iron are the main factors that affect the amount of iron absorbed by the body (25). The economic level also influences the consumption of foods that increase iron absorption because some people cannot afford to buy healthy foods, including foods that increase iron absorption (26). The low knowledge of young women regarding the consumption of foods that increase iron absorption is thought to be a factor causing the variable consumption of foods that increase iron absorption to be unrelated in this study.

Infectious Disease

The results of this study align with a study conducted by Ekasanti et al., with a higher risk score; female adolescents with a history of infectious diseases are 12.80 times more likely to experience anemia than female adolescents who do not have a history of infectious diseases. Statistical values also show that there is a relationship between infectious diseases and the incidence of anemia in young women at high school in East Java (2). The results of this study are supported by Pizzini' et al (27), which shows that the presence of infectious diseases that have been and are being suffered by young women increases the risk of anemia in these adolescents.

Iron deficiency harms the normal functioning of the immune system. Specifically, two distinct changes in the immune system are associated with iron deficiency: reduced response of T-cell lymphocytes to infectious agents and reduced bactericidal action of macrophages and neutrophils. Children with iron deficiency anemia (ADB) are more susceptible to infection than normal children (28).

The results of this study are the same as the theory, which says that parasites and infectious diseases are the factors that cause iron deficiency anemia because a high frequency of parasites will interfere with iron absorption. Infectious diseases in this study included diarrhea, ARI, malaria, worm infections, and pulmonary tuberculosis (29).

Heavy Meal Frequency

The results of other studies obtained different results; the frequency of heavy meals <3x a day is a risk factor for the occurrence of anemia in female adolescents with an OR of 24, which means that female adolescents who eat less frequently in a day have a 24 times higher risk of developing anemia compared to young women who have good eating frequency. This is proven by the relationship between the frequency or number of meals in one day and the incidence of anemia (14). This study is in line with research conducted by Fairuza (30), which said that the frequency of eating in multivariate analysis had a significant relationship with the incidence of anemia (p = 0.00; aOR = 38.48), so the more the frequency of eating, the lower the incidence. Anemia is 38.48 times compared to young women with less eating frequency.

CONCLUSION

The results showed that the factors influencing the incidence of anemia in young women at SMA Negeri 8 Jambi City include knowledge of young women, consumption of iron tablets, breakfast, and frequency of heavy meals. Researchers suggest that the Puskesmas through the school can hold programs to prevent and treat anemia, such as the movement to drink iron tablets simultaneously, rewards students who regularly and regularly take iron tablets, and the breakfast movement with all school members.

CONFLICT OF INTEREST

There is no conflict of interest in this research.

AUTHOR CONTRIBUTION

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