Factors Associated with the Incidence of Anemia in Female Students at SMA Negeri I Jayapura in 2018

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Abstract

Background: Anemia is a condition in which the amount of red blood cells or hemoglobin in the body is lower than usual. Adolescent girls are more likely to develop anemia as a result of their dietary habits, nutritional status, nutrient consumption, viral infections, and menstrual patterns. In 2007, the frequency of anemia among adolescent girls in Jayapura city was 16.7%. **Objectives:** The goal of this study was to learn about the factors that contributed to anemia among female students at the SMA Negeri I Jayapura in 2018. **Methods:** Analytic descriptive research with a cross sectional method is the sort of investigation. There were 83 students in grades XI and XII that participated in the study. Data were analyzed using the Pearson Correlation test. **Result:** The results of the analysis showed that there was a relationship between iron intake (p = 0.001), energy intake (p = 0.000), and protein intake (p = 0.002) with the incidence of anemia. Whereas, there was no significant correlation between vitamin C intake (p = 0.702), nutritional status (p = 0.711), and pocket money (p = 0.340) with the incidence of anemia among female students at the SMA Negeri I Jayapura in 2018.

Keywords: Risk factors; anemia; female students; high school.

1. Introduction

Nutrition is one of the most important aspects of development because it can aid in the realization of a high-quality supply of human energy that can work efficiently during growth. Every human being, from babies in the womb to newborns, children, adolescents, adults, and the elderly, requires adequate nutrition [1]. Adolescent girls have been identified as a vulnerable population to the consequences of malnutrition.

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Anemia is a medical condition characterized by a hemoglobin (Hb) level that is lower than normal when compared to age and gender-specific threshold values. Adolescent girls' hemoglobin levels should be higher than 12 g/dl [2]. Anemia in adolescent girls can increase the likelihood of functional and psychological problems, as well as the prevalence of disorders in late pregnancy [3]. Anemia is still common in adolescent girls, with a global prevalence ranging from 40 to 88 percent. Anemia affected 53.7 percent of adolescent girls in developing countries in 2010, according to the World Health Organization (WHO). In developing countries, iron deficiency anemia is the most common type of nutritional anemia. In Indonesia, the iron diet anemia rate is 72.3 percent [4].

Iron Nutrient Anemia is the most common type of nutritional anemia in developing countries (AGB). Adolescents (10-19 years old) account for 26.2 percent of the Indonesian population, with 50.9 percent males and 49.1 percent females. Anemia affects 21.7 percent of the Indonesian population, according to basic health research (Riskesdas) 2013, with 26.4 percent of those aged 5-14 years suffering from anemia and 18.4 percent of those aged 15-24 years suffering from anemia [5].

According to the Jayapura City Central Statistics Agency (BPS), the population reached 275,694 people, with a gender-based population distribution of as many as 130,554 people in Jayapura City, with women of childbearing age (WUS) (15-49 years) accounting for 83,009 people from the total population (61.63 percent). Anemia was 17.9 percent prevalent in Papua Province in 2007, according to Riskesdas (2007). Anemia affects 16.7 percent of adolescent girls in Jayapura City. The inclusion of adolescents in the WUS group demonstrates that the data has the potential to represent anemia in adolescent girls in Papua Province, particularly in Jayapura City. Because adolescent girls enter reproductive life immediately after menstruation, the high prevalence of anemia among them is cause for concern. The location of the research is influenced by the position of schools in the Jayapura City area with the highest number of students in SMA Negeri I compared to other schools in Jayapura City, as well as the high heterogeneity of students in terms of socioeconomic, family background, and other factors. With this background, researchers are interested in conducting research on "Factors related to the incidence of anemia in female students at the SMA Negeri 1 Jayapura in 2018."

2. Methods

A descriptive analytic research design with a quantitative approach using a cross-sectional study was used. The study was carried out at the SMA Negeri I Jayapura. This study was conducted over a one-month period in October and November of 2018. This study's population consisted of 582 students from classes XI and XII at SMA Negeri I Jayapura. The sample size in this study was 83 female students. To determine the number of samples based on the force and majors, stratified sampling was used. The following criteria were used to determine inclusion in this study: 1) the respondents' age was 15-18 years; 2) they were an active student at SMA Negeri I Jayapura; 3) they were already menstruating; and 4) they were willing to be a research respondent. Meanwhile, the exclusion criteria were: 1) menstruation at the time of data collection; and 2) fasting at the time of data collection. The variables in this study were: 1) anemia status as measured by a Digital Quick Hb Meter; 2) nutrient intake (iron, energy, protein, and vitamin C) as measured by the recall method over a 2-day period and compared to the nutritional adequacy rate (RDA) for Adolescents in 2013; 3) The nutritional

status of the students was assessed using tread and microtoise scales; and 4) Pocket money, which students use to buy food or drink while in the school environment. Univariate and bivariate data analysis was used in this study. The statistical test used is the Pearson Correlation test to test the relationship between the independent and dependent variables which are numerical, with the degree of significance used is p value < 0.05.

3. Results

3.1. Analysis Univariate

On the research variables, a univariate analysis was performed. The distribution of the frequency and percentage of each variable related to the incidence of anemia in female students at SMA Negeri I Jayapura in 2018 will be produced by this analysis.

Table 1: Frequency distribution of variables related to the incidence of anemia in female students at SMA Negeri I Jayapura in 2018.

Variable	Category	Frequency (n)	Percentage (%)
Hemoglobin levels (Hb)	Anemia	42	50,6
	Not anemia	41	49,4
Iron Intake	Less Intake	83	100,0
	Enough intake	0	0,0
Vitamin C intake	Less Intake	78	94,0
	Enough intake	5	6,0
Energy Intake	Less Intake	77	92,8
	Enough intake	6	7,2
Protein Intake	Less Intake	73	88,0
	Enough intake	10	12,0
Nutritional status	Abnormal	27	32,5
	Normal	56	67,5
Pocket money	Low	51	61,4
	High	32	38,6
Total		83	100,0

Source: Primary Data, 2019

Based on Table 1, it shows that the frequency distribution of the incidence of anemia experienced by respondents is anemia at 50.6% and not anemia at 49.4%. Most of the respondents have less iron intake (100.0%), less vitamin C intake (94.0%), less energy intake (92.4%), and less protein intake (88.0%). Most of the respondents have normal nutritional status (67.5%), and low pocket money (61.4%).

3.2. Analysis Bivariate

Bivariate analysis was carried out to determine the factors related to the incidence of anemia in female students at SMA Negeri I Jayapura in 2018; namely iron intake, vitamin C intake, energy intake, protein intake, nutritional status, and pocket money. To find out the factors related to the incidence of anemia, the Pearson correlation test was used with a significance level of 5%. The results of the bivariate analysis are presented in the Table 2:

Table 2: The relationship between the independent variables and the incidence of anemia in female students at SMA Negeri I Jayapura in 2018.

Variables	Hemoglobin levels (Hb), average 11.52 gr/dL			
	n	average	r	p-value
Iron Intake (mg)	83	3.88	0,361	0.000
Vitamin C intake (mg)	83	19.17	0,040	0.720
Energy Intake (kkal)	83	1258.19	0,537	0.000
Protein Intake (g)	83	40.93	0,342	0.002
Nutritional status	83	22.46	-0,041	0.711
Pocket money (IDR)	83	11,950	0,059	0.340

Source: Primary data, 2019

The average hemoglobin level of the respondents is 11.52 g/dL, which is lower than the normal hemoglobin level in adolescent girls, which is 12.0 g/dL, according to Table 2. The average nutrient intake is as follows: 1) iron consumption is 3.88 mg per day; 2) vitamin C consumption is 19.17 mg per day; 3) energy consumption is 1258.19 kcal per day; and 4) protein consumption is 40.93gr per day. This graph shows that the average nutritional intake of respondents was less than the adolescent RDA in 2013. The average nutritional status of those assessed using a female BMI was 22.46, which was classified as normal. Meanwhile, the average daily pocket money of respondents is Rp.11,950. According to Table 2, the relationship between iron intake and the respondent's hemoglobin level is weak (r=0.361) and positive, indicating that the higher the iron intake, the higher the hemoglobin level. The statistical tests revealed p 0.01, indicating a significant relationship between iron intake and the incidence of anemia (p = 0.000). The relationship between vitamin C intake and the incidence of anemia is very weak (r=0.040) and has a positive pattern, implying that the more vitamin C consumed, the higher the hemoglobin level. Statistical test results with p = 0.720 indicate that there is no significant relationship between vitamin C intake and anemia incidence. The relationship between energy intake and the incidence of anemia can be seen to have a moderate relationship (r=0.537) and a positive pattern, indicating that the higher the energy intake, the higher the hemoglobin level in the body. Statistical tests yielded p 0.01, indicating a significant relationship between energy intake and anemia incidence (p = 0.000). Protein intake and the incidence of anemia have a weak relationship (r=0.342) and a positive pattern, indicating that the higher the protein intake, the higher the hemoglobin level. Statistical tests yielded p 0.01, indicating that there is a statistically significant relationship between protein intake and the occurrence of anemia (p = 0.002). The relationship between nutritional status and the incidence of anemia is known to have a very weak relationship (r=-0.041) and a negative pattern, implying that if students' nutritional status is abnormally high, their hemoglobin level will be lower. The statistical tests yielded a p value of 0.711, indicating that there is no significant relationship between nutritional status and anemia incidence. The relationship between menstrual pattern and the incidence of anemia has a very weak relationship (r=0.036) and a positive pattern, indicating that the higher the normal menstrual pattern, the higher the hemoglobin level. Statistical analysis revealed that there was no significant relationship between menstrual patterns and the incidence of anemia (p = 0.744). The relationship between pocket money and the incidence of anemia in female students is very weak (r=-0.106) and negative, indicating that the higher the student allowance, the lower the hemoglobin level in the blood. Statistical analysis revealed that p > 0.05, indicating no significant relationship between pocket money and

anemia (p = 0.340).

4. Discussion

4.1. The Relationship between Iron Intake and the Incidence of Anemia in Female Students at SMA Negeri I Jayapura in 2018

The findings revealed a strong link between iron intake and the occurrence of anemia in the participants. This is because they consume fewer iron-rich foods, such as red meat, on a daily basis. Dietary factors such as skipping one or two meals influence iron-rich food consumption. According to recall data, respondents eat staple foods twice a day on average and replace them with snacks. Adolescent girls in metropolitan areas with poor iron intake are 33.5 times more likely to suffer from anemia than adolescent girls with adequate iron intake, according to Sari and his colleagues (2016) [6]. In female students, hemoglobin level has a significant relationship with iron adequacy [7]. In addition to eating habits, other factors that also affect anemia in respondents are the habit of drinking tea, coffee or milk after eating. The tannins in tea, caffeine in coffee, and calcium in milk can inhibit iron absorption. The limitation of the researcher in doing recall on this variable is that the 1x24 hour recall filling was carried out in a short time (for 2 days) and when the interview was conducted, the researcher had limited time.

4.2. The Relationship between Vitamin C Intake and the Incidence of Anemia in Female Students at SMA Negeri I Jayapura in 2018

Vitamin C aids iron absorption, which can help prevent anemia. The lack of a link between vitamin C intake and anemia is due to the fact that the function of vitamin C as an iron enhancer cannot function based on findings from respondents' recollection of iron intake consumed in small amounts. This study backs up the findings of Pradanti and his colleagues (2015) [7] and Kirana (2011) [8], who discovered a link between vitamin C deficiency and hemoglobin levels in students at SMP Negeri 3 Brebes and SMA Negeri 2 Semarang. Young women who consume enough vitamin C have a 1.58 times higher risk of anemia than adolescent girls who consume insufficient vitamin C. Reduced consumption of vitamin C-rich fruits can also have an effect on anemia. Guava, oranges, kedondong, and papaya are among the fruits included. According to FFQ data, among the fruits consumed by respondents during the week, Vitamin C aids in the absorption of non-heme iron found in plant foods. As a result, if you don't consume enough vegetables and fruits, your body may be unable to absorb iron, resulting in anemia. Many people are anemic when it comes to the percentage of people who do not get enough vitamin C. The researcher's challenge in doing recall on this variable is that filling out a 1x24 hour recall is only done for two days, despite the fact that it should be done for seven days to determine micronutrient adequacy. During the interview, the researcher had a limited amount of time.

4.3. The Relationship between Energy Intake and the Incidence of Anemia in Female Students at SMA Negeri I Jayapura in 2018

Because nutrient absorption and metabolism are linked, a lack of one nutrient is frequently followed by a lack of another. Energy-producing nutrients include carbohydrates, lipids, and proteins. Carbohydrates provide energy

and aid in the regulation of protein metabolism. This finding is consistent with Agustina's (2016) research, which found a link between energy intake and the prevalence of anemia in adolescent girls in Kebumen Regency [9]. If there are enough carbohydrates in the diet, protein will not be used as a source of energy. So that protein's role in transporting nutrients, particularly iron, into cells is not jeopardized. Young women require 2125 kcal of energy per day, according to the RDA. Carbohydrates, which include rice, wheat, and their processed products, as well as tubers, corn, sago, and sugar, should account for 60% of this nutritional adequacy level. The majority of respondents, however, consume less energy than the RDA. This is due to the respondent's eating habits, which include skipping one to two meals per day, a desire to diet in order to maintain an ideal body shape, and a preference for snacks over large meals. If the respondent's daily energy needs are not met, the body's nutrient metabolism will be altered, resulting in anemia.

4.4. The Relationship between Protein Intake and the Incidence of Anemia in Female Students at SMA Negeri I Jayapura in 2018

According to the study's findings, there was a significant relationship between protein intake and the occurrence of anemia. This is because respondents consume more vegetable protein sources, such as tofu and tempeh, than animal protein sources, such as red meat, which contains a lot of iron. Because the protein content of vegetable protein sources is lower, this is the cause of the respondent's protein deficiency. This finding is consistent with previous research that found a link between protein intake and the prevalence of iron deficiency anemia in urban areas. Anemia is more common in adolescent girls who eat less protein [6], [10]. Respondents' lack of protein intake is also influenced by other nutrients, one of which is energy intake. If the daily energy requirement is not met, protein will be used as an energy producer. This can interfere with the function of the protein that acts as an iron carrier in the blood.

4.5. The Relationship between Nutritional status and the Incidence of Anemia in Female Students at SMA Negeri I Jayapura in 2018

The nutritional status of a person reflects the adequacy of his nutritional consumption. Statistical studies revealed that there was no link between dietary status and the occurrence of anemia. This is due to the fact that other factors, such as nutritional intake, have an effect on the prevalence of anemia. This finding contrasts with the findings of Permaesih (2005), who found a significant relationship between BMI and anemia, with underweight adolescent girls having a 1.4 times risk of anemia compared to girls with normal BMI [11]. Nutrition is one of the most important determinants of human resource quality. From conception to old age, every human being, including newborns, children, adolescents, and the elderly, requires adequate nutrition. Nutritional adequacy is affected by age, gender, exercise, weight, and height. A person's nutritional status is a snapshot of what he eats on a daily basis, which is reflected in the nutritional status value. Adolescent malnutrition is not a risk factor for anemia, but it is a risk factor for iron deficiency and the shrinkage of iron reserves or stores in the body.

4.6. The Relationship between Pocket money and the Incidence of Anemia in Female Students at SMA Negeri I Jayapura in 2018

In this study, pocket money refers to the amount of money students spend each day on food or drinks while at school. A calculation is performed to obtain a median of IDR 11,000 in order to determine whether students have a large or small amount of pocket money. So, if the pocket money is greater than or equal to Rp. 11,000, it is said to be high, and if it is less than Rp. 11,000, it is said to be low. The results show that there is no link between pocket money and the occurrence of anemia. The findings of this study are consistent with the findings of Qorina's (2018) study, which discovered that there was no significant relationship between pocket money and the incidence of anemia in adolescent girls at SMAN 1 Payakumbuh in 2017 [12]. Fast food is typically the food that respondents find appealing. Respondents prefer fast food that is high in calories because it is made from flour and processed by frying, such as fried tempeh, tofu, sweet potato, bakwan, meatball noodles, instant fried noodles, and so on. Fast food is high in calories, fat, sugar, and sodium while being low in fiber, vitamin C, iron, and protein. As a result, if students frequently consume fast food, their vitamin, protein, and iron intake is insufficient.

5. Conclusion

Based on the results of data analysis and hypothesis testing, it can be concluded as follows:

1. There is a significant relationship between iron intake and the incidence of anemia in female students at SMA Negeri I Jayapura in 2018 (r=0.361; p-value=0.000);

2. There is no significant relationship between vitamin C intake and the incidence of anemia in female students at SMA Negeri I Jayapura in 2018 (r=0.040; p-value=0.720);

3. There is a significant relationship between energy intake and the incidence of anemia in female students at SMA Negeri I Jayapura in 2018 (r=0.537; p-value=0.000);

4. There is a significant relationship between protein intake and the incidence of anemia in female students at SMA Negeri I Jayapurain 2018 (r=0.342; p-value=0.002);

5. There is no significant relationship between nutritional status and the incidence of anemia in female students at SMA Negeri I Jayapura in 2018 (r=-0.041; p-value=0.711);

6. There is no significant relationship between vitamin C intake and the incidence of anemia in female students at SMA Negeri I Jayapura in 2018 (r=0.059; p-value=0.340).

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