

# Relationship Between Nutritional Status, Food Intake, Nutritional Knowledge, and Family Income with the Incidence of Anemia

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**Keywords:** Anemia, Food Intake, Family Income, Nutritional Knowledge.

**Abstract:** The impact of anemia on adolescent girls includes decreased academic school grades, difficulty concentrating, lack of passion for learning so that it affects the learning achievement of adolescent girls. This study aimed to determine a relationship between nutritional status, food intake, nutritional knowledge and family income with the incidence of anemia in high school students of Muhammadiyah 15 Jakarta. A cross-sectional design was used. This research was conducted at SMA Muhammadiyah 15 Jakarta in February 2023. Primary data will be collected by checking hemoglobin, measure nutritional status, conducting food intake interviews using SQ-FFQ, measuring student knowledge related to nutrition and informed consent along with characteristic data. The results showed that a nutritional status ( $p=0.048$ ), protein intake ( $p=0.000$ ), iron intake ( $p=0.003$ ), nutritional knowledge ( $p=0.009$ ) and family income ( $p=0.019$ ) have a correlation with the incidence of anemia in adolescent girls. This study shows that more than half of young women experience anemia so that it is expected that young women will add insight regarding nutritional anemia by participating in counseling both online through social media and offline through internal or external school activities, routinely consuming blood supplement tablets given by the school and checking hemoglobin levels regularly and maintaining adequate intake.

## 1 INTRODUCTION

Anemia is a condition in which the amount of hemoglobin in the body is less than normal ( $<12$  mg/dl) for young women (WHO, 2011). Young women are vulnerable to anemia because young women experience menstruation every month, especially during their teenage years where there is an increase in nutritional needs (Eka, 2019). The impact is that young women will get sick more easily due to decreased immunity, lack of motivation to carry out daily activities, lack of interest in learning so that academic achievement decreases. In the long term, the incidence of anemia in young women is at risk of giving birth to babies with low birth weight (LBW), asphyxia, experiencing bleeding during childbirth, to death of the mother or baby (Anggoro, 2020).

The world prevalence of anemia reaches 50-80% (WHO, 2015). According to RISKESDAS 2018 data, anemia has increased by 48.9% (RISKESDAS, 2018). Adolescent girls who experience anemia in the West Jakarta area with an age range of 10-19 years account for 6.55% of anemia cases in 2018,

experienced an increase in 2019, namely 19.10% of anemia cases, and increased again in 2020 to 49.27 % cases (Delima, 2020).

One of the main causes of anemia is nutritional status. This condition is more likely to occur in young women who tend to pay attention to their appearance so they apply an inappropriate diet in order to have a slim body shape, are used to consuming less nutritious food and instant food and often skip breakfast. If this goes on for too long it will affect the nutritional status of young women and the body will continue to lose hemoglobin levels until they become anemic due to a lack of the diversity of nutrients needed to form hemoglobin (Parliani, 2018). In line with that, young women who have a thin nutritional status have a 1.4 times higher risk of developing anemia than young women who have normal nutritional status (Anjaya & Rohmah, 2020).

Inadequate nutritional intake is a major factor in the problem of anemia, lack of nutritional intake can be affected by food intake that is consumed not according to needs. Adolescent girls who do not eat a variety of foods, especially foods that help the

process of forming hemoglobin, namely foods that are rich in protein and iron, can be at risk of developing anemia. A study by Niematush Sholihah explains that young women intake of protein and iron has a high chance of experiencing anemia, namely 33 times and 8.7 times (Ni'matush Sholihah et al., 2019).

Nutritional knowledge of young women plays an important role in anemia, lack of knowledge of adolescents will certainly affect eating behavior, lifestyle and eating habits of young women (Hamdani, 2019). Lack of knowledge of anemia related to nutrition will result in young girls consuming foods containing little iron so that iron in young girls cannot be fulfilled, this is in line with research conducted by Misroh Mulianingsih obtained statistical test results with a p value of 0.000 ( $<0.05$ ) indicating there is the relationship between knowledge and the incidence of anemia in young women (Misroh mulianingsih, 2021). Other research is also in line with this, namely research conducted by Nurhayati found that around 75.6% of students who had less knowledge experienced anemia with a p value of 0.000 ( $<0.05$ ) which means there is a relationship between this knowledge and the incidence of anemia young women of MAN 1 Banjarmasin class of 2020 (Nurhayati et al., 2020).

Adolescent girls who have low-income families affect the availability of food both in terms of quality and quantity and low family income also affects access to health services to prevent and treat anemia in female adolescents (Devinia, 2020). in line with Theresia's research and concluded that there is a relationship between parental income and the incidence of anemia in young women. (Theresia & Putri, 2021).

## 2 RESEARCH METHOD

This research is quantitative research with observational analytic design with a cross sectional approach. This study aims to see the relationship between the dependent variable, namely the incidence of anemia and the independent variables, namely nutritional status, food intake, nutritional knowledge, and family income which was conducted at SMA Muhammadiyah 15 Jakarta in February 2023. The sample technique used was purposive sampling with a sample of 65 respondents. This study used the chi square and fisher's exact tests. Primary data was collected by checking hemoglobin using a digital hemoglobin tool with the easy touch brand to check hemoglobin levels, taking anthropometric measurements (weight and height) using digital

scales and microtoise to determine nutritional status, conducting food intake interviews to determine food intake (source protein, and iron) using the SQ-FFQ form, filling out a questionnaire related to nutritional knowledge filled out by female students to measure the student's knowledge and filling out the consent form along with characteristic data which includes age, number of family dependents and family income.

## 3 RESULT AND DISCUSSION

### 3.1 Univariat

Table 3.1: Univariate Result.

Variable	n	%
<b>Age</b>		
15 years old	11	16.9
16 years old	32	49.2
17 years old	22	33.8
<b>Incidence of Anemia</b>		
Anemia	34	52.3
Not Anemic	31	47.7
<b>Nutritional Status</b>		
Thinnes	6	9.2
Normal	41	63.1
Overweight	18	27.7
<b>Protein Intake</b>		
Inadequate intake	32	49.2
sufficient intake	28	43.1
More Intake	5	7.7
<b>Iron Intake</b>		
Inadequate intake	51	78.5
sufficient intake	10	15.4
More Intake	4	6.2
<b>Nutritional Knowledge</b>		
Less nutritional knowledge	42	64.6
Enough nutritional knowledge	13	20.0
Good nutritional knowledge	10	15.4
<b>Family Income</b>		
Less family income	40	61.5
Enough family income	25	38.5
<b>Amount</b>	<b>65</b>	<b>100</b>

The results of this study indicate that more than half of female adolescent experience anemia, namely as many as 52.3% with a hemoglobin level of at most 11.9/dL. teenage girls who have more nutritional status as much as 27.7% and less nutritional status as much as 9.2% with an average normal nutritional

status of young women (0.056 SD). Almost a small proportion of young women lack protein intake, namely as much as 49.2% with an average protein intake of 58.3 g/day. Most young women lack iron intake, namely as much as 78.5% with an average iron

intake of 9.3 g/day. More than half of young women have less knowledge, namely as many as 64.6% with the highest score of 50 points. young women who have a low family per capita income of 61.5% with a maximum per capita income of IDR 950,000.

### 3.2 Bivariate

Table 3.2: Bivariate Result.

Variable	Incidence of Anemia				Total		OR (95% Confident Inteval)	P Value
	Anemia		Not Anemic		n	%		
	n	%	n	%				
<b>Nutritional Status</b>								
Thinnes	6	100	0	0.0	6	100	-	0.048
Normal	19	46.3	22	53.7	41	100		
Overweight	9	50	9	50	18	100		
<b>Protein Intake</b>								
Inadequate	25	78.1	7	21.9	32	100	-	0.000
Sufficient	6	21.4	22	78.6	28	100		
more	3	60	2	40	5	100		
<b>Iron Intake</b>								
Inadequate	32	62.7	19	37.3	51	100	-	0.003
Sufficient	2	20.0	8	4.8	10	100		
more	0	0.0	4	100	4	100		
<b>Nutritional Knowledge</b>								
Less	27	64.3	15	35.7	42	100	4.114	0.009
Enough	7	30.4	16	69.6	23	100	(1.384 - 12.232)	
<b>Family Income</b>								
Less	23	65.7	12	34.3	35	100	3.311	0.019
Enough	11	36.7	19	63.3	30	100	(1.196 -9.173)	
<b>Amount</b>	<b>34</b>	<b>52.3</b>	<b>31</b>	<b>47.7</b>	<b>65</b>	<b>100</b>		

#### 3.2.1 Incidence of Anemia

Based on table 3.1 as many as 52.3% of young women at SMA Muhammadiyah 15 Jakarta experienced anemia and obtained a median value of 11.9 g/dL with the lowest hemoglobin level being 8.6 g/dL where this category is included in the category of moderate anemia (WHO, 2011). From the results of these it can be concluded that the incidence of anemia in young women at SMA Muhammadiyah 15 Jakarta is quite high compared to the prevalence in the East Jakarta area in 2021, which is 25.6% Warda & Fayasari (2021) and in 2022 in the South Jakarta area with the prevalence of anemia in young women, namely 50.6% (Mahardika et al., 2022).

The main factor in the occurrence of anemia is influenced by the food intake consumed by young women, namely the lack of consumption of hemoglobin-forming substances such as protein and iron. The protein requirement for female adolescents aged 13-18 years is 65 grams/day and the iron requirement is 15 mg/day. If female adolescents experience menstruation, the iron requirement

increases to 26 mg/day (Agustina & Fridayanti, 2017). Based on the results of the interviews, young women who are anemic often skip breakfast, eat their main meal every day with iced tea, like to consume coffee, rarely consume vegetables and fruit, and are disobedient in taking iron tablets. In addition, the high prevalence of anemia in SMA Muhammadiyah 15 Jakarta can occur due to young girls who do not consume iron tablets given by the school where SMA Muhammadiyah 15 West Jakarta already has a program for giving blood tablets to teenage girls by regional health centers. Aligned research by Nirmala et al (2021), it was stated that the results of interviews with the West Jakarta Health Center for young women were 98.6% disobedient in taking iron tablets (Nirmala et al., 2021).

#### 3.2.2 Nutritional Status

Based on table 3.1, as many as 63.1% of female adolescents had normal nutritional status, 27.7% of female adolescents had excess nutritional status and 9.2% of female adolescents had underweight nutritional status. From these results, the average

nutritional status of young women was obtained, namely nutritional status in the normal category (0.056 SD). Based on the interview results, this can occur due to young women who prefer snacks rather than eating home-cooked meals where young women tend to consume snack foods such as batagor, dumplings, cilok, fried foods, the majority of which are foods high in fat and carbohydrates. In addition, lack of consumption of vegetables and fruit, tend to consume tea and coffee drinks as a companion to meals, and disobedience in taking iron tablets. In line with research conducted by Anjaya et al (2020) which states that anemia can occur as a result of an unhealthy diet.

Based on table 3.2, young women who have a nutritional status of less than 100% have anemia, while young women with more than 50% nutritional status have anemia, so it can be concluded that there is a significant relationship between nutritional status and the incidence of anemia in young women at SMA Muhammadiyah 15 Jakarta with p-value 0.048. One of the risk factors for anemia is young women with poor nutritional status. Research conducted by Indrawatiningsih (2021) states that young women with poor nutritional status have a 15,000 times chance of developing anemia compared to young women with good nutritional status. His research concluded that there was a significant relationship between nutritional status and anemia in young women (Indrawatiningsih et al., 2021). Other research states that undernutrition in young women results in an increase in glycolytic enzymes such as hexokinase, pyruvate kinase and G6PD (glucose 6-phosphate dehydrogenase) changing membrane permeability resulting in the breakdown of red blood cells which is characterized by low serum ferritin levels (Arima et al., 2019). This research is in line with research conducted by Muhayati & Ratnawati (2019) which found that the results of a study of young women with a thin BMI as much as 67.7% experienced anemia, so it was concluded that there was a significant relationship between nutritional status and the incidence of anemia in young women at SMA Negeri 97 Jakarta (Muhayati & Ratnawati, 2019). Other research states that this can occur because young women who have a thin nutritional status can experience anemia due to overly adjusting their diet to maintain body shape (body image) resulting in malnutrition (Sari, 2019).

### 3.2.3 Protein Intake

Based on table 3.1, 49.2% of female adolescents lacked protein intake, 43.1% of female adolescents had sufficient protein intake and 7.7% of female adolescents had excess protein intake. From these results, it was found that the average protein intake for young women was 58.3 grams/day, which could meet around 89.6% of the needs of young women. Based on the results of the Semi Quantitative Food Frequency Questionnaire (SQ-FFQ) interview, the type of protein most often consumed by young women is animal protein, namely chicken, eggs and fish. Adolescent girls with less protein intake most often consume vegetable protein sources compared to animal protein sources because the price is relatively cheaper. In addition, the lack of protein intake is because young women often consume inhibitory substances such as iced tea and coffee at mealtimes and rarely eat fruits and vegetables which can help absorb protein, this causes the total protein needs of young women cannot be met. In line with this, the results of a study conducted by Marlenywati et al (2020) stated that as many as 73.3% of female students lacked protein intake because protein consumption was dominated by vegetable protein rather than animal protein, which should be balanced. Other studies have suggested that protein intake is not fulfilled, possibly due to the poor quality and quality of the protein consumed, where the quality of the protein is determined by the composition and number of essential amino acids (Pratama et al., 2020).

Based on table 3.2, 78.1% of female adolescents who lacked protein intake experienced anemia, while female adolescents who had excess protein intake of 60% experienced anemia, so it can be concluded that there was a significant relationship between protein intake and the incidence of anemia in female adolescents at SMA Muhammadiyah 15 Jakarta with p-value 0.000. This research is in line with research conducted by Solichah et al (2019) which stated that the lower the protein intake, the lower the hemoglobin level. The results of his research concluded that there was a significant relationship between protein intake and hemoglobin levels in female adolescents (Sholicha & Muniroh, 2019). Another study stated that as many as 68.3% of the proportion of young women in the protein-deficient category experienced anemia, meaning that there was a significant relationship between protein intake and the incidence of anemia in young women at SMU 98 Jakarta (Junengsih & Yuliasari, 2017).

### 3.2.4 Iron Intake

Based on 3.1, 78.5% of female adolescents lacked iron intake, 15.4% of female adolescents had sufficient iron intake and 6.2% of female adolescents had excess iron intake. From these results the average intake of iron in female adolescents was 9.3 mg/day. Based on the results of the Semi Quantitative Food Frequency Questionnaire (SQ-FFQ) interview, female adolescents tend to consume foods high in protein but low in iron, such as vegetable protein. In addition, this is evidenced by the decreased absorption of iron consumed by the high iron needs of young women who are not balanced. Young women tend to consume light snacks, sweetened and carbonated drinks, consume coffee and tea as a companion to the main meal, and low fruit and vegetable consumption causes low iron intake in female adolescents, causing female adolescents to experience anemia. For this reason, female adolescents are provided with iron supplements given by the school to help meet their iron needs. However, female adolescents do not adhere to taking iron tablets. In line with this, a study conducted by Warda et al (2021) stated that young women with low iron bioavailability have 9,927 times the risk of experiencing anemia. Her research concluded that young women with low iron consumption had a 15,812 chance of experiencing anemia (Warda & Fayasari, 2021). Other research states that lack of iron intake in female adolescents is influenced by the type, amount and frequency of intake of heme iron consumed in small amounts (Arima et al., 2019).

Based on table 3.2, as many as 62.7% of female adolescents who lack iron intake experience anemia, while female adolescents who have an excess of 100% iron intake do not experience anemia, so it can be interpreted that there is a significant relationship between iron intake and the incidence of anemia in female adolescents in SMA Muhammadiyah 15 Jakarta with a p value of 0.003. In line with this, a study conducted by Marlenywati et al (2020) stated that a lack of iron intake could result in a decrease in the number of erythrocytes resulting in iron deficiency anemia. His research concluded that there was a significant relationship between respondents' iron intake and hemoglobin levels (Marlenywati & Kurniasih, 2020). Another study conducted by Akib & Sumarmi (2017) states that the main cause of iron deficiency is reduced iron absorption, female adolescents prefer to consume vegetable protein compared to animal protein which has a higher iron content and is more physiological for the body (Akib & Sumarmi, 2017). The same study stated that the

occurrence of anemia is influenced by the level of absorption and bioavailability of iron so that sufficient iron intake may not necessarily be able to meet the needs of iron in the body (Arima et al., 2019).

### 3.2.5 Nutritional Knowledge

Based on table 3.1, 64.6% of female adolescents had insufficient nutritional knowledge, 20% of female adolescents had adequate nutritional knowledge and 15.4% of female adolescents had good nutritional knowledge. From these results a knowledge score was obtained with a median value of 50 with the lowest knowledge score being 20 and the highest knowledge score being 100. Based on the results of the interviews the lack of knowledge of nutrition in young women was due to the fact that most young women had never received special education or counseling regarding anemia. In addition, most of the health information obtained by young women through social media such as tiktok, YouTube, Instagram, Twitter and Facebook. However, the truth of health information circulating on social media cannot be validated, this causes misinformation by young women. In line with this, according research by Rusdi et al (2021) states that social media is a place that is often accessed by adolescents to seek information, especially health information and platforms that can reach many targets that are not limited in space and time. In his research, he stated that education through social media had an impact on increasing knowledge and changing behavior so that it could be concluded that misinformation caused inappropriate behavior changes (Rusdi et al., 2021). Other research states that the level of knowledge affects the tendency of young women to choose foods with good nutritional value, so it can be concluded that if young women have good nutritional knowledge they can avoid consuming foods that hinder the absorption of nutrients (Anggoro, 2020).

In the bivariate analysis, nutritional knowledge was divided into two categories, namely knowledge of poor nutrition and knowledge of adequate nutrition (knowledge of adequate nutrition and knowledge of good nutrition). Based on table 3.2, as many as 64.6% of female adolescents at SMA Muhammadiyah 15 Jakarta have poor nutritional knowledge. In addition, as many as 64.3% of young women who have poor nutritional knowledge experience anemia, so it can be concluded that there is a significant relationship between nutritional knowledge and the incidence of anemia in SMA Muhammadiyah 15 Jakarta students with a p value of 0.009. Adolescent girls with poor

nutritional knowledge are at risk of experiencing anemia 4 times compared to female adolescents with sufficient nutritional knowledge. In line with this, research conducted by Anggoro (2020) states that the higher the level of knowledge of young women, the lower the risk of young women experiencing anemia, the results of his research show that there is a significant relationship between knowledge and the incidence of anemia in young women (Anggoro, 2020). Other research states that young women who have less knowledge of nutrition lead to a lack of intake of hemoglobin-forming nutrients such as sources of protein and iron so that hemoglobin levels become low (Suryani et al., 2020).

### 3.2.6 Family Income

Based on table 3.1 as many as 61.5% of young women with low per capita family income and as many as 38.5% of young women with sufficient per capita family income. From these results obtained a median value of Rp. 950,000 per capita income for a family of young women with the lowest per capita income of Rp. 300,000 and the highest per capita income is Rp. 5,000,000. Based on the results of the interview, the low family income was due to the young women's family economy which had not fully recovered after the outbreak of COVID-19. The low per capita income of the family of young women is influenced by the number of family members, meaning that the more the number of family members, the lower the per capita income of the family, this causes the nutritional adequacy of young women to prevent anemia. In line with this, research conducted by Alexander (2020) states that the greater the income the family earns, the more nutritional adequacy of adolescent girls is fulfilled (Alexander, 2020).

Based on table 3.2 as many as 65.7% of young women who have low family income experience anemia, it can be concluded that there is a significant relationship between family income and the incidence of anemia in SMA Muhammadiyah 15 Jakarta students with a p value of 0.019. The category of family income can be seen from the size of per capita income in the household. Young women with low family income are 3 times at risk of experiencing anemia compared to young women with sufficient family income. Based on the results of interviews with young women with low family income, they tend to eat cheap and tasty food, such as instant noodles, fried dumplings, batagor, cilok, and so on, compared to nutritious foods. This situation causes low consumption of quality food resulting in nutritional deficiencies such as anemia. This research is in line

with research conducted by Anggoro (2020) which states that young women with sufficient family income can influence the diversity of nutrients prepared by their parents. The low intake of iron in young women is obtained from the food consumed daily (Anggoro, 2020). Other research states that the higher the level of family income affects the type of food consumed so that someone with a high income will change their diet from traditional to practical food, this has an impact on the anemia status of young women (Warda & Fayasari, 2021). Other research also states that family income can affect access to meet nutritional needs. his research concluded that there was a significant relationship between family income and the incidence of anemia in young women (Misroh mulianingsih, 2021).

## 4 CONCLUSIONS

Based on the results of research on the relationship between nutritional status, protein intake, iron intake, nutritional knowledge and family income with the incidence of anemia in female adolescents at SMA Muhammadiyah 15 Jakarta, it can be concluded that most young women are 16 years old, namely 49.2%, more than half of female adolescent experience anemia, namely as many as 52.3%, teenage girls who have more nutritional status as much as 27.7% and less nutritional status as much as 9.2%, almost a small proportion of young women lack protein intake, namely as much as 49.2%, most young women lack iron intake, namely as much as 78.5%, more than half of young women have less knowledge, namely as many as 64.6%, young women who have a low family per capita income of 61.5%.

the results of the study showed that there was a relationship between nutritional status, food intake including protein and iron intake, nutritional knowledge and family income with the incidence of anemia in SMA Muhammadiyah 15 Jakarta students.

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