



Analysis of factors affecting anemia in adolescent girls in Kuningan Regency, West Java

Suratmi^{1}, Entin Jubaedah², Moh Hisyam Hermawan³, Siska Cecilia⁴

^{1,2,4} Poltekkes Kemenkes Tasikmalaya, ³ Muhammadiyah University Cirebon

* Corresponding author: suratmi@dosen.poltekkestasikmalaya.ac.id

Abstract. Anemia is a basic problem faced in Indonesia. Correct management of anemia will be very important because this case can have a long impact on the generation chain as mentioned in the 1000 HPK (First Day of Birth) program if there are problems in adolescence that are not resolved, they will continue to the next period, namely the pre-pregnancy period, pregnancy, childbirth, postpartum and even the baby has the potential to face problems. Adolescent girls are susceptible to anemia because they experience menstruation and pursue a growing period. Menstruating adolescent girls experience twice as much iron loss as adolescent men. This study aims to analyze the factors that cause the incidence of anemia in adolescents. The research was conducted at the Nusaherang Health Center with a sectional cross-sectional research design where variable independent and variable dependent data were measured at the same time. This study produced information that there was a relationship between age, place of residence of adolescents, and consumption of functional drinks based on sweet potato leaves and there was no relationship between education being pursued and anemia. There needs to be an effort to pay attention to the early adolescence period, daily consumption when children live in dormitories, and consume functional drinks based on sweet potato leaves.

Keywords: Analysis, Factors, Anemia

INTRODUCTION

Anemia is one of the most common nutritional problems in the world, including in developing countries. The number of people suffering from anemia/Fe deficiency is also large, namely 1.6 billion or almost a quarter of the world's population, of which 45% is spread across Southeast Asia, including Indonesia. The findings of several studies in Indonesia show that the prevalence of anemia in adolescents is also high (26.1% - 42.6%). Data from the World Health Organization (WHO) (2021) states that the prevalence of anemia of reproductive age (15-49 years) is 29.9% [1].

Serious treatment is needed in this case of anemia because of the many impacts that may occur. Including if anemia occurs in adolescence, among others, lowering the body's immune system so that people with anemia are susceptible to infectious diseases, decreasing fitness and thinking agility due to lack of oxygen to muscle cells and brain cells, as well as decreasing learning achievement and work/performance productivity. In addition, adolescent health is also a very important part of the generation cycle. The following chart shows that adolescent health is the first chain in the HPK cycle. Adolescent health greatly determines the quality of the next generation of human resources because healthy and non-anemia rematri will grow and develop into healthy mothers-to-be and give birth to healthy babies. This is in line with these efforts in support of the 1000 HPK Movement [2], as depicted in the following chart:



Sumber: Modifikasi dari Nutrition challenges in the next decade, food and nutrition Bulletin, 2003

The HPK movement was initiated by the Ministry of Health in 2024 with the hope of reducing stunting rates and maternal and infant mortality through appropriate intervention[3]. Until now, this program has continued with the hope of solving various problems at each stage, including anemia. In the rematri and WUS, guidelines for administering TDD have been issued and have also been supplemented with the Proportion of History of Blood Supplement Tablets (TTD) Received and Taken During the Last Child Pregnancy in Women aged 10-54 years according to the Province, the 2023 Indonesian Health Survey has received a TTD of 24.6% [4]. In the 2018 Riskesdas report, it was stated that 76.2% of adolescents had consumed iron, but only 1.4% consumed as many as 52 tablets. This percentage has not shown a high level of adherence to iron consumption in adolescents.[5].

About 0.5-1 mg/day of iron will be eroded through urine, feces, sweat, and cells eroded from the skin and gastrointestinal tract. High iron loss occurs during menstruation and increased needs during pregnancy thus contributing to the high rate of iron deficiency in women of reproductive age. Many factors affect the high prevalence of anemia, including age, consumption of TDD or alternatives, and limited access to nutritious food[6]. The iron needs of adolescent girls for growth differ between *early adolescence* and *middle adolescence*. Greater iron needs are needed by *early adolescence* because at that age growth *spurts* are more intense than in *middle adolescence*, so if there is a lack of macro and micronutrients in adolescence, both *early adolescence* and *middle adolescence* can interfere with growth and inhibit sexual maturation[7]. Another factor that affects anemia is eating habits. An unbalanced diet, such as a lack of vegetable consumption and excessive consumption of carbohydrates and fats without enough vitamins and minerals, can inhibit the formation of red blood cells and lead to anemia. Daily consumption of varied foods and beverages is important to meet the needs of micro and macronutrients[6].

As mentioned above, obedience to TDD consumption is an obstacle to overcoming anemia in adolescents. Teens feel that TDD makes them feel nauseous and smelly, and have solid stools. Research by Jubaedah E (2023) produces a functional beverage product based on sweet potato leaves that can increase HB levels due to its high polyphenol content.

METHODS

This study is quantitative research with a cross-sectional approach, namely research conducted at a time, where independent variables and deep variables are taken at the same time. The independent variables in this study were factors that caused anemia such as age, place of residence of respondents, and consumption of functional drinks rich in antioxidants.

This research was carried out at the Nusaherang Health Center from March to December 2024, with a population of all adolescents in the Nusaherang Health Center work area 2024 with a sample of adolescents aged 10-19 years in the Nusaherang Health Center work area in 2024 who met the inclusion and exclusion criteria. Inclusion criteria: Adolescent girls aged 10-19 years, have menstruated, have no worms/worm eggs in the stool, and are willing to be a research subject by signing *informed consent*. Meanwhile, the exclusion criteria are teenagers who change domicile. The technique used in sampling is *stratified random sampling*. The sample size used in this study uses the following formula

$$n = \frac{(Z_{\alpha} \sqrt{2PQ} + Z_{\beta} \sqrt{P_1Q_1 + P_2Q_2})^2}{(P_1 - P_2)^2}$$

Based on the formula above, the number of samples needed was 150 people and the sampling technique used stratified random sampling in 10 groups consisting of posrem groups (youth posyandu), youth groups in junior high schools and youth groups in Islamic boarding schools.

The instrument used in this study is a questionnaire about the factors that affect anemia. Data collection was carried out directly/primarily data through short interviews and HB-level checks. The research has received a statement of ethical feasibility from the Health Research Ethics Commission (KEPK) of the Tasikmalaya Ministry of Health with No. DP.04.03/F.XXVI.20/355/2024. Data analysis was carried out using unpaired independent T analysis and a test using Chi-square analysis. In SPSS version 25.

RESULTS AND DISCUSSION

The research was conducted at the Nusaherang Health Center with data collection points in 6 integrated service centers (Posyandu) for adolescents and 2 Islamic boarding schools in the Nusaherang Health Center, Kuningan Regency. The following are the results of the research that has been carried out:

Univariate Analysis

Table 1 Overview of factors affecting anemia in the Nusaherang Health Center area, Kuningan Regency in 2024

Characteristic	Minimum	Maximum	Median/ Percentage
Age	10 Years	18 Years	14 Years
Education	JUNIOR High School	Senior High School	JUNIOR
Residence			
Boarding house	47		31,3%
Parents' Home	103		68,7%
Status Anemia			
Anemia	51		34 %
No Anemia	99		66 %

The table above shows that the average age of the respondents is 14 years old, the median education being pursued is the junior high school level, the respondents are more likely to pass away with their parents and 34% of adolescents experience anemia.

Bivariate Analysis on Factors Affecting Anemia

1). Effect of Age on Anemia in Adolescent Girls

Table 3.
The effect of age on the incidence of anemia in adolescent girls at the Nusaherang Health Center, Kuningan Regency

No	N	Min	Max	SD	Mean	Pvalue
1	155	10	18	0,871	14	0,001

Table 3 above shows that there is an effect of age on anemia status with a P-value of 0.001

Age is a limit or level of life size that affects someone's physical condition (Iswantoro, C & Anastasia, 2013). The more old or older a person is, the more frequent their menstrual frequency is. This makes the older the respondent, the more likely they are to experience anemia.

This condition will be aggravated by menstruation every month. When a woman experiences menstruation, she will experience an iron loss of approximately 0.56 mg per day. This amount will be more if added to 0.8 mg per day due to basal loss so that the total loss becomes 1.36 mg per day. This condition is the background for the need for iron consumption in adolescents in addition to increasing adolescent knowledge.

According to FAO/WHO (2001), the iron needs of adolescent girls for growth differ between *early adolescence* and *middle adolescence*. Greater iron needs are needed by *early adolescence* because at that age *growth spurts* are more intense than in *middle adolescence*, so if there is a lack of macro and micronutrients in adolescence, both *early adolescence* and *middle adolescence* can interfere with growth and inhibit maturation sexually [7]

The above opinion explains that there are different iron needs between the ages of adolescent girls, but still lose blood during menstruation, which has a greater potential to cause anemia at a higher age. Adolescent girls are susceptible to anemia because they experience menstruation and pursue a growing period. Menstruating adolescent girls experience twice as much iron loss as adolescent men. In addition, adolescent girls are usually very concerned about their body shape, so many limit their food consumption to a vegetarian diet. This growth causes the need for iron to increase dramatically and it is during adolescence that the need for nutrients reaches its highest point.[8]

The Influence of Education that is being pursued on the status of adolescent anemia

Table 5. The Influence of Education that is being pursued on the status of adolescent anemia

		Status Anemia				P value
		Anemia		No Anemia		
		N	%	N	%	
Education	ITS/SMP	15	21,3	42	73,7	0,193
		36	37,9	59	62,1	
	MA/SMA					
	Total	51		99		

Table 5 above shows that there is no relationship between the education currently pursued and anemia in adolescent girls. In theory, good education is very important in preventing and overcoming anemia among adolescents. Education will make a person understand everything better, easier to self-regulate, and so on. With higher education, a person will be smarter at measuring which foods are good and which are not good for their health. However, this study shows that there is no relationship between the education being pursued and the anemia status.

This phenomenon encourages efforts to reduce anemia status by providing health education to respondents at all levels of education. By increasing knowledge and awareness about anemia through health education, adolescents can reduce their risk of developing anemia and its negative impact on their health and academic achievement. Therefore, a targeted health education program is urgently needed to support the younger generation in maintaining their health optimally.

Table 6. Influence of residence on anemia status

		Status Anemia			
		Anemia		Not anemia	
		N	%	n	%
Residence	Boarding house	27	57,4	20	42,6
	With Parents	14	13,6	89	86,4

P value <0,001

Table 6 above shows that there is a relationship between the respondent's residence and anemia in adolescent girls with a P value of < 0.001. The results showed that respondents who lived in dormitories had a higher percentage of anemia compared to respondents who lived with their parents. This is following the research of Virodika T et al. that limited access makes a person susceptible to anemia because one of the factors and even the main factors that affect anemia is eating habits. An unbalanced diet, such as a lack of vegetable consumption and excessive consumption of carbohydrates and fats without enough vitamins and minerals, can inhibit the formation of red blood cells and lead to anemia. Daily consumption of varied foods and beverages is important to meet the needs of micro and macronutrients[6].

Especially in this study, respondents who live in dormitories that are quite good and very representative for learning, clean and always offer up-to-date learning, but because the fees charged to parents/guardians are only Rp. 400,000/month, the dormitory has to save on consumption expenses. This problem can be overcome with the initiative of parents to equip respondents with additional food, especially protein. In addition, the activities of the respondents were also very dense from morning to night, starting from learning at schools and Islamic boarding schools.

Table 7 Effect of Functional Drink Consumption With Anemia Status

		Status Anemia			
		Anemia		Not anemia	
		N	%	n	%
Residence	Boarding house	27	57,4	20	42,6
	With Parents	14	13,6	89	86,4

P value <0,001

Table 7 above shows that there is a relationship between functional beverage consumption and anemia in adolescent girls with a P value of < 0.001.

One effort to overcome anemia in teenagers is giving Blood Addition tablets (TDD). The results of the 2018 Riskesdas report stated that 76.2% of teenagers had consumed iron, but only 1.4% had consumed 52 tablets. This percentage does not yet show a high level of compliance with iron consumption in adolescents. ([5]. One of the causes is the taste and aroma that adolescents do not like.

Currently, inadequate eating habits and insufficient consumption of nutrients in developing countries can lead to iron deficiency anemia [9]). This condition must be prevented and overcome. The Indonesian government's efforts are to provide iron supplementation to adolescents. This is not the case based on a systematic review and RCT studies [10]. In 20 which explained that a better effect on hemoglobin in children with anemia/iron deficiency was shown by this study, but not the other way around in the intervention in adolescents/adults. (Silva Neto et al., 2019). Therefore, it is necessary to think about the provision of alternative food or drinks that are preferred by teenagers, cheap and locally sourced, such as the products of this research. In the first year of this research, a formulation containing a lot of antioxidants (polyphenols) was produced, and the fermentation results produced Lactobacillus SP. Some of the reasons why a woman is recommended to consume antioxidants include affecting ovulation, thickening of decidua, facilitating menstruation, and affecting uterine implantation [11]. In addition, antioxidants can function to capture free radicals and act as enzyme cofactors that affect the maturation and development process of cells, as well as increase the activity of antioxidant enzymes [11].

This study showed a decrease in anemia from 80 percent to 5 percent in the formulation of functional drinks made from sweet potato leaves. The formulation of the drink in this study comes from sweet potato leaves. Sweet potato leaves provide a source of dietary nutrients and bioactive compounds, including vitamins[12] . Sweet potatoes are also one of the most important food crops in the world, so their leaves are always available. The treatment and prevention of various diseases are the well-known properties of sweet potatoes. [6][13]

Table 1.8 shows that the median before the intervention was 13, and after the intervention it became 12, and a p-value < 0.001 was obtained, meaning that there was a statistically significant difference between Hb levels before and after the intervention.

Adolescent girls are prone to anemia because they experience menstruation and pursue growth. Adolescent girls who are menstruating experience iron loss as much as 2 (double) times compared to adolescent boys. In addition, young women usually pay great attention to their body shape so many limit their food consumption to a vegetarian diet. This growth causes iron needs to increase dramatically, and in adolescence, nutritional needs reach their highest point. [8]

One of the efforts to overcome anemia in adolescents is to give Blood Supplement Tablets. The results of the 2018 Riskesdas report stated that 76.2% of adolescents had consumed iron, but only 1.4% had taken as many as 52 tablets. This percentage has not shown a high level of adherence to iron consumption in adolescents. [14] One of the causes is the taste and aroma that teenagers do not like.

High Fe levels are strongly believed to be one way to increase Hb levels [15][16]. The results of the analysis of intervention products show that the levels are not high enough. The relatively high level in this study was a polyphenol of 233 mg/l. Polyphenols are organic compounds that are widely found in plants and have become a new concern in the field of nutrition in recent decades [17][18]. A growing body of research suggests that polyphenol consumption may play an important role in health by regulating metabolism, weight, chronic disease, and cell proliferation. [19]

Based on the literature above, high polyphenols in beverage formulations triggered an increase in Hb levels after the intervention. These organic compounds repair damaged cells and trigger cell proliferation so that cells, including red blood cells, grow and multiply. [19][20]. Polyphenols are compounds that are naturally found in fruits, vegetables, and other plant foods. They are a group of micronutrients with antioxidant properties and are known for their potential therapeutic benefits, including their role in preventing degenerative diseases such as cancer. Polyphenols can be classified into flavonoids and non-flavonoids, and polyphenols have gained attention due to their wide application in food chemistry and their innovation potential. Antioxidants are beneficial to the body [21][22][23]. Many studies have shown the effect of polyphenols on anemia. The production process of red blood cells becomes perfect, and cell proliferation increases when polyphenols are present in a person's diet. Therefore, polyphenols are very beneficial for people with anemia[21][24][25].

Lactobacillus SP in its formulation also has a good effect on the body, including maintaining intestinal health to help food absorption [25][26]. Some of the mechanisms that cause Lactobacillus to become a beneficial substance include the mechanism of antagonism, namely the resistance of pathogenic bacteria in the intestine by Lactobacillus. In addition, the role of immunology in the gastrointestinal tract is also triggered by lactobacillus bacteria in the intestines. The immunological mechanisms of Lactobacillus also protect against pathogenic bacteria and strengthen the intestinal wall. With these two roles, the absorption of functional drinks made from sweet potato leaves which contain a lot of polyphenols is maximized and functions optimally. [12][26]. The formulation of functional drinks in this study is expected to be a solution for developing countries, including Indonesia, to overcome anemia because the raw materials are very cheap and easy to obtain.

CONCLUSIONS

Anemia in adolescent girls must be overcome as best as possible because this is an important period in the reproductive cycle. Many factors affect anemia. This study showed that there was no relationship between the education currently pursued and anemia in adolescent girls with a pvalue of 0.193, there was a relationship between the respondent's residence and anemia in adolescent girls with a P value of < 0.001 and there was a relationship between functional beverage consumption and anemia in adolescent girls with a P value of < 0.001. It is necessary to pay attention to these factors to overcome the problem of anemia

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