

Original Research Paper

Diet and history of infectious diseases affect the incidence of anemia in adolescent girls

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Abstract

This study was conducted at SMPN 77 Central Jakarta in 2023 to determine the correlation between diet, physical activity and history of infectious diseases with the incidence of anemia in adolescent girls. The research method used is correlative descriptive with a cross-sectional design. The research sample was 114 adolescent girls who were selected by stratified random sampling technique. The results showed that as many as 36.8% of adolescent girls experienced anemia, with a total of 43.0% having a LILA (Upper Arm Circumference) <19 cm. The results of statistical analysis showed that there was a correlation between diet and the incidence of anemia ($p=0.000$) and $OR=53.3$ (CI 95%. 6.7 – 420.3) as well as disease history with the incidence of anemia ($p=0.000$) and $OR=17.9$ (CI 95%. 6.3 – 50.6). However, no association was found between physical activity and the incidence of anemia ($p=0.537$). The results of the study concluded that adolescents with poor diets had a 53.3 times greater risk of developing anemia, while adolescents with a history of infectious diseases had a 17.9 times greater risk. This study suggests that adolescents regulate their diet by paying attention to the frequency and type of food consumed and maintaining immunity to avoid infectious diseases and prevent anemia by consuming iron tablets regularly.

Keywords: adolescents; anemia; diet; infectious diseases; physical activity

1. Introduction

Food intake in adolescents today is often neglected, where adolescents focus more on appearance and high levels of physical activity. Adolescence is a period of nutritional insecurity because there is an increase in rapid physical growth and development, in addition to that adolescents need enough energy to do daily physical activities (Mokoginta et al., 2016). An unbalanced diet will have an impact on optimal growth and development, and is more susceptible to chronic diseases such as cardiovascular disease, cancer, and osteoporosis in adulthood (Paat et al., 2021). Infectious diseases such as parasitic infections (worms), hemorrhoids (hemorrhoids), and bleeding are one of the causes that can affect the occurrence of anemia (Kurniasih et al., 2021). In order for the body to remain healthy and avoid various chronic diseases or infections, the diet of adolescents needs to be improved so that their nutritional intake is optimal and thus improve the health of each individual (Schwarz et al., 2014).

An overview of adolescents' diets according to a survey conducted by Global School Health in 2015 includes: Not always eating breakfast (65.2%), most adolescents consume less fruit and vegetable fiber (93.6%) and often consume flavored foods (75.7%). If this way of consumption is continuously carried out and becomes a routine eating habit for adolescents, it will have an impact on increasing the risk of anemia (Kementrian Kesehatan Republik Indonesia, 2018).

Meanwhile, adolescents' diets that are too picky about food such as not liking vegetables or disliking certain types of protein are related to the incidence of anemia in adolescents, where the teenager also does a lot of physical activities such as participating in extracurricular activities, sports, organizations

in the school environment and so on. Physical activities carried out by adolescents require a lot of energy, if the absorbed energy is not enough, it will cause adolescents to experience malnutrition, one of which is anemia. However, this is different from the 2018 Basic Health Research (Riskesdas), the proportion of the Indonesian population aged 10 years and over who do not do enough physical activity increased from 26.1% in 2013 to 33.5% in 2018, as many as (42.5%) adolescents do not do enough physical activity (Kementrian Kesehatan Republik Indonesia, 2019).

Teenagers also often consume snacks such as seblak, meatballs, fast food or junk food such as pizza, burgers, fried chicken (Roside & Dwihesti, 2020). Eating these foods is low in iron and other nutrients such as vitamin A, vitamin C, folate, riboflavin and B12, the mistake of consuming iron along with other substances can interfere with the absorption of iron as the main nutrient for adolescent girls (Julaecha, 2020). As many as 32% or three out of ten Indonesian adolescents suffer from anemia.

The incidence of anemia in several countries with anemia populations aged 15-49 years is Africa 69.9 million, America 38.1 million, Southeast Asia 190.6 million, Europe 48.4 million, Eastern Mediterranean 55.2 million, Western Mediterranean 55.2 million, Western Pacific 92.6 million, and global 496.3 million. Meanwhile, according to the Indonesian Ministry of Health (2018), based on data from DKI Jakarta, as many as 23% of adolescent girls experience anemia.

Anemia is a body condition where hemoglobin (Hb) levels in blood cells are said to be low so that they do not meet the physiological needs of the body (Kementrian Kesehatan Republik Indonesia, 2021). Anemia is characterized by frequent complaints of dizziness and glowing in the eyes, eyelids, lips, tongue, skin and palms becoming pale (Apriyanti, 2019). Common signs of anemia with the designation 5L are lethargy, fatigue, weakness and weakness (Ministry of Health of the Republic of Indonesia, 2021), and can be caused by stress and late eating (Romandani & Rahmawati, 2020). According to the World Health Organization (WHO), adolescent girls over the age of 15 have normal hemoglobin levels of >12.0 gr/dl (>7.5 mmol) (Sari et al., 2022).

Based on the phenomena described above, researchers are interested in finding out more about the factors that affect the incidence of anemia in adolescent girls at SMPN 77 Central Jakarta in 2023.

2. Research Methods

This study uses an analytical descriptive method with a cross-sectional study design and was conducted at SMPN 77 Central Jakarta in May – June 2023. The population in this study is adolescent girls in grades 7 and 8 who attend SMPN 77 Jakarta in 2023. The sample in this study amounted to 114 respondents. This study began by obtaining an overview of the incidence of anemia, infectious diseases, and physical activity, then analyzed to obtain the correlation between diet, infectious diseases, and physical activity and the incidence of anemia. The methodology used in this study is primary data (researchers obtain data directly from the first hand), namely Hb examination using the GCHb tool, compiled a questionnaire that includes diet, physical activity and history of infectious diseases in the last 6 months. This research has received approval from the Health Research Ethics Committee of the Faculty of Medicine and Health, Muhammadiyah University, Jakarta with No.43/PE/KE/FKK-UMJ/V/2023. Respondents in this study are required to agree to informed consent. Researchers will keep data or information related to respondents confidential.

3. Results and Discussion

Table 1. Distribution of Age Frequency, LILA, Diet, Physical Activity, History of Infectious Diseases, and Incidence of Anemia in Adolescent Girls at SMPN 77 Central Jakarta in 2023

Variable	Frequency (n)	Percentage (%)
Age		
Early adolescence	60	52.6

Variable	Frequency (n)	Percentage (%)
Middle teens	54	47.4
LILA		
CAKE	49	43.0
Not a SEZ	65	57.0
Diet		
Good	19	16.7
Not good	95	83.3
Physical activity		
Keep	76	66.7
Heavy	38	33.3
History of infectious diseases		
Exist	32	28.1
None	82	71.9
Anemia		
Anemia	42	36.8
Not anemia	72	63.2
Total	100	100

Source: Primary Data, 2023

The table above shows that the majority of adolescent girls are in the early adolescence phase as many as 60 respondents (52.6%), and middle adolescents as many as 54 respondents (47.4%). Based on LILA (upper arm circumference), most adolescent girls do not experience KEK (chronic energy deficiency) as many as 65 respondents (57%) and those who experience KEK as many as 49 respondents (43%). Adolescent girls with the most bad diets were 95 respondents (83.3%) and those with good diets were 19 respondents (16.7%). Moderate intensity physical activity was 76 respondents (66.7%) and heavy activity was 38 respondents (33.3%). Meanwhile, adolescent girls who did not have a history of infectious diseases were 82 respondents (71.9%) and those who had a history of infectious diseases were 32 respondents (28.1%). and 72 respondents (63.2%) adolescent girls did not experience anemia and 42 respondents (36.8%) experienced anemia.

Table 2. The Correlation between Diet and the Incidence of Anemia in Adolescent Girls at SMPN 77 Central Jakarta in 2023

Diet	Anemia				OR 95%CI	P (value)
	Anemia		No Anemia			
	N	%	N	%		
Good	18	94.7	1	5.3	53.3	0.000
Not good	24	25.3	71	74.7		

Source: Primary Data, 2023

Based on the table above, it can be seen that there is a significant correlation between diet and the incidence of anemia ($p=0.000$). Adolescents who had a poor diet were 53.3 times more likely to develop anemia than adolescent girls who had a good diet. OR = 53.3 (CI 95%. 6.7 – 420.3, $p=0.000$).

Based on the results of the study, a significant correlation was found between diet and the incidence of anemia ($p=0.000$). Adolescents who had a poor diet were 53.3 times more likely to develop anemia than adolescent girls who had a good diet. OR = 53.3 (CI 95%. 6.7 – 420.3, $p=0.000$).

The prevalence of anemia in adolescent girls nationally reaches 23%. The incidence of anemia in adolescents is influenced by changes in diet and lifestyle, including the frequency of eating and the type of food consumed. Diet is a description of the frequency and type of food consumed every day. Poor

diet is one of the factors that cause anemia. Consumption of good food and the amount of food that should be consumed will affect optimal body health (Satyagraha et al., 2020).

Adolescents in Indonesia who consume food with good nutrition are very rare, adolescents consume more food with poor nutrition, where the prevalence reaches 50% of the total adolescent population, this is still the cause why adolescents in Indonesia are prone to anemia.

Table 3. The Correlation between Physical Activity and the Incidence of Anemia in Adolescent Girls at SMPN 77 Central Jakarta in 2023

Physical activity	Anemia				OR 95%CI	P (value)
	Anemia		No Anemia			
	N	%	N	%		
Keep	26	34.2	50	65.8	0.715	0.537
Heavy	16	42.1	22	57.9		

Source: Primary Data, 2023

Based on the table above, it can be seen that there is no correlation between physical activity and the incidence of anemia ($p=0.537$). Adolescents who engage in moderate and vigorous physical activity will experience the same risk of anemia. OR = 0.715 (CI 95%. 0.32 – 1.59).

Based on the results of the above study, it shows that there is no correlation between physical activity and the incidence of anemia ($p=0.537$). Adolescents who engage in moderate and vigorous physical activity will experience the same risk of anemia. OR = 0.715 (CI 95%. 0.32 – 1.59).

Hemoglobin (Hb) levels are greatly influenced by the physical activity that a person does. Hemoglobin (Hb) levels increase when a person exercises regularly. This condition can occur when a person is active, so tissues or cells will need more oxygen. In addition, a person's condition varies greatly, some show normal hemoglobin (Hb) results but some show higher results. Physical fitness decreases, this condition is caused by other factors besides hemoglobin (Hb) levels that determine a person's physical health (Chibriyah, 2018).

Although there is no statistically associated association between physical activity and the incidence of anemia, some of the theories above suggest that strenuous physical activity will affect hemoglobin levels within normal limits or more. Strenuous physical activity causes the metabolism in the body's cells to increase so that iron metabolism in the body causes hemoglobin levels in the body to be normal or higher (Basuki, 2019).

Table 4. The Correlation between Physical Activity and the Incidence of Anemia in Adolescent Girls at SMPN 77 Central Jakarta in 2023

History Disease Infection	Anemia				OR 95%CI	P (value)
	Anemia		No Anemia			
	N	%	N	%		
Exist	26	81.3	6	18.8	17.9	0.000
None	16	19	66	80.9		

Source: Primary Data, 2023

Based on the table above, it can be seen that there is a significant correlation between infectious diseases and the incidence of anemia ($p=0.000$). Adolescent girls who have a history of infectious diseases are 17.9 times more likely to develop anemia than adolescent girls who have no history of infectious diseases. OR = 17.9 (CI 95%. 6.3 – 50.6. $p=0.000$).

The results showed that there was a significant correlation between the history of infectious diseases and the incidence of anemia ($p= 0.000$). Adolescent girls who have a history of infectious diseases are 17.9 times more likely to develop anemia than adolescent girls who have no history of infectious diseases. $OR = 17.87$ ($IK\ 95\% = 6.3 - 50.6$ $p= 0.000$).

Infectious and parasitic diseases are one of the causes of iron deficiency anemia in adolescents. This tends to happen in tropical, humid and poor sanitary conditions. Chronic diseases such as COPD and malaria will worsen anemia. Infectious diseases can cause nutritional disorders in several ways, such as vomiting, diarrhea, and loss of appetite. Infection can also lead to a decrease in hemoglobin (Hb) levels. Diarrhea and ISPA cause a decrease in appetite which in turn can decrease the level of nutrient consumption (Listiana, 2016).

Inflammation that occurs when a person suffers from an infectious disease will interfere with the absorption of iron that occurs in a person's body. Iron plays a role in the process of apoptosis or cell death. The deification process is divided into 2 namely intrinsic pathways and extrinsic pathways. The intrinsic pathway is the release of cytochromes. Cytochrome is a hemoprotein that contains a heme group and functions as an electron carrier. Iron is an important component of cytochromes, if iron reserves are reduced, it will inhibit the apoptosis process. When the body loses apoptosis, cells will divide uncontrollably in the long term.

4. Conclusion

From the results of research conducted on adolescent girls at SMPN 77 Central Jakarta in 2023, it can be concluded that based on the results of LILA measurements, there are still 43.0% who experience SEZs. Meanwhile, those who experience anemia are 36.8%. This means that the percentage of respondents who experience anemia in this study is still quite high, because based on national research, anemia in adolescents is 23%.

Respondents who had a bad diet were quite a lot (83.3%) and this factor was related to the incidence of anemia ($p=000$) where adolescents who had a bad diet had a 53.3 times chance of developing anemia.

In the last 6 months, there were 28.1% who had a history of infection and this was related to the incidence of anemia ($p=000$) where adolescents who had a poor diet had a 17.9 times chance of experiencing anemia.

There was no association between physical activity and the incidence of anemia, $p = 0.537$. Statistical analysis shows that anemia can be experienced by adolescent girls with or without moderate and vigorous activity.

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