



The Relationship between the Level of Consumption of Energy, Protein, Fe and Blood Tablets with Anaemia Status in Adolescent Girls at SLTPN 1 Menui Morowali Regency

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Abstract. A global health concern, anaemia stunts teenage girls' motor development and impairs their cognitive function. The World Health Organization (WHO) reports that between 40% and 88% of the world's population suffers from anaemia in 2015. According to 2018 statistics from Riskesdas, the prevalence of anaemia in Indonesia is 23.7% overall, 26.8% in the 5–14 age group, and 32.0% in the 15–24 age group. The objective is to find out in 2023 how much calories, protein, iron, and blood pills that teenage females at SLTPN 1 Menui Morowali Regency consumed in connection to their anaemia state. This study used a cross-sectional design based on analytical descriptive research. A total of 52 teenage females were selected using a proportionate sampling method. Examination of hemoglobin levels, completion of a two-day meal recall questionnaire to determine caloric intake, and administration of blood-added tablets are all components of the data gathering process. The chi-square test was used in this investigation. In this study, anaemia was reported by the majority of participants (76.6%), with 63.5% of the participants consuming less energy, 44.2% consuming less protein, 96.2% consuming less iron, and 96.2% consuming less blood-added tablets. In teenage females, there is a correlation between the quantity of protein consumed and their anaemia state; however, in adolescent girls, there is no correlation between caloric consumption, iron, and blood pills and anaemia status.

Keywords: Adolescent Anaemia Girls, Energy, Protein, Fe and Blood Added Tablets

1. Introduction

Nutritional anaemia is a disorder where blood hemoglobin levels are lower than normal as a consequence of the lack of red blood cell-forming tissue in its formation to keep hemoglobin levels at a normal level [1]. As to the report by the World Health Organization [2], the global prevalence of anaemia in 2015 was estimated to be between 40% and 88%. According to Riskesdas figures from 2018, the prevalence of anaemia in Indonesia is 23.7%, with 26.8% of cases occurring in the 5–14 age group

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and 32.0% in the 15–24 age group. In Indonesia, women experience anaemia at a rate of 27.2% compared to men's 20.3% [3]. The screening results of the Ulunambo Community Health Center, Morowali Regency in 2022 showed that SLTPN 1 Menui was a junior high school whose 9 female students experienced anaemia with a presentation of 28%.

Research conducted by Fitrah in 2019 on junior high school teenage girls in North Mamuju Regency stated that 70.5% were anemic and had insufficient energy intake and 65.5% of teenage girls who were anemic also had insufficient protein intake.

Anaemia, caused by a deficiency in iron and other nutrients, is more common among teenage females than in any other age group. Teenage females might lose up to 1.25 milligrams of iron daily due to their monthly menstrual cycles. Anaemia may be caused by an iron deficiency in up to half of the cases. Anaemia occurs when a young woman's hemoglobin (Hb) level drops below the normal range, which is less than 12 gr/dl [4].

The impact of anaemia that occurs during the growth period will result in decreased work productivity, learning ability, immune system and reproductive health. Apart from that, anaemia can also cause fatigue, paleness, dizziness, and decreased body resistance, making it easy to catch infectious diseases. This situation affects concentration and learning achievement and affects the work productivity of young women. Considering that the impact that occurs as a result of iron deficiency anaemia is very detrimental in the future, prevention and control efforts need to be carried out early [5].

Compliance with consuming blood supplement tablets is influenced by two factors, namely self-awareness regarding consuming blood supplement tablets and health worker factors. Non-compliance in consuming blood supplement tablets is an obstacle faced in efforts to increase daily iron for young women. Non-compliance with consuming blood supplement tablets in young women is caused by boredom and laziness in consuming them because the taste and aroma of blood supplement tablets are unpleasant. Apart from that, the effects that arise after consuming blood supplement tablets include nausea, vomiting, burning or pain in the pit of the stomach and black stools [6].

Among young women in Central Sulawesi region, 99.3 percent of students received blood supplement pills (TTD) in 2018, according to Riskesdas statistics [3]. Blood supplement pills were administered to 68.2% of young women in 2021, according to the Morowali District Health Service profile. 90.6% of the young women getting blood supplement pills (TTD) are located in SLTPN 1 Menui, which is the workplace of the Ulunambo Community Health Center.

2. Methods

A cross-sectional research design based on descriptive analytics is used in this study. The study was place in SMP Negeri 1 Menui, Morowali Regency, Indonesia, from February 23 to March 23, 2023. Participants in this research include for the 2022–2023 school year, 103 female students enrolled in seventh, eighth, and ninth grade at State Junior High School 1 Menui, Morowali Regency. In this investigation, 52 individuals were included in the sample. Primary data collection in this study was carried out during interviews using questionnaires and blood hemoglobin

examination. To determine the prevalence of anaemia, it was obtained by examining blood hemoglobin, the level of energy, protein and Fe consumption was obtained by 2 x 24 hours food recall and the level of consumption of blood supplement tablets was obtained through interviews using a questionnaire. Secondary data in this research includes a general description of the school, number of teachers and number of female students. Data analysis used the chi square test.

3. Results

This research was conducted in adolescent girl in working area Menui Health Center. Sample characteristics can be seen in Table 1.

Table 1. The Characteristics of Sample

Variable	n	%
Age (year)		
13	16	30,7
14	22	42,3
15	14	30,0
Total	52	100,0
Class		
VII	14	26,9
VIII	20	38,5
IX	18	34,6
Total	52	100,0

Source: primary data, 2023

According to the above table, which contains 52 samples, the majority of the sample characteristics based on age are 42.3% for samples aged 14 and above, 30.7% for samples aged 13 and up, and 30.0% for samples aged 15. Based on class, the 52 samples Class VIII accounts for 38.5% of the sample, class IX accounts for 34.6%, and class VII accounts for 26.9%.

Table 2. Sample Distribution based on Energy, Protein, Fe and Blood Supplement Tablet (TTD) Consumption and Anaemia Status

Variable	n	%
Energy Consumption		
Good	19	36,5
Poorly	33	63,5
Total	52	100,0
Protein Consumption		
Good	29	55,8
Poorly	23	44,2
Total	52	100,0

Fe		
Consumption	2	3,8
on Good	50	96,2
Poorly	52	100,0
Total		
Blood Added Tablets		
Good	2	3,8
Poorly	50	96,2
Total	52	100,0
Anaemia		
Status	12	23,1
Normal	40	76,9
Anaemia	52	100,0
Total		

Based on the table a, it is known that the energy consumption of 33 samples (63.5%) is in the poor category and 19 samples (36.5%) are in the good category. The protein consumption of 23 samples (44.2%) was in the poor category and 29 samples (55.8%) were in the good category. For Fe consumption, 50 samples (96.2%) were in the poor category and 2 samples (3.2%) were in the good category, the same as for consumption of blood supplement tablets, while anaemia status was obtained as many as 40 samples (76.9%) were anaemia and 12 samples (23.1%) were not anaemia.

Table 3. Relationship between Energy Consumption Levels and Anaemia Status

Energy Consumption	Anaemia Status				Total		P-Value
	Anaemia		Normal				
	n	%	n	%	n	%	
Good	13	68,4	6	18,2	33	100,0	0.317
Poorly	27	81,8	6	31,6	19	100,0	
Total	40	50,0	12	50,0	52	100,0	

Anaemia was present in 27 out of 33 teenage females (81.8% of the total) with poor energy intake, and in 13 out of 19 (68.4% of the total) with excellent energy consumption (table 3). With a p-value of just 0.317, the Chi-square test found no statistically significant correlation between energy intake and anaemia in teenage females.

Table 4. Relationship between Protein Consumption Levels and Anaemia Status

Protein Consumption	Anaemia Status				Total		P-Value
	Anaemia		Normal		n	%	
	n	%	n	%			
Good	21	91,3	2	8,7	23	100,0	0.046
Poorly	19	65,5	10	34,5	29	100,0	
Total	40	76,9	12	23,1	52	100,0	

Anaemia was present in 21 (91.3%) of the 23 teenage girls whose protein intake was inadequate, as shown in table 4. In contrast, 19 (65.5%) of the 29 teenage girls whose protein intake was high had anaemia. There is a statistically significant correlation between teenage females' protein intake and their anaemia status, according to the Chi-square test ($p = 0.046$).

Table 5. Relationship between Protein Consumption Levels and Anaemia Status

Fe Consumption	Status Anaemia				Total		P-Value
	Anaemia		Normal		n	%	
	n	%	n	%			
Good	0	0,0	2	100,0	2	100,0	0.050
Poorly	40	80,0	10	20,0	50	100,0	
Total	40	76,9	12	23,1	52	100,0	

Anaemia was present in 80 percent of the 50 teenage girls whose fe consumption was poor, according to table 5, but none of the two girls whose fe consumption was acceptable had anaemia. There is no significant link between Fe intake and anaemia status in teenage females, according to the Chi square test findings ($p = 0.050$).

4. Discussion

a. Anaemia Status in Adolescent Girls

When there is insufficient hemoglobin (Hb) in the blood, a condition known as anaemia occurs. Anaemia is defined as a hemoglobin level below 12 gr/dl in young women. A larger percentage of young women were found to be anaemic (76.9% vs. 23.1% in the study at SLTPN 1 Menui, Morowali Regency) than in the study by [7] in Situbundo, where 68.6% of the teenage girls tested negative for anaemia.

In 2017, the World Health Organization designated anaemia as a serious public health problem if the prevalence of anaemia was $> 40\%$. Based on these criteria, the prevalence of anaemia in adolescents at SLTPN 1 Menui, Morowali Regency is in the severe category, which indicates that it requires good attention and treatment. Adolescent girls play a role in determine the quality of future human resources because they will become prospective mothers so that nutritional needs, especially Fe, must be fulfilled starting from adolescence.

Low iron consumption is the reason for the high prevalence of anaemia in SLTPN

1 Menui, Morowali Regency. Cognitive function, physical abilities, and job productivity can all suffer from iron dietary anaemia. Aside from that, inadequate consumption and absorption of iron can also lead to nutritional anaemia. Sufficient consumption of nutrients is required for the best possible formation of red blood cells and hemoglobin. Iron deficiency anaemia can be caused by a number of factors, such as nutritional status, understanding of anaemia, and menstrual cycles.

b. Relationship between Energy Consumption Levels and Anaemia Status in Adolescent Girls

Energy is a byproduct of metabolic processes including carbohydrates, proteins, and fats [8]. Metabolic processes, physical activity, development, and temperature control all rely on it as an energy source. Analyzing the correlation between energy consumption and teenage girls' anaemia status revealed that a low energy consumption group accounted for 81.8% of the cases, while a high energy consumption group accounted for 68.4%. There is no correlation between calorie intake and teenage girls' anaemia status, according to the chi-square test. Based on this research, it shows that low energy consumption in young women is caused by the tendency of teenagers to want to diet for the reason of maintaining an ideal body shape, resulting in wrong eating patterns and a preference for fast food.

The respondents' lack of nutritional consumption was influenced, among other things, by their eating habits of skipping one meal. Lack of energy both quantitatively and qualitatively, the body's working capacity will be disrupted resulting in the dismantling of protein reserves in the body. Consistent with other studies, this one finds no correlation between energy intake and the prevalence of anaemia in young women [9]. [10] found a substantial correlation between energy consumption and the prevalence of anaemia in teenage females; this study contradicts her findings.

c. Relationship between Protein Consumption Levels and Anaemia Status in Adolescent Girls

According to [8], protein is a nutrient that contains nitrogen, around 16% of nitrogen is contained in protein. During adolescence, protein needs increase because the growth and development process occurs quickly. If energy intake is limited, protein will be used as an energy source.

Erythrocytes, hemoglobin, and other blood droplets, as well as the transportation of iron to the bone marrow to create new blood cells, are all dependent on protein [11]. The study found that 91.3% of the cases of anaemia in teenage females happened in those who consumed inadequate amounts of protein, whereas 65.5% of the cases occurred in those who consumed an adequate amount of protein. A correlation between teenage girls' protein intake and their anaemia status was shown using the chi-square test (see also [4], [12]–[14]).

This study's findings suggest that young women's inadequate protein intake is caused by a diet deficient in macronutrients. Specifically, some participants report skipping breakfast in favor of sugary drinks and cakes, which leaves them short on protein. There are a number of variables that affect protein intake, including age, body mass index (BMI), and the quality of the protein consumed. The body's absorption of

iron is facilitated by protein. One way to understand this is that hemoglobin, a red blood pigment that is tested to evaluate anaemia status, is a binding between globin and heme proteins that transports oxygen and carbon dioxide. Findings from this study corroborate those by [15], who also found a very substantial correlation between protein consumption and hemoglobin levels. A decreased hemoglobin level is associated with a reduced protein diet. The findings of this study are in line with those of [16] [17], who also found that protein intake is related to hemoglobin levels. Anaemia rates were shown to be correlated with protein consumption [18], [19].

d. Relationship between Fe Consumption Levels and Anaemia Status in Adolescent Girls

Among iron's many vital functions in the body are its involvement in hemoglobin synthesis and the support it provides to metabolic enzymes via the binding of oxygen. Both heme and non-heme iron are components of the element iron. Iron intake that is less than the Nutritional Adequacy Rate (AKG) will not immediately affect Hb levels because the body still has iron reserves in the liver, after these iron reserves are used up. This will only cause a decrease in Hb levels which begins with a decrease in ferritin levels [16]. Anaemia affected 80% of teenage females whose Fe intake was low, according to an investigation of the correlation between the two variables. No correlation between Fe intake and anaemia status was found in teenage females according to the chi-square test.

Some respondents had the practice of drinking tea after meals, which hindered the absorption of iron, according to this study based on interview data. The body's iron absorption level is the determining factor in meeting iron demands. Iron enhancers and inhibitors affect iron absorption, particularly of the non-heme kind. Consumption of inhibitors, such as polyphenols in tea and coffee, may lead to anaemia. This study's findings corroborate those of [20]–[22], who found no correlation between Fe consumption and anaemia in teenage females. The same or similar findings were reported by [23], who found no correlation between iron consumption and anaemia in teenage females.

5. Conclusion

At SLTPN 1 Menui, Morowali Regency, young women's anaemia condition is unrelated to their calorie consumption, iron consumption, or use of blood supplement pills. In the case of teenage females enrolled at SLTPN 1 Menui in Morowali Regency, there is a correlation between their protein intake and their anemic condition.

Suggestion

It is hoped that there will be coordination with health workers to provide education to young women about balanced nutrition, anaemia and the importance of consuming blood supplement tablets. Also, one day every week that is used as a day to consume blood supplement tablets at school.

References

1. N. K. Windaningsih, I. K. Kencana, and I. M. Suarjana, "Gambaran Konsumsi Protein Hewani, Konsumsi Tablet Tambah Darah dan Kejadian Anemia Siswi SMAN 1 Payangan Kabupaten Gianyar," *J. Ilmu Gizi J. Nutr. Sci.*, vol. 7, no. 3, pp. 83–91, 2020, doi: doi.org/10.33992/jig.v7i3.331.
2. WHO, *Haemoglobin Concentrations for the Diagnosis of Anaemia and Assessment of Severity. Vitamin and Mineral Nutrition Information System*. Geneva: World Health Organization, 2011.
3. Riskesdas, *Laporan Riskesdas Nasional 2018*. Jakarta: Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan, 2019.
4. R. Nuraeni, P. Sari, N. Martini, S. Astuti, and L. Rahmiati, "Peningkatan Kadar Hemoglobin melalui Pemeriksaan dan Pemberian Tablet Fe Terhadap Remaja yang Mengalami Anemia Melalui 'Gerakan Jumat Pintar,'" *J. Pengabd. Kpd. Masy. (Indonesian J. Community Engag.*, vol. 5, no. 2, pp. 200–221, 2019, doi: 10.22146/jpkm.40570.
5. I. G. A. N. Agustini, "Hubungan Tingkat Konsumsi Energi, Protein, Zat Besi dan Kepatuhan Minum Tablet Besi dengan Kejadian Anaemia Gizi pada Remaja Putri di SMP Negeri 2 Ubud," Poltekkes Kemenkes Denpasar, 2020.
6. A. A. Meitasari, "Hubungan Kepatuhan Konsumsi Tablet Tambah Darah dengan Kadar Hemoglobin pada Remaja Putri di MTS Srigading Lampung Timur," Universitas Muhammadiyah Surakarta, 2022.
7. A. Hamidiyah, L. Rohmani, and N. A. Zahro, "Faktor Determinan Anemia Santri Putri (Determinant Factors of Anemia Female Santri)," *OKSITOSIN J. Ilm. Kebidanan*, vol. 6, no. 1, pp. 64–72, 2019, doi: 10.35316/oksitosin.v6i1.345.
8. Adriani and Wirjatmadi, *Peranan Gizi dalam Siklus Kehidupan*. Jakarta: Kencana, 2012.
9. P. Sari, R. T. D. Judistiani, D. Hilmanto, D. M. D. Herawati, and M. Dhamayanti, "Iron Deficiency Anemia and Associated Factors Among Adolescent Girls and Women in a Rural Area of Jatinangor, Indonesia," *Int. J. Womens. Health*, vol. 14, no. August, pp. 1137–1147, 2022, doi: 10.2147/IJWH.S376023.
10. E. A. Ely, "Hubungan antara Asupan Zat Gizi Energi, Protein, Zat Besi dan Pola Menstruasi dengan Kejadian Anaemia pada Remaja Putri berdasarkan Jenjang Pendidikan di Kabupaten Kebumen," *Bidan Prada Akad. Kebidanan YLPP Purwokerto*, 2017.
11. S. D. Rahayu and F. F. Dieny, "Citra Tubuh, Pendidikan Ibu, Pendapatan Keluarga, Pengetahuan Gizi, Perilaku Makan dan Asupan Zat Besi pada Siswi SMA," *Media Med. Indones.*, vol. 46, no. 3, pp. 184–194, 2012.
12. K. Iqbal *et al.*, "Effect of Iron Deficiency Anemia on Intellectual Performance of Primary School Children in Islamabad, Pakistan," *Trop. J. Pharm. Res.*, vol. 14, no. 2, pp. 287–291, 2015, doi: 10.4314/tjpr.v14i2.14.
13. S. A. Toruntju, B. La, P. Leksono, M. Rahmat, and W. O. Salma, "The Influence of Wedge Sea Hare (*Dolabellaauricularia*) Extract and Papaya Juice on Hemoglobin (Hb) and Ferritin Levels of Mice Strain (Balb / C) with Anemia," *Medico-Legal Updat.*, vol. 20, no. 1, pp. 1347–1352, 2020, doi: 10.37506/v20/il/2020/mlu/194490.
14. B. Santosa, F. N. Damayanti, S. Nurjanah, and N. N. Anggraini, "The Effect of Iron Giving on Hemoglobin Levels in Anemia Pregnant Women," *J. Kebidanan*, vol. 11, no. 2, p. 203, 2022, doi: 10.26714/jk.11.2.2022.203-210.
15. C. A. Sholicha and L. Muniroh, "Hubungan Asupan Zat Besi, Protein, Vitamin C dan Pola Menstruasi dengan Kadar Hemoglobin pada Remaja Putri di SMAN 1 Manyar Gresik," *Media Gizi Indones.*, vol. 14, no. 2, pp. 147–153, 2019, doi: 10.20473/mgi.v14i2.147-153.
16. Haslindah, "Hubungan Body Image, Asupan Zat Gizi Mikro (Fe, Vitamin C, Vitamin A,

- dan Vitamin B12) dan Protein dengan Kadar Hb pada Remaja Putri di SMAN 12 Makassar Tahun 2017 (Skripsi).” Universitas Hasanuddin, 2017.
17. Nopiana, “Hubungan Asupan Protein dan Zat Besi dengan Kadar Hemoglobin,” *J. Media Kesehat. Poltekkes Kemenkes Bengkulu*, vol. 8, no. 1, pp. 1–10, 2015, doi: doi.org/10.33088/jmk.v8i1.264.
 18. A. Kumar, E. Sharma, A. Marley, M. A. Samaan, and M. J. Brookes, “Iron Deficiency Anaemia: Pathophysiology, Assessment, Practical Management,” *BMJ Open Gastroenterol.*, vol. 9, no. 1, pp. 1–9, 2022, doi: 10.1136/bmjgast-2021-000759.
 19. R. Paramastri, C. Y. Hsu, H. A. Lee, L. Y. Lin, A. L. Kurniawan, and J. C. J. Chao, “Association between Dietary Pattern, Lifestyle, Anthropometric Status, and Anemia-Related Biomarkers among Adults: A Population-Based Study from 2001 to 2015,” *Int. J. Environ. Res. Public Health*, vol. 18, no. 7, pp. 1–15, 2021, doi: 10.3390/ijerph18073438.
 20. N. D. Astuti, B. Wirjatmadi, and M. Adriani, “The Role of Addition of Vitamin C in Iron Supplementation on Ferritin Serum Levels in Anemia Adolescent Females,” *Heal. Notions*, vol. 2, no. 3, pp. 332–338, 2018, doi: doi.org/10.33846/hn.v2i3.147.
 21. C. Ekiz, L. Agaoglu, Z. Karakas, N. Gurel, and I. Yalcin, “The Effect of Iron Deficiency Anemia on the Function of The Immune System,” *Hematol. J.*, vol. 5, no. 7, pp. 579–583, 2005, doi: 10.1038/sj.thj.6200574.
 22. S. A. Toruntju, A. Syam, S. Palutturi, M. Arif, V. Hadju, and A. R. Thaha, “Study of Hemoglobin and Ferritin Profile as Indicators in Children Hematology of 12-15 Years Provided Local Rice Fortification,” *Int. J. Sci. Basic Appl. Res.*, vol. 32, no. 1, pp. 352–364, 2017.
 23. A. Akib and S. Sumarmi, “Kebiasaan Makan Remaja Putri yang Berhubungan dengan Anemia: Kajian Positive Deviance (Food Consumption Habits of Female Adolescents Related to Anemia: A Positive Deviance Approach),” *Amerta Nutr.*, vol. 1, no. 2, pp. 105–116, 2017, doi: 10.20473/amnt.v1.i2.2017.105-116.

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