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Analisis Penyebab Anemia berdasarkan Siklus Menstruasi, Pola Makan, dan Asupan Gizi pada Remaja

Analysis of the Causes of Anemia Based on the Menstrual Cycle, Eating Patterns, and Nutritional Intake in Adolescents

Catur Wulandari[1]*, Dini Setiarsih[1], Anugrah Linda Mutiarani[1], Farah Nuriannisa[1], Alifia Sefty Arruny Wahyudi[1], Risma Defva Santoso[1],

[1]Department of Nutrition, Faculty of Public Health, Universitas Nahdlatul Ulama, Surabaya, Indonesia

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***Correspondence:**
Catur Wulandari
cawulan@unusa.ac.id

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ABSTRAK

Latar Belakang: *Mahasiswa merupakan kelompok remaja putri yang rentan mengalami defisiensi zat besi. Anemia pada remaja putri dapat disebabkan oleh berbagai faktor, diantaranya siklus menstruasi, pola makan, dan asupan gizi.*

Tujuan: *Penelitian ini bertujuan untuk menganalisis hubungan siklus menstruasi; pola makan; asupan protein, zat besi, dan vitamin C dengan kejadian anemia pada remaja putri.*

Metode: *Penelitian observasional analitik ini melibatkan 104 mahasiswa sebagai responden. Kejadian anemia dinilai dengan mengukur kadar hemoglobin (Hb) responden. Penilaian asupan gizi menggunakan metode recall 3 x 24 jam. Siklus menstruasi dikaji menggunakan kalender menstruasi. Analisis data menggunakan uji Spearman rank dengan p-value < 0,05.*

Hasil: *Hasil penelitian menyatakan terdapat hubungan antara siklus menstruasi (p-value 0,000); pola makan (p-value 0,000); asupan protein (p-value 0,012); asupan zat besi (p-value 0,001); asupan vitamin C (p-value 0,002) dengan kejadian anemia rite pada remaja putri*

Kesimpulan: *Hubungan antar variabel tersebut menandakan bahwa siklus menstruasi, pola makan, dan asupan gizi menjadi penyebab terjadinya anemia pada remaja putri.*

Kata kunci: *Anemia, Asupan Gizi, Pola Makan, Remaja, Siklus Menstruasi*

ABSTRACT

Background: Students as young women are vulnerable to iron deficiency anemia. Anemia in adolescent girls can be caused by factors such as the menstrual cycle, diet, and nutritional intake

Objectives: This research aims to analyze the relationship between the menstrual cycle, diet, intake of protein, iron, and vitamin C with the incidence of anemia in adolescent girls

Methods: This observational analytical research involves 104 female students as a sample. Anemia is assessed by measuring the respondent's hemoglobin level. Nutritional intake was assessed using the 3 x 24-hour recall method. Data analysis used the Spearman rank test with p-value <0.05.

Results: The research results stated that there was a relationship between the menstrual cycle (p-value 0.000); diet (p-value 0.000); protein intake (p-value 0.012); iron intake (p-value 0.001); Vitamin C intake (p-value 0.002) with the incidence of anemia in adolescent girls.

Conclusion: The existence of this relationship means that the menstrual cycle, eating patterns, and nutritional intake are the causes of anemia in adolescent girls.

Keywords: Adolescents, Anemia, Dietary Habit, Menstrual Cycle, Nutritional Intake

INTRODUCTION

Anemia is a public health problem that never ends and needs special attention. Anemia is a condition where the number of red blood cells in the blood circulation decreases below normal limits (Sholicha and Muniroh, 2019). The impact caused by anemia is that you feel tired easily, there is a decrease in concentration in studying, decreased productivity, and decreased body resistance, making it easy to get infections (Siauta, Indrayani and Bombing, 2020). Anemia can have long-term impacts when young women become adults and become pregnant. Adolescent girls who experience anemia can experience complications during pregnancy, childbirth, low birth weight, and risk of death (Nuraeni *et al*., 2019).

Factors that influence the occurrence of anemia are nutritional status, socio-economic status, menstrual patterns consisting of cycles, length, and volume of blood, diet, and intake of macro-micronutrients. The menstrual cycle is one of the factors that causes anemia with normal cycles, and short bleeding cycles so that the iron intake in the body is lost with the blood. If the iron levels in the body are low, anemia occurs. In the menstrual cycle, hormones have an important influence. If the hormones are disturbed in balance, the menstrual cycle will be disrupted and result in menstrual disorders (Baadiah *et al.*, 2021).

Other factors can be exacerbated if students do not pay attention to their eating patterns, such as skipping breakfast, choosing foods and snacks that are low in nutrients and liking junk food, this is because iron intake in the body is reduced but the intake consumed is not balanced. So, the quantity and quality of food and drink affect the health level of an individual which will cause anemia (Suryanti, 2017).

Lack of food intake is one of the causes of anemia. In general, this includes macronutrient deficiencies such as carbohydrates, protein, and fat, and micronutrient deficiencies such as vitamins and minerals. Lack of macronutrients and micronutrients causes the body to become thinner and weight loss drastically. This can cause constant pain and prolonged anemia (Umami, 2021).

Protein plays an important role in the formation of blood cells such as erythrocytes and hemoglobin and in transporting iron for the formation of blood cells in the bone marrow (Alfani and Nuriannisa, 2022)(Alfani and Nuriannisa, 2022). Insufficient protein intake will disrupt the formation of erythrocytes and hemoglobin and delay the transfer of iron so that red blood cell production is disrupted (Kusudaryati and Prananingrum, 2018). Iron is part of the hemoglobin molecule. Therefore, iron deficiency in the body reduces hemoglobin production (Umami, 2021). Iron deficiency is usually caused by low iron intake and poor iron bioavailability due to over-reliance on plant-based diets high in iron absorption inhibitors such as phytate (Ayensu *et al.,* 2020). Vitamin C is a substance that helps the process of absorbing iron in the body (Ni'matush Sholihah, Sri Andari and Bambang Wirjatmadi, 2019).

Anemia is a nutritional problem that still needs attention. Anemia has been found to be an independent risk factor for major bleeding, heart failure, and death in patients with non-valvular atrial fibrillation (NVAF) (Krittayaphong *et al.*, 2021). According to the World Health Organization (WHO, 2018) shows that the prevalence of iron deficiency anemia is 35-75% in developing countries. Anemia is one of the nutritional problems that occurs among students of Universitas Nahdlatul Ulama Surabaya. This can be seen from the results of a preliminary study conducted by the author on 10 students from the Bachelor of Nutrition study program at Universitas Nahdlatul Ulama Surabaya showed that 70% of students suffered from anemia, 60% of students who suffered from anemia had normal menstrual cycles, 30% had short cycles and 10% have a long cycle without anemia. Apart from that, 80% of female students suffer from anemia because their eating patterns are irregular and prefer junk food, while 20% who are not anemic eat regularly and with variety. This study aims to analyze the causes of anemia based on the menstrual cycle, diet, and nutritional intake in adolescents.

METHODS

This research is an analytical observational study with a population of 874 young women who are students at the Faculty of Health, Universitas Nahdlatul Ulama Surabaya (UNUSA). Samples were taken using a stratified random sampling technique with a total of 104 respondents. The inclusion criteria in this study were active students at the Health Faculty of Universitas Nahdlatul Ulama Surabaya, willing to take part in research as proven by signing an informed consent. The exclusion criteria in this study were students who were sick or suffering from an illness, students who were menstruating at the time of data collection.

Meanwhile, the drop out criteria were students who did not fill out the questionnaire completely, students who withdrew as respondents, students who died during the research period.

The author examined the nutritional status of the respondents, nutritional status was measured based on body mass index (BMI) with a classification of very thin < 17.0; thin 17.0-18.4; normal 18.5-25.0; fat > 25.1-27.0; obesity > 27.0 (Kemenkes RI, 2014). This research consists of a dependent variable, namely the incidence of anemia, and independent variables which include: menstrual cycle, eating patterns, protein intake, iron (Fe) intake, and vitamin C intake. The menstrual cycle variable is the average of the time between the first day of menstruation and the next menstruation for two menstrual cycles obtained from the last three months of menstruation with a short cycle classification of <21 days; normal cycle 21-35 days; long cycle >35 days (Ilmi dan Selasmi, 2019). The eating pattern variables studied include the type of food, amount of food, and frequency of eating of respondents with the category of eating patterns being bad if they meet 1 or none of the 3 criteria; the diet is good enough if it meets 2 of the 3 criteria; and a good diet if it meets 3 criteria (Almatsier, 2013). Intake variables are measured by the amount of nutrient intake per day and then compared with the nutritional adequacy rate. Intake categories are severe deficit (<70%); moderate deficit (70-79%); mild deficit (80-89%); normal (90-119%); and excessive (≥120%) (Kemenkes, 2014). The incidence of anemia is assessed from the respondent's hemoglobin level with the classification of anemia if the Hb level is <12 g/dL and not anemia if the Hb level is 12-15 g/dL (WHO, 2019).

The instruments used in collecting data are menstrual calendars, food recall forms (FAO, 2012), and Hb meter Easy Touch GCHb. Data collection on nutritional intake was carried out by conducting food recalls 3 x 24 hours, namely 2 times on weekdays and 1 time on weekends. After data processing, data analysis was then carried out using the Spearman Rank test with a confidence level of 95%. Data analysis used the IBM SPSS Statistics 22 program. Research data collection was carried out after obtaining ethical approval from the health research ethics committee of Universitas Nahdlatul Ulama Surabaya with number 015/EC/KEPK/UNUSA/2023 on May 15 2023.

RESULTS AND DISCUSSION

This research was carried out at Universitas Nahdlatul Ulama Surabaya, taking respondents aged 18-22 years as research subjects. Respondent characteristics are presented in the table below.

Table 1. Characteristics of Adolescent girls

Characteristics	Frequency (n)	Percentage (%)
Age		
19 years old	24	23.1
20 years old	24	23.1
21 years old	28	26.9
22 years old	28	26.9
Total	104	100.0
Nutritional status		
Very thin	9	8.7
Thin	25	24.0
Normal	68	65.3
Fat	1	1.0
Obesity	1	1.0
Total	**104**	**100.0**
Consumption of blood-added tablets		
1-5x/month	13	12.5
1-4x/week	13	12.5
Never	78	75.0
Total	**104**	**100.0**
Residence		
Boarding house	64	61.5
House	40	38.5
Total	**104**	**100.0**

Based on the table above, it is known that the majority (65.3%) of respondents have normal nutritional status. There were 24% of respondents with underweight nutritional status. The majority (75%) of respondents had never consumption of blood-added tablets. The majority (61.5%) of respondents live in boarding houses because the distance from where they live to campus is quite far.

Table 2. The Relationship between the Menstrual Cycle and Anemia in Adolescent Girls

Menstrual Cycle	Menstrual Cycle and Anemia						p-value
	Anemia		Not Anemia		Total		
	n	%	n	%	n	%	
Short Cycle	24	23.1	0	0	24	23.1	
Normal Cycle	31	29.8	32	30.8	63	60.6	**0.000**
Long Cycle	2	1.9	15	14.4	17	16.3	
Total	**57**	**54.8**	**47**	**45.2**	**104**	**100**	

The menstrual cycle is divided into three categories, namely short cycles (<21 days), normal cycles (21-35 days), and long cycles (>35 days) (Ilmi & Selasmi, 2019). Based on the table above, it is

known that the majority (60.6%) of respondents have a normal menstrual cycle. Women who experience short menstrual cycles have a greater chance of causing anemia because the amount of blood they expel is twice as large (McLean *et al.*, 2009).

Table 3. The Relationship between Diet and Anemia in Adolescent Girls

Diet	Diet and Anemia						p-value
	Anemia		Not Anemia		Total		
	n	%	n	%	n	%	
Not good	46	44.2	0	0	46	44.2	
Enough	11	10.6	15	14.4	26	25	**0.000**
Good	0	0	32	30.8	32	30.8	
Total	**57**	**54.8**	**47**	**45.2**	**104**	**100**	

Based on the table above, it is known that almost half (44.2%) of respondents have poor eating patterns. Based on the recall results, some respondents did not meet the type, quantity, and frequency of food consumption, so these respondents had poor eating patterns. Adolescent girls who live in boarding houses must prepare their food. So, it is not uncommon for young women to consume food that does not meet balanced nutrition.

Adolescent girls as students who live in boarding houses consider the time and costs of consuming food with balanced nutrition. So, they prefer to buy food at food stalls or sellers near where they live (Surjadi, 2019). Some risk factors that can cause anemia are a diet that is low in iron and vitamins, especially folate, and intestinal disorders which will affect the absorption of nutrients into the body (Suryanti, 2017).

Table 4. Description of the Menstrual Cycle in Respondents

Category	Anemia		Not Anemia		Total		p-value
	n	%	n	%	n	%	
Protein Intake							
Severe Deficit	15	14.4	21	20.2	36	34.6	
Moderate Deficit	7	6.7	23	22.1	30	28.9	
Mild Deficit	9	8.6	9	8.6	18	17.3	**0.012**
Normal	10	9.6	3	2.9	13	12.5	
Excessive	6	5.7	1	1	7	6.7	
Total	**47**	**45.2**	**57**	**54.8**	**104**	**100**	
Iron Intake							
Severe Deficit	13	12,5	22	21.1	35	33.6	
Moderate Deficit	8	7.6	24	23	32	30.8	
Mild Deficit	14	13.4	10	9.6	24	23.1	**0.001**
Normal	12	11.5	1	1	13	12.5	
Excessive	0	0	0	0	0	0	
Total	**47**	**45.2**	**57**	**54.8**	**104**	**100**	
Vitamin C Intake							
Severe Deficit	23	22.1	40	38.4	63	60.6	
Moderate Deficit	5	4.8	11	10.5	16	15.4	
Mild Deficit	6	5.7	5	4.8	11	10.6	**0.002**
Normal	13	12.5	1	1	14	13.4	
Excessive	0	0	0	0	0	0	
Total	**47**	**45.2**	**57**	**54.8**	**104**	**100**	

Kemenkes RI (2014) categorizes nutritional intake into five categories, namely severe deficit (<70% RDA); moderate deficit (70-79% RDA); mild deficit (80-89% RDA); normal (90-119% RDA); more (>120% RDA). Based on the table above, it is known that almost half (34.6%) of respondents have a protein intake with a severe deficit. Almost half (33.6%) of respondents had iron intake with a severe deficit. The majority (60.6%) of respondents had severe deficits in vitamin C intake.

Daily food consumption in adolescents is influenced by residential status (Farida, 2012). In addition, blood-added tablets consumption affects iron intake in adolescent girls. Compliance with Blood Supplement Tablet consumption will have an impact on adequate iron intake in adolescents (Yuniarti, Rusmilawaty and Tunggal, 2015). Vitamin C intake affects iron absorption in adolescent girls (Almatsier, 2009), where the consumption of insufficient sources of vitamin C in young women causes vitamin C intake to become a deficit.

Sufficient protein is needed for hemoglobin (Hb) synthesis to run well, because protein has an

important role in the absorption and transportation of iron, so low protein intake cannot support the Hb formation process. Low Hb levels in the blood are an indicator of anemia (Oktokenia Roziqo, 2016). Trisnawati (2014) stated that there was a relationship between the level of protein adequacy and Hb levels (p-value 0.039).

Inadequate iron intake can also cause anemia, such as consuming foods that have poor quality iron, consuming foods that can interfere with iron absorption such as drinking tea and coffee and consuming junk food that only contains a small amount of calcium, iron, riboflavin, folic acid, vitamin A, and vitamin C, while the saturated fat, cholesterol and sodium content is high (Arisman, 2010). Warda and Fayasari (2021) stated that the lower the level of iron consumption, the more likely to experience anemia (p-value 0.000), this shows that iron is an important main component in blood formation (hemopoiesis), especially in the formation of Hb molecules.

Vitamin C functions in the absorption of iron by changing ferric ions into a form that is easily absorbed by the body, namely ferrous ions. If vitamin C is not in sufficient quantities, then the interaction of iron in the Hb formation process is not optimal, the result will be an impact on reducing Hb levels (Darmawan, 2019). Pradanti, M and K (2015) stated that consumption of vitamin C is strongly related to the incidence of anemia. Low intake of vitamin C causes low Hb levels.

This research uses primary data, so the data represents the actual condition of the respondents. However, this research still needs to be developed by adding the variables studied and increasing the number of respondents used. This study did not examine all factors associated with anemia in adolescent girls.

CONCLUSION

The existence of this relationship means that the menstrual cycle, eating patterns, and nutritional intake are the causes of anemia in adolescent girls. Iron deficiency anemia in adolescent girls can be caused by short menstrual cycles, poor eating patterns, and nutritional deficits. Nutritional intake, especially protein, iron and vitamin C intake, can cause anemia in young women. Many factors can cause anemia in young women, it is hoped that further research can examine other factors.

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Conflict of Interest and Funding Disclosure

None.

Author Contributions

CW: conceptualization, investigation, methodology, supervision, writing–review and editing; ALM: methodology, writing–original draft; FN: methodology; formal analysis, writing–original draft; RDS: data collection, data processing; ASAW: data collection, data processing; DS: writing–original draft, writing–review and editing.

REFERENCES

Alfani, H. and Nuriannisa, F. (2022) 'Literature Review: Konsumsi Protein, Zat Besi, dan Vitamin C dengan Kejadian Anemia pada Remaja Putri', *Journal Scientific of Mandalika (JSM)*, 3(8).

Ayensu, J. *et al.* (2020) 'Prevalence of anaemia and low intake of dietary nutrients in pregnant women living in rural and urban areas in the Ashanti region of Ghana', *PLoS ONE*, 15(1), pp. 1–15. Available at: https://doi.org/10.1371/journal.pone.0226026.

Baadiah, M. *et al.* (2021) '29340-66715-1-PB', *Jurnal Kesehatan Masyarakat*, 9(3), pp. 338–348.

FAO (2012) 'FAO/WHO guide for developing and improving national food recall systems', pp. 1–68. Available at: http://www.who.int/foodsafety/publications/fs_management/recall/en/index.html.

FARIDA, R.N. (2012) *Gambaran Dan Determinan Anemia Pada Mahasiswi S-1 Reguler Fakultas Kesehatan Mahasiswi S-1 Reguler Fakultas Kesehatan Masyarakat Universitas Indonesia Tahun 2012, Gambaran Dan Determinan Anemia Pada Mahasiswi S-1 Reguler Fakultas Kesehatan Masyarakat Universitas Indonesia Tahun 2012*.

Krittayaphong, R. *et al.* (2021) 'Impact of anemia on clinical outcomes of patients with atrial fibrillation: The COOL-AF registry', *Clinical Cardiology*, 44(3), pp. 415–423. Available at: https://doi.org/10.1002/clc.23559.

Kusudaryati, D.P.D. and Prananingrum, R. (2018) 'Hubungan Asupan Protein Dan Status Gizi Dengan Kadar Hemoglobin Pada Remaja Putri Anemia', *Profesi (Profesional Islam) : Media Publikasi Penelitian*, 16(1), p. 47. Available at: https://doi.org/10.26576/profesi.303.

McLean, E. *et al.* (2009) 'Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005', *Public Health Nutrition*, 12(4), pp. 444–454. Available at: https://doi.org/10.1017/S1368980008002401.

Ni'matush Sholihah, Sri Andari and Bambang Wirjatmadi (2019) 'Hubungan Tingkat Konsumsi Protein, Vitamin C, Zat Besi dan Asam Folat dengan Kejadian Anemia Pada Remaja Putri SMAN 4 Surabaya', *Amerta Nutrition*, 3(3), pp. 135–141. Available at: https://doi.org/10.2473/amnt.v3i3.2019.135-141.

Nuraeni, R. *et al.* (2019) 'Peningkatan Kadar Hemoglobin melalui Pemeriksaan dan Pemberian Tablet Fe Terhadap Remaja yang Mengalami Anemia Melalui "Gerakan Jumat Pintar"', *Jurnal Pengabdian kepada Masyarakat (Indonesian Journal of Community Engagement)*, 5(2), p. 200. Available at: https://doi.org/10.22146/jpkm.40570.

Oktokenia Roziqo, I. (2016) 'Hubungan Asupan Protein, Zat Besi, Vitamin C Dan Seng Dengan Kadar Hemoglobin Pada Balita Stunting', *Journal of Nutrition College*, 5(4), p. 419. Available at: http://ejournal-s1.undip.ac.id/index.php/jnc.

Pradanti, C.M., M, W. and K, H.S. (2015) 'Hubungan Asupan Zat Besi (Fe) dan Vitamin C dengan Kadar Hemoglobin Pada Siswi Kelas VIII SMP Negeri 3 Brebes', *Jurnal Gizi Universitas Muhammadiyah Semarang*, 4(1), pp. 24–29.

Sholicha, C.A. and Muniroh, L. (2019) 'HUBUNGAN ASUPAN ZAT BESI, PROTEIN, VITAMIN C DAN POLA MENSTRUASI DENGAN KADAR HEMOGLOBIN PADA REMAJA PUTRI DI SMAN 1 MANYAR GRESIK
<i>[Correlation Between Intake of Iron, Protein, Vitamin C and Menstruation Pattern with Haemoglobin Concentration among ', *Media Gizi Indonesia*, 14(2), p. 147. Available at: https://doi.org/10.20473/mgi.v14i2.147-153.

Siauta, J.A., Indrayani, T. and Bombing, K. (2020) 'Hubungan Anemia Dengan Prestasi Belajar Siswi di SMP Negeri Kelila Kabupaten Mamberamo Tengah Tahun 2018', *Journal for Quality in Women's Health*, 3(1), pp. 82–86. Available at: https://doi.org/10.30994/jqwh.v3i1.55.

Surjadi, C. (2019) 'Globalisasi dan Pola Makan Mahasiswa : Studi Kasus di Jakarta', 40(6), pp. 416–421.

Trisnawati, I. (2014) *Hubungan Asupan Fe, Zinc, Vitamin C Dan Status Gizi Dengan Kejadian Anemia Pada Remaja Putri Di Smp Negeri 4 Batang, Fakultas Ilmu Kesehatan Universitas Muhammadiyah Surakarta*.

Umami, R. (2021) 'Hubungan Asupan Zat Gizi, Siklus Menstruasi, Lama Menstruasi dan Pengetahuan dengan Kejadian Anemia Pada Siswi MTS Islamiyah Batahan Kabupaten Pasaman Barat Tahun 2020', *Skripsi Universitas Perintis Indonesia* [Preprint].

Warda, Y. and Fayasari, A. (2021) 'Konsumsi pangan dan bioavailabilitas zat besi berhubungan dengan status anemia remaja putri di Jakarta Timur', *Ilmu Gizi Indonesia*, 4(2), p. 135. Available at: https://doi.org/10.35842/ilgi.v4i2.198.

Yuniarti, Rusmilawaty and Tunggal, T. (2015) 'Hubungan Antara Kepatuhan Minum Tablet Fe Dengan Kejadian Anemia Pada Remaja Putri Di MA Darul Imad Kecamatan Tatah Makmur Kabupaten Banjar', *Jurnal Publikasi Kesehatan Masyarakat Indonesia*, 2(1), pp. 31–36.