JURNAL MIDPRO, Vol. 16 No. 02 (December, 2024): 149-162 **E-ISSN: 2684-6764**
Terakreditasi Nasional Peringkat 4 No. 36/E/KPT/2019
Available Online at http: http://jurnalkesehatan.unisla.ac.id/index.php/midpro

Anemia In Adolescents Based on BMI (Body Mass Index) and Menstrual Cycle

[K]Dwi Siska Mayang Sari[1], Nurul Azizah[2], Yanik Purwanti[3], Evi Rinata[4]
[1,2,3] Midwifery, Faculty of Health Science, Universitas Muhammadiyah Sidoarjo
Email Corepondence author ([K]): nurulazizah@umsida.ac.id

ABSTRACT

Anemia is one of the global health issues. There was an increase in the prevalence of anemia in the 15 24 age group from 2014 to 2018, rising from 18.4% to 32%. Anemia in adolescents impacts concentration ability, immunity, cognitive function, and poses risks such as giving birth to low birth weight (LBW) babies and stunting. This study aims to determine the relationship between Body Mass Index (BMI) and Menstrual Cycle with the incidence of anemia in adolescents. The research employed a quantitative approach with a cross-sectional design. The population consisted of 60 individuals, with sample collection conducted using the total sampling technique. Data analysis was carried out using the chi-square statistical test. The study showed that almost all adolescent girls with anemia had abnormal BMI (96.4%) and abnormal menstrual cycles (75.9%). Statistical tests revealed a significant relationship between anemia and BMI (P-value=0.001) and menstrual cycle (P-value=0.001) among adolescent girls. There is a significant relationship between BMI and menstrual cycle with the incidence of anemia in adolescent girls. BMI and menstrual cycle are factors contributing to anemia, thus requiring interventions targeting nutritional status and menstrual health among adolescent girls by raising awareness and promoting the habit of consuming healthy and balanced nutritious food.

Keywords: Anemia; BMI; Menstrual Cycle

Article history :

Received: 3 Agustus 2024
Received in revised form: 13 September 2024
Accepted: 21 Oktober 2024
Available online: 15 Desember 2024

INTRODUCTION

One of the most common nutritional problems among adolescents is anemia.[1] Adolescent anemia is a condition where the hemoglobin level in the body is lower than normal and insufficient to meet physiological needs.[2,3] Among adolescents, anemia often becomes a significant issue, particularly due to the increased nutritional requirements during growth and development that are not met with adequate and balanced nutrition. [4,5]

According to the World Health Organization (WHO) in 2019, 29.9% of adolescents were affected by anemia.[6] The prevalence of anemia is particularly high in developing countries, including Indonesia. Based on the Basic Health Research (Riskesdas) data, the prevalence of anemia in the 15-24 age group increased from 18.4% in 2014 to 32% in 2018.[7] Data from the East Java Provincial Health Office indicated that in 2020, 42% of adolescent girls experienced anemia, which increased to 57.1% in 2021.[8] In Surabaya, 21% of adolescents were reported to have anemia in 2016, with this percentage increasing to 22% in 2019.[9]

Adolescent anemia is characterized by symptoms such as fatigue, weakness, lethargy, exhaustion, and forgetfulness (referred to as the "5L"), along with pale complexion and blurry vision, which impair daily activities and affect immunity and concentration.[4,5] Anemia can occur over short or long periods and ranges in severity from mild to severe.[3] The impacts of anemia include reduced concentration and immunity, cognitive impairment, and risks during future pregnancies, such as delivering low birth weight (LBW) babies and stunting.[10]

Factors contributing to anemia in adolescents include poor nutritional health, low iron intake, being overweight, the onset of menarche, menstrual patterns, and irregular eating habits.[11] BMI (Body Mass Index) and menstrual cycles are among the factors influencing the prevalence and severity of anemia in adolescents. BMI reflects the nutritional status of adolescents.Those with malnutrition are 3.1 times more likely to experience anemia. [11] Menstrual cycles also play a crucial role in the health of adolescent girls. [12] Adolescent girls are at risk of iron deficiency due to excessive menstrual blood loss and increased iron needs during growth. [13]

The WHO aims to reduce anemia among women of reproductive age by 50% by 2025. Further actions are needed across various health and nutrition aspects, along with appropriate interventions to address nutritional deficiencies and menstrual disorders. [14] The Ministry of Health has launched a program that distributes iron tablets to adolescent girls, targeting 40% of them to consume these

supplements as an effort to combat anemia. This program focuses on improving the nutritional status of adolescent girls to break the cycle of stunting, prevent anemia, and reduce heart disease risk. Additionally, it aims to raise awareness about the importance of iron intake, promote healthy eating habits, and encourage a lifestyle that supports optimal growth and health. [7]

Based on surveys and previous data at SMP IT Al-Uswah Surabaya in 2022, 44 out of 135 adolescent girls, or 31%, were reported to have anemia. These figures highlight the persistent high prevalence of anemia among adolescents, given its significant impact on their future health. Thus, this study seeks to explore the relationship between BMI (Body Mass Index) and menstrual cycles with the incidence of anemia among adolescents. The objective of this research is to determine the correlation between BMI and menstrual cycles and their effect on anemia incidence in adolescents.

METHOD

This study is a quantitative study with a cross-sectional design. The total population consists of 60 adolescent girls. The sampling method employed total sampling, meaning the entire population was included as study subjects. The inclusion criteria were adolescent girls aged 13-15 years (Grade VIII), those who had started menstruating, and those who agreed to participate as respondents. The exclusion criteria were adolescents who refused or were absent during the study, those with blood disorders such as thalassemia, and those taking certain medications that could affect the study results, such as blood thinners. The study variables included independent variables (BMI and menstrual cycle) and a dependent variable (the incidence of anemia in adolescent girls). Data collection was conducted on August 29, 2024, at SMP IT Al-Uswah Surabaya.

Data collection was performed simultaneously within one day. The instruments used included a digital scale (brand OKUMI®), a height measurement device (brand GEA®), a hemoglobin level measurement device (brand GCHb®), and a questionnaire. Data collection involved respondents completing a questionnaire to gather information about their menstrual cycles. Subsequently, researchers measured the respondents' weight and height to calculate BMI, followed by hemoglobin level checks. The data were recorded on pre-prepared sheets. Once collected, the data were compiled and analyzed. Data analysis consisted of univariate and bivariate analyses using the chi-square statistical test, performed via computerization with the SPSS v.29 program.

RESULTS

Table 1. Frequency Distribution of Respondents' Characteristics

Variables	N	(%)
Adolescent Characteristics		
Age		
13 Years	40	66.7
14 Years	20	33.3
Eating Patterns		
Once a Day	1	1.7
Twice a Day	35	58.3
Three Times a Day	24	40.0
Parental Characteristics		
Father's Education		
High School	11	18.3
Diploma/Bachelor's	49	81.7
Mother's Education		
High School	16	26.7
Diploma/Bachelor's	44	73.3
Father's Occupation		
PNS/TNI/BUMN	10	16.7
Teacher/Lecturer	4	6.7
Nurse	1	1.7
Private Sector	38	63.3
Entrepreneur	7	11.7
Mother's Occupation		
PNS/BUMN	10	16.7
Teacher/Lecturer	5	8.3
Nurse	3	5.0
Private Sector	14	23.3
Entrepreneur	1	1.7
Housewife (IRT)	27	45.0

Based on Table 1, the frequency distribution of respondents' characteristics shows that the majority, 40 (66.7%), are 13 years old. More than 50% of the adolescents have a eating pattern of two meals a day, with 35 (58.3%) respondents. Regarding parental characteristics, almost all fathers have a college degree, with 49 (81.7%) fathers having a Diploma/Bachelor's education, and 44 (73.3%) mothers have a similar level of education. In terms of occupation, all fathers are employed, with the majority working in private companies, 38 (63.3%), while nearly half of the mothers are not working or are homemakers, with 27 (45%).

Table 2. Frequency of Respondents' Hemoglobin Levels

Hemoglobin	N	(%)
Normal 12- 16 g/dL	32	53.3
Mild Anemia 11.0-11.9 g/dL	25	41.7
Moderate Anemia 8.0-10.9 g/dL	3	5.0
Severe Anemia < 8.0 g/dL	0	0

Based on Table 2, the frequency of hemoglobin levels in adolescent girls shows that the majority have normal hemoglobin levels, with 32 (53.3%) respondents. Adolescent girls with mild anemia account for 25 (41.7%) respondents. Very few adolescent girls have moderate anemia, with 3 (5%) respondents, and none of the respondents have severe anemia.

Table 3. Frequency of Body Mass Index (BMI)

Body Mass Index (BMI)	N	(%)
Very Underweight <17.0	4	6.7
Underweight 17.0-18.4	13	21.7
Normal 18.5-25.0	32	53.3
Overweight 25.1-27.0	5	8.3
Obese >27.0	6	10.0

Based on Table 3, the Body Mass Index (BMI) of 60 respondents shows a wide range of results. A total of 32 (53.3%) adolescent girls have a normal BMI, 13 (21.7%) fall into the underweight category, 4 (6.7%) are categorized as very underweight, 5 (8.3%) are categorized as overweight, and 6 (10.0%) adolescent girls are classified as obese.

Table 4. Frequency of Menstrual Regularity

Menstrual Regularity	N	(%)
Once a month	28	46.7
Twice a month	25	41.7
Irregular menstruation	7	11.7

The data in Table 4 shows that almost half of the adolescent girls, 28 (46.7%), experience menstruation once every month. A total of 25 (41.7%) adolescent girls menstruate twice a month, while 7 (11.7%) adolescent girls sometimes menstruate in one month but skip menstruation in the following month.

Table 5. Frequency of Menstrual Cycle

Menstrual Cycle	N	(%)
Normal 21-35 hari	31	51.7
Abnormal (<21 days or >35 days)	29	48.3

Based on Table 5, the majority of adolescent girls have a menstrual cycle within the normal range of 21-35 days, with 31 (51.7%) respondents. Meanwhile, 29 (48.3%) adolescent girls have menstrual cycles that are considered abnormal (<21 days or >35 days).

Table 6. Analysis of the Relationship Between Anemia and Body Mass Index (BMI) in Adolescents

BMI	**Hemoglobin Levels**		**Total**	***p-value***
	Anemia	**No Anemia**		
Normal	1 3.1%	31 96.9%	32 100%	0.001
Abnormal	27 96.4%	1 3.6%	28 100%	
Total	28 46.7%	32 53.3%	60 100%	

Table 6 shows that almost all adolescent girls with anemia have an abnormal Body Mass Index (BMI), totaling 27 (96.4%) respondents. Among the adolescent girls with anemia and a normal BMI, there is only 1 (3.1%) respondent. The chi-square statistical test yielded a p-value of 0.001, indicating a significant relationship between BMI and the occurrence of anemia in adolescent girls.

Table 7. Analysis of the Relationship Between Anemia and Menstrual Cycle in Adolescents

Menstrual Cycle	**Hemoglobin Levels**		**Total**	***p-value***
	Anemia	**No Anemia**		
Normal	6 19.4%	25 80.6%	31 100%	0.001
Abnormal	22 75.9%	7 24.1%	29 100%	
Total	28 46.7%	32 53.3%	60 100%	

Based on Table 7, it shows that almost all adolescent girls with anemia have an abnormal menstrual cycle, with 22 (75.9%) respondents, compared to 6 (19.4%) adolescent girls who have a

normal menstrual cycle. The chi-square statistical test yielded a p-value of 0.001, indicating a significant relationship between the menstrual cycle and the occurrence of anemia in adolescent girls.

DISCUSSION

The study revealed that nearly half (46.7%) of adolescent girls experienced anemia. Anemia is a condition in which hemoglobin levels and/or the number of erythrocytes in the body are below normal, making them insufficient to meet the body's needs. [2 3] Factors influencing anemia in adolescent girls include nutritional status, low iron intake, menstrual patterns/cycles, dietary habits, menarche, and being overweight. [11] This study analyzed the relationship between Body Mass Index (BMI) and menstrual cycles with anemia in adolescent girls.

Findings on the BMI of adolescents showed that nearly half (46.7%) had abnormal BMI. One of the factors influencing BMI is dietary patterns and nutritional intake. Most (58.3%) adolescent girls had poor dietary habits, with a main meal frequency of only twice a day. A proper diet should include three main meals a day with balanced nutrition, consisting of carbohydrate sources, protein, vegetables, and fruits.[15] This aligns with Mindo's study (2020), which found that poor dietary habits tend to result in abnormal BMI (69.2%).[16] Nutrition is a crucial factor in determining nutritional status, but adolescents' focus on appearance and the prevalence of junk food contribute to unhealthy eating habits. Low BMI in adolescents is also associated with high physical activity and menstruation, which increase the risk of iron deficiency and anemia.[17]

Another factor contributing to anemia is menstruation. This study found that nearly half of the respondents had menstrual cycles categorized as abnormal (<21 days or >35 days) and irregular periods. One of the factors causing menstrual cycle disorders is stress.[18] For adolescent girls, stress is often caused by physical activities and the heavy workload of school assignments. A study conducted by Kandou (2017) found a significant moderate relationship between stress and menstrual cycle patterns.[19]

Body Mass Index (BMI) and the Incidence of Anemia in Adolescent Girls

Research data indicate that nearly all adolescent girls with anemia had an abnormal Body Mass Index (BMI). There is a significant relationship between BMI and the incidence of anemia in adolescent girls (p-value = 0.001). An abnormal BMI can contribute to anemia in adolescent girls. This finding

aligns with the study by Siti (2021), which found a correlation between nutritional status and anemia incidence, showing that poor nutritional status is associated with insufficient iron intake.[17] A study by Risna'im et al. (2022) also found that adolescents with low BMI are more likely to experience anemia, indicating a relationship between BMI and hemoglobin levels in adolescent girls.[20]

In the category of low BMI, the risk of anemia increases due to insufficient essential nutrients for hemoglobin formation. This condition begins with inadequate nutrient intake, especially iron, folic acid, and vitamin B12, which play a crucial role in hematopoiesis (red blood cell formation). A deficiency in these nutrients prevents the body from producing adequate hemoglobin, leading to anemia. Additionally, the body's iron reserves, stored as ferritin, decrease alongside reduced body mass and muscle mass, exacerbating iron deficiency necessary for oxygen transport in the blood. Consequently, individuals with low BMI often experience anemia symptoms such as fatigue, dizziness, and weakened immune systems.[21]

A study by Yulianti (2024) on factors associated with anemia in adolescent girls found a correlation between nutritional status and anemia incidence. Adolescent girls with poor nutritional status were 3.1 times more likely to experience anemia compared to those with normal nutritional status.[22] Nutritional status is influenced by dietary patterns and nutrient intake. Most (58.3%) adolescent girls had poor dietary habits, with a main meal frequency of only twice a day. A proper diet should consist of three main meals daily with balanced nutrition, including sources of carbohydrates, protein, vegetables, and fruits.[15]

This finding aligns with Mindo's study (2020), which reported that poor dietary habits are associated with abnormal BMI (69.2%).[16] Nutrition plays a crucial role in determining nutritional status, but adolescents' focus on appearance and the prevalence of junk food contribute to unhealthy eating habits. Insufficient balanced nutrition leads to iron deficiency and iron loss, contributing to anemia in adolescent girls with low BMI.[17] Nutrition intake among adolescents is vital as it influences anemia incidence, which subsequently affects their activities and learning focus, leading to decreased academic performance.[17]

This study also found that 8.3% of adolescent girls were categorized as overweight and 10.0% as obese based on BMI. Adolescents with excessive BMI were 3.21 times more likely to experience anemia. A study by Syah (2022) found a correlation between obesity and anemia levels in adolescent

girls.[23] Obesity-related anemia is linked to adipose fat accumulation, which reduces iron absorption. This fat triggers chronic inflammation involving pro-inflammatory cytokines such as Interleukin-6 (IL-6) and Tumor Necrosis Factor-α (TNF-α). Systemic inflammation in obesity contributes to metabolic and degenerative diseases. These cytokines stimulate hepcidin release, which inhibits ferroportin, thereby reducing iron absorption and release. As a result, hypoferritinemia and iron metabolism disorders occur, leading to anemia.[23]

Additionally, fat accumulation in the liver generates lipid peroxides and free radicals. This disrupts hemoglobin synthesis, decreases hemoglobin levels, and shrinks erythrocytes, causing anemia.[24] The findings of this study are consistent with Dewi's research (2023), which found that BMI above the normal range or overweight was associated with a 3.41 times higher risk of anemia in female students. This demonstrates a significant relationship between BMI and anemia in adolescent girls.[25]

Parental education and occupation also influence parenting styles, which affect adolescents' nutritional status. Parents who are often away from home tend to pay less attention to their children's eating patterns.[26] The findings show that nearly all parents had a bachelor's/diploma degree (81.7%), and the majority of parents were employed (63.3% of fathers and 55% of mothers). A study by Angelina (2023) revealed that maternal parenting has a relationship with adolescents' nutritional status, as parents play a critical role in adolescents' growth and development through adequate nutrition and health. Adolescents' nutritional status is influenced by various factors, including education, occupation, knowledge, maternal parenting, and family economic conditions. In addition to nutritional intake, love, attention, comfort, and proper parenting also support optimal adolescent growth.[26]

Menstrual Cycle and the Incidence of Anemia in Adolescent Girls

This study highlights that almost all adolescent girls experiencing anemia have abnormal menstrual cycles. There is a significant relationship between menstrual cycle and the incidence of anemia in adolescent girls (p-value = 0.001). These results align with the study by Nofianti (2021), which stated a correlation between menstrual cycle and the incidence of anemia in adolescent girls.[27] Similarly, Retno (2021) found that abnormal menstrual patterns increase the risk of anemia by 4.7 times compared to normal menstruation.[28]

The menstrual cycle involves hormonal changes regulating the release of eggs and the shedding

of the uterine lining. In some women, particularly those experiencing heavy menstrual bleeding (menorrhagia), blood loss can be significant. This blood loss reduces the number of red blood cells that carry oxygen throughout the body. If this blood loss is not promptly replaced, the body becomes deficient in iron, a crucial component for hemoglobin production. This lack of hemoglobin leads to anemia. During the menstrual cycle, the body requires more iron to produce new red blood cells. Insufficient iron intake can cause anemia. Adolescents who menstruate lose approximately 84 ml of blood and 133 g/l of iron each month, necessitating an additional 0.56 mg of iron daily, making them vulnerable to iron deficiency.[21]

Research by Herwandar (2022) found a significant relationship between hemoglobin levels and menstrual cycles in adolescent girls.[29] Individuals with normal menstrual cycles lose less blood compared to those with abnormal cycles. Anemia in menstruating adolescents, especially iron-deficiency anemia, occurs when the body loses more iron than it can replenish due to menstrual bleeding. One of the triggers of anemia in adolescent girls is an abnormal menstrual cycle.[30]

The findings of this study revealed that nearly half (48.3%) of adolescent girls with abnormal menstrual cycles (<21 days or >35 days) and (41.7%) experienced menstruation twice a month. These conditions can lead to anemia due to excessive blood loss during menstruation, resulting in iron deficiency. A study by Elmaoğulları (2018) emphasized that anemia in adolescents is often caused by heavy menstrual bleeding not compensated with adequate iron intake.[31] Menstrual abnormalities include cycle disturbances, blood volume, and bleeding duration.[30] According to Hadriani (2023), adolescents with sufficient hemoglobin levels are more likely to have regular menstrual cycles. Conversely, iron deficiency in the body lowers hemoglobin levels, leading to anemia in adolescents.[32]

Dietary patterns, parental care, and stress significantly affect the menstrual cycles of adolescent girls. According to Marsahusna (2022), a balanced diet comprising carbohydrates, proteins, and fats helps maintain regular menstrual cycles. Conversely, a deficiency or excess in intake can disrupt the cycle.[33] Adolescents receiving less parental attention, often due to parents' busy work schedules, face risks of unhealthy eating habits, inadequate rest, and stress. Stress impacts reproductive hormones through the activation of adrenaline, causing the hypothalamus to release CRH (Corticotropic Releasing Hormone). CRH inhibits the secretion of GnRH (Gonadotropin Releasing Hormone), which can suppress reproductive function. Findings by Anggoro (2023) revealed a link between stress levels and

menstrual cycles.[34]

The Indonesian government has implemented measures to address anemia by distributing iron and folic acid tablets (TTD) since 2014. Adolescent girls are the primary target for these supplements due to their dual risk of anemia from rapid growth, increased erythrocyte mass, and higher iron requirements due to blood loss during menstruation. This program, known as Weekly Iron and Folic Acid Supplementation, is ideally implemented in schools for girls aged 12–18 years. It is conducted through school health programs (UKS/M) in educational institutions, with a designated weekly iron tablet consumption day agreed upon locally. One tablet is provided weekly throughout the year. Schools play a role in nutrition education, balanced nutrition promotion, and early anemia detection to combat anemia.[35]

This study acknowledges certain limitations. The research was conducted on a sample restricted to one specific region, which may limit the generalizability of the results to other adolescent populations. Additionally, the variables examined were limited. Future studies are encouraged to expand the sample size and explore additional variables affecting adolescent girls. Subsequent research is expected to contribute significantly to addressing anemia in adolescent girls through a more comprehensive approach and to develop sustainable, need-based interventions.

CONCLUSION

The incidence of anemia among adolescent girls remains high. There is a relationship between BMI (Body Mass Index) and the menstrual cycle with the occurrence of anemia in adolescent girls. It is important to implement interventions targeting nutritional status and menstrual health in adolescent girls by raising awareness and promoting healthy eating habits. Schools are advised to collaborate with healthcare workers and school health units (UKS) to provide regular nutritional education about the importance of a healthy and balanced diet, introducing the "Isi Piringku" concept consisting of 1/3 plate staple foods, 1/3 plate vegetables, 1/6 plate protein, 1/6 plate fruits, and recommendations for drinking water. Periodic health check-ups, particularly monitoring hemoglobin levels, BMI, and menstrual cycles, should be conducted along with regular iron supplementation of 1 tablet per week for a year, supervised by healthcare providers. Parental support is crucial in ensuring adolescents receive adequate nutrition and in creating an environment that supports their physical and mental health.

REFERENCES

1. Himma Muliani R, Rakhimah F, Purnama Sari R, Fitriana Kurniawati H. The Influence of Knowledge About Nutrition on Anemia Status In Adolescent Women. Published online 2024. doi:10.21070/Midwiferia.V10i1.1685
2. Chaparro CM, Suchdev PS. Anemia epidemiology, pathophysiology, and etiology in low- and middle-income countries. *Ann N Y Acad Sci*. 2019;1450(1):15-31. doi:10.1111/nyas.14092
3. Yunita E, Apidianti SP. Pemanfaatan Ekstrak Tanaman Ciplukan (Physalis Angulat L.) sebagai Terapi Anemia pada Remaja di Masa Menstruasi. *Jurnal Kebidanan Midwiferia*. 2019;5(2):12-17. doi:10.21070/mid.v5i2.2763
4. WHO. World Health Organization. (2015). The Global Prevalence Of Anaemia In 2011. Geneva: WHO. Published online 2015.
5. Ayu Hadikasari A. *Hubungan Anemia, Status Gizi, Olahraga Dan Pengetahuan Dengan Kejadian Disminore Pada Remaja Putri*. Vol 1.; 2015.
6. World Health Organization. WHO.int [homepage in Internet]. World Health Organization : Anemia in Women and Children [updated 2019; cited 2022 August 2]. Published online 2022. Accessed August 27, 2024. https://www.who.int/data/gho/themes/topics/anaemia_in_women_and_children.
7. Kemenkes RI. Kemenkes RI.int [homepage on Internet]. Jakarta : Laporan Nasional Hasil Riset Kesehatan Dasar (Riskesdas) 2018 [updated 2019; cited 2022 August]. Lembaga Penelitian dan Pengembangan Kesehatan. 2018. Accessed August 27, 2024. https://www.litbang.kemkes.go.id/laporan -riset-kesehatan-dasar-riskesdas/.
8. Salehah VA, Hanum F. *Dietary Patterns for Anemia Cases in Adolescent Girls [Pola Makan Terhadap Kejadian Anemia Pada Remaja Putri]*.
9. Kumairoh MI, Putri PH. *Hubungan Konsumsi Zat Besi, Protein San Zat Inhibitor Dengan Kejadian Anemia Pada Remaja Relationship Between Consumption of Iron, Protein And Inhibitors With The Incidence Of Anemia In Adolescents*.; 2021.
10. Utami Aras, Margawati A, Pramono Dodik, Wulandari DR. *Anemia Pada Remaja Putri*. (Utami ArasMPDodikWDA, ed.). Fakultas Kedokteran Universitas Diponegoro Semarang; 2021.
11. Permanasari I, Mianna R, Wati YS. *Remaja Bebas Anemia Melalui Peran Teman Sebaya*. Cetakan Pertama 2021. Gosyen Publishing; 2021.

12. Amelia PK, Arisani Prodi DIII Kebidanan Jurusan Kebidanan G, Kesehatan Kemenkes Palangka Raya P, DIII Kebidanan Jurusan Kebidanan P. Hubungan Indeks Massa Tubuh (IMT), Kadar Hemoglobin dan Paparan Asap Rokok dengan Kejadian Dismenore. Published online 2019.
13. sutria N. *Hubungan Pola Menstruasi Terhadap Kejadian Anemia Pada Remaja Putri Literature Review*.; 2022.
14. World Health Organization. https://www.who.int/teams/nutrition-and-food-safety/global-targets-2025. Published online 2015.
15. Poltekes Kemenkes Yogyakarta. Kebutuhan Gizi Masa Remaja dan Dewasa. Published online 2016. Accessed December 9, 2024. http://eprints.poltekkesjogja.ac.id/2863/4/CHAPTER%202.pdf
16. Lupiana M, Indriyani R. Hubungan Pola Makan Remaja dengan Indeks Massa Tubuh di SMP Advent Bandar Lampung. Published online 2020.
17. Nurjannah SN, Putri EA. Hubungan Status Gizi dengan Kejadian Anemia pada Remaja Putri di SMP Negeri 2 Garawangi Kabupaten Kuningan. *Journal of Midwifery Care*. 2021;1(02):125-131. doi:10.34305/jmc.v1i02.266
18. Nagma S, Kapoor G, Bharti R, et al. To evaluate the effect of perceived stress on menstrual function. *Journal of Clinical and Diagnostic Research*. 2015;9(3):QC01-QC03. doi:10.7860/JCDR/2015/6906.5611
19. Rsup D, Kandou RD, Tombokan KC, Pangemanan DHC, Engka JNA. *Hubungan Antara Stres Dan Pola Siklus Menstruasi Pada Mahasiswa Kepaniteraan Klinik Madya (Co-Assistant)*. Vol 5.; 2017.
20. Risna'im AR, Mahtuti EY, Masyhur M, Faisal. Overview Of Anemia In Young Women Low Body Mass Index (Thin Category). *Medicra (Journal of Medical Laboratory Science/Technology)*. 2022;5(2):62-67. doi:10.21070/medicra.v5i2.1636
21. Cohen CT, Powers JM. Nutritional Strategies for Managing Iron Deficiency in Adolescents: Approaches to a Challenging but Common Problem. *Advances in Nutrition*. 2024;15(5). doi:10.1016/j.advnut.2024.100215
22. Yulianti A, Aisyah S, Handayani DS, Kader Bangsa U. Lentera Perawat Faktor-Faktor yang Berhubungan dengan Anemia pada Remaja Putri. 2024;5(1).
23. Syah MNH. The Relationship between Obesity and Anemia among Adolescent Girls. *Poltekita : Jurnal Ilmu Kesehatan*. 2022;15(4):355-359. doi:10.33860/jik.v15i4.712
24. Paramudita PU, Made N, Mahayati D, Somoyani NK, Kebidanan J, Kemenkes Denpasar P.

Hubungan Indeks Massa Tubuh Dengan Status Anemia Pada Remaja Putri.; 2021. http://ejournal.poltekkes-denpasar.ac.id/index.php/JIK

25. Kusuma Dewi B, Nurjanah S, Wulan Hasthi Murti N. Hubungan Indeks Massa Tubuh (IMT) dengan Kejadian Anemia pada Remaja Putri. Published online 2023.
26. Angelina R, Keperawatan F, Kesehatan I, Bandung I. *Jurnal Ilmiah STIKES Yarsi Mataram Pola Asuh Orang Tua, Aktifitas Fisik Remaja Dengan Status Nutrisi*. Vol XIII.; 2023. http://journal.stikesyarsimataram.ac.id/index.php/jik
27. Nofianti IGATP, Juliasih NK, Wahyudi IWG. Hubungan Siklus Menstruasi dengan Kejadian Anemia Remaja Putri di SMP Negeri 2 Kerambitan. Published online 2021.
28. Sugesti R, Islami D, Munawaroh M, et al. Pola Menstruasi, Gaya Hidup dan Dukungan Keluarga Berhubungan dengan Kejadian Anemia. Published online 2021. doi:10.53801/sjki.v1i2.38
29. Herwandar FR, Heryanto ML, Juita SR. Hubungan Kadar Hemoglobin dengan Siklus Mensruasi pada Remaja Putri. *Jurnal Ilmu Kesehatan Bhakti Husada: Health Sciences Journal*. 2023;14(01):99-106. doi:10.34305/jikbh.v14i01.724
30. Manuaba. *Ilmu Kebidanan Buku Ajar Obstetric & Ginekologi*. Graha Cipta; 2016.
31. Elmaoğulları S, Aycan Z. Abnormal uterine bleeding in adolescents. *JCRPE Journal of Clinical Research in Pediatric Endocrinology*. 2018;10(3):191-197. doi:10.4274/jcrpe.0014
32. Hadriani H, Entoh C, Radjulaeni Z, Astuti MD. Relationship of Diet and Menstrual Cycle with Anemia in Young Women. *Napande: Jurnal Bidan*. 2023;2(1):48-53. doi:10.33860/njb.v2i1.2188
33. Marsahusna Wanggy D, Ulfiana E. The Relationship between Nutritional Value, Diet, Physical Activities, and Stress with Menstrual Cycle Disorders. *Indonesian Journal of Midwifery*. 2022;5. http://jurnal.unw.ac.id/index.php/ijm
34. Anggoro. Hubungan Pola Makan dan Stres dengan Siklus Menstruasi Remaja Putri. 2023;5(2):2023. doi:10.37631/agrotech.v1i1
35. Kementrian Kesehatan RI. *Pedoman Pemberian Tablet Tambah Darah (TTD) Bagi Remaja Putri*.; 2020.