

Factors Causing Anemia in Adolescent Girls: Literature Review

Yustica Qothrunnada^a, Lestari Sudaryanti^{b*}

^alestari.sudaryanti@vokasi.unair.ac.id

^aMidwifery Study Program, Faculty of Medicine Airlangga University, Surabaya 60132, Indonesia

^bDepartement of Midwifery Education, Faculty of Medicine Airlangga Airlangga, Surabaya 60132, Indonesia

Abstract

Background: Lowered hemoglobin levels in erythrocytes, which are insufficient for the body's physiological requirements, are known as anemia. The WHO states that women over the age of 15 should have hemoglobin levels of at least 12.0 g/dl (> 7.5 mmol). Anemia is one of the many major issues that the world faces when it comes to malnutrition. This is exemplified by the fact that anemia was listed as one of the Global Burden Diseases in 2004 and that, of the 1.159 billion people who suffer from anemia worldwide, 50% have an iron deficiency. Thus, the purpose of this research is to identify the contributing causes to teenage anemia. **Method:** This study employs a literature review methodology based on 15 pertinent publications from two databases, Pubmed and Google Scholar. Articles from the last seven years that meet the following requirements are eligible for inclusion: they must be primary research, not a literature review, systematic review, or meta-analysis; they must also include complete text, be written in both Indonesian and English, and reflect the goals and findings of the study. **Results and discussion:** studies indicate that knowledge, the duration of the menstrual cycle, nutritional quality, and parental education are the main causes of anemia in teenage girls. **Conclusion:** The literature evaluation leads to the conclusion that nutritional status, knowledge, the duration of the menstrual cycle, and parental education are the main risk factors for the incidence of anemia in teenage females. This is predicated on an analysis of fifteen articles.

Keywords: factors causing anemia, anemia, adolescent girls

1. Background

The World Health Organization (WHO) estimates that 1.62 billion people worldwide, or 24.8% of the total population, suffer from anemia. WHO set a 2012 goal of bringing the global anemia prevalence down to 15% by 2025 [1]. Based on data from the 2018 Riskesdas, anemia prevalence in Indonesia was 48.9%. Over the course of the last 11 years, the prevalence of anemia among teens in Indonesia has increased, rising from 6.9% in 2007 to 32.0% in 2018.

Anemia is a condition where hemoglobin levels in erythrocytes decrease so that they are insufficient for the body's physiological needs. According to WHO, normal hemoglobin levels in women aged over 15 years are > 12.0 g/dl (> 7.5 mmol) [2]. Insufficient hemoglobin levels will limit the flow of oxygen, thereby reducing physical activity. The parameters usually used to measure anemia are hematocrit and erythrocyte count. WHO recommends a number of cut-off values to determine anemia caused by iron deficiency in various groups (Sari et al., 2022). Adolescent girls who experience anemia will experience impaired growth, decreased ability to concentrate on learning, reduced enthusiasm for activities because they feel tired quickly [3].

In the Republic of Indonesia Minister of Health Regulation Number 25 of 2014, adolescents are residents with an age range of 10-18 years (Permenkes) while according to WHO, adolescents are residents with an age range of 10-19 years (WHO). Adolescent girls are more at risk of experiencing anemia compared to adolescent boys because adolescent girls will experience menstruation every month which causes bleeding.

Based on data from Bappenas and UNICEF, one of the goals of the Sustainable Development Goals (SDG's) is to eliminate hunger and all forms of malnutrition by 2030 and achieve food security. There are several serious problems that pose a challenge to the world in terms of malnutrition, one of which is anemia. This is demonstrated by the inclusion of anemia in the 2004 Global Burden Disease list with a total of 1.159 billion sufferers worldwide, around 50% of all anemia sufferers have iron deficiency [4].

According to research conducted by Yamin in 2012, there are several factors that influence anemia in young women, including level of knowledge, nutritional status, menstrual patterns, level of iron consumption, history of illness and parental income.

2. Method

This research is a literature study research, namely the researcher will review relevant articles according to predetermined criteria. Articles were obtained from searches on Google Scholar and Pubmed taken in the period 2017-2023. The inclusion criteria set are articles from the last 7 years, have full text, in Indonesian and English, there is a match between the research objectives and results and are primary research, not a literature review, systematic review or meta-analysis. The keywords used in the article search were factors causing anemia, anemia in adolescent girls. Exclusion criteria are research articles that are incomplete and do not match the research objectives.

3. Results

No	Author and year	Research Title	Method	Results
1	(Indrawatiningsih et al., 2021)	Factors that Influence the Occurrence of Anemia in Adolescent Girls	Proportional random sampling was employed in this cross-sectional study, which included 98 young women as the total sample.	Three associated variables—adolescent education, parental income, and nutritional status—are included in the bivariate research results. The multivariate results revealed a relationship (P=0.000) between adolescent education and grades, a relationship (P=0.002) between nutritional status and grades, and a relationship (P=0.006) between parental income and grades.
2	(Ahmed and Mohammed, 2022)	Anemia and its associated factor	This study was carried out utilizing the cross-	The study's findings indicated that only one

		among adolescent school girls in Godey and Degehabur council Somali region, eastern Ethiopia	sectional approach.	variable—young women's nutritional state and knowledge of anemia—was significantly correlated, with a value of (P=0.000).
3	(Basith et al., 2017)	Factors Associated with the Incidence of Anemia in Adolescent Girls	There are 50 responders in this study, which combines cluster sampling with probability sampling.	The analysis's findings indicate that three variables—parental education level (P=0.000), menstrual cycle length (P=0.004), and menstrual length (P=0.003)—have a significant link with each other.
4	(Febianingsih, 2019)	Prevalence and Risk Factors of Anemia in Adolescent Girls at SMAN 1 ABIANSEMAL Bandung	By employing a standardized questionnaire to conduct interviews, this study employs a cross-sectional methodology.	Based on the multivariate analysis results, there was a strong correlation observed between the value and the duration of menstruation (P=0.000), the frequency of complete meals eaten in a day and the value (P=0.000), and the abstinence from animal side dishes and the value (P=0.002).
5	(Triana, 2023)	Risk Factors for Anemia in Adolescent Girls	The cross-sectional approach and total sampling technique are used in this study.	According to the analysis's findings, the incidence of anemia was significantly correlated with three variables: length of menstruation (P=0.017), food intake patterns (P=0.011), and awareness of values (P=0.004).
6	(Tarigan et al., 2023)	Determinants of Anemia In Adolescent Girls	In this study, a survey and a cross-sectional technique are used.	Three variables were discovered to have a significant association based on the research findings: menstruation pattern (P=0.001), parental education (P=0.011), and infection incidence (P=0.001).

7	(Shaban et al., 2020)	Anemia and its associated factors among adolescents in Kuwait	Twelve junior high schools were chosen at random from each of the State of Kuwait's provinces to participate in this cross-sectional survey, which was conducted at the schools.	Only age, gender, and levels of ferritin and iron were found to be related to anemia in multivariable analysis. Women had an increased risk of anemia compared to men; adjusted odds ratio 1.75 (95% CI: 1.12-2.73), $p < 0.001$. Similar to early adolescents, late adolescents had a higher risk of anemia ($p = 0.014$).
8	(Gebreyesus et al., 2019)	Anaemia among adolescent girls in three districts in Ethiopia.	A cross-sectional design centered in the community was adopted in this investigation. Weekends were used for this study in order to get information on young girls who were enrolled in school and those who had not. Data was gathered from 1323 teenage girls in total. from every district.	Adolescents who had never heard the term "anemia" had a 60% greater incidence of the condition than those who had (OR 1.58; 95% CI: 1.09–2.29). Teenage girls who reside in households with a moderate social status have a higher likelihood of experiencing anemia compared to those who reside in households with a high social status (AOR 1.48; 95% CI; 1.05–2.09).
9	(Fentie et al., 2020)	Prevalence of Anemia and Associated Factors among Secondary School Adolescent Girls in Jimma Town, Oromia Regional State, Southwest Ethiopia.	A cross-sectional study design based at a school was used to gather data from 528 secondary school girls in Jimma city, southwest Ethiopia, between January 1 and February 1, 2019. A multiphase sampling strategy was employed in the selection of research subjects.	Multivariate logistic regression analysis revealed that anemia was positively correlated with living away from family (AOR = 4.430, 95% CI (2.20, 8.90), having a low dietary diversity score (AOR = 3.57, 95% CI (1.88, 6.75), menstruating for more than five days (AOR = 2.25, 95% CI (1.17, 4.33), and having a low economic status (AOR = 2.16, 95% CI (1.17, 4.33).
10	(Sari et al., 2022)	Iron Deficiency Anemia and Associated Factors Among Adolescent Girls and Women in a Rural Area of Jatinangor, Indonesia	A cross-sectional study comprising 85 women and 95 teenage girls was carried out between April and November 2018 for this study. Participants were chosen at random from seven villages in the Jatinangor district using cluster random sampling.	Protein intake was found to be positively linked with anemia (OR=0.25; 95% CI 0.11-0.58) by multivariate logistic regression analysis.

11	(Engidaw et al., 2018)	Anemia and associated factors among adolescent girls living in Aw-Barre refugee camp, Somali regional state, Southeast Ethiopia	There was a cross-sectional study design. Researchers used basic random sampling methods to find research subjects. To gather information, a systematic questionnaire was employed. HemoCueHb 301 was used to measure hemoglobin levels.	Anemia was shown to be twice as common in late adolescents as it was in early adolescents, according to the results analysis (AOR: 1.95, 95% CI (1.09, 3.47)). Anemia was found to be three times more common in those who spent at least eight years living in camps (AOR: 2.92, 95% CI (1.14, 7.50)), and it was eleven times more common in those who ingested less heme iron sources once a week than in those who consumed more iron than twice a week (AOR: 11.42, 95% CI (3.42, 38.18)).
12	(Ansari et al., 2020)	The Relationship Between Menstrual Patterns and the Incidence of Anemia in Adolescent Girls at Smpn 18 Banjarmasin	This study is cross-sectional in nature and employs an analytical observational methodology. At SMPN 18 Banjarmasin, the population consisted of female youths who met inclusion and exclusion criteria.	The chi square test results revealed a p value of 0.000 ($p < 0.05$), indicating a sustained correlation between the incidence of anemia and menstruation. Anemia was 26.5 times more likely to strike respondents or young women whose menstrual cycle was lengthy at risk (more than seven days). A p value of 0.000 ($p < 0.05$) was obtained from the chi square test findings, indicating a significant correlation between the menstrual cycle and the occurrence of anemia. Anemia was 20 times more likely to strike respondents whose menstrual cycles were at risk (cycles shorter than 24 days).
13	(Nabilah et al., 2020)	Correlation of Menstrual Pattern, Nutritional Status and Level of Knowledge With the Incidence of Anemia on Teenage Girls	This study employs a cross-sectional methodology and an analytical observational design. All of the study's participants were female students from Batu City State Islamic High School.	The only predictor in this study that significantly correlated with the occurrence of anemia was dietary status. It is known that $p\text{-value} = 0.023$ ($p\text{ value} < 0.05$) based on statistical tests. The analysis's results also revealed that the PR value (underweight/normal) = 0.47, indicating a 0.47-fold increase in anemia risk for

			young women with low nutritional status compared to those with normal nutritional status.
14	(Pareek et al., 2022)	Determinants of Anemia Among Adolescents Girls	Research methodology used a random sample of 100 teenage females (ages 15 to 19) chosen from 300 teenage girls residing in Navi Mumbai, India's impoverished urban settlements
15	(Vaira et al., 2022)	Factors Related Of Anemia in Adolescence Girl	This study employed a cross-sectional approach and analytical observation as its research design. Since total sampling was used to gather the data for this study, all young women who met the inclusion criteria in classes XI and XII of SMAS PGRI 2 Banjarmasin were eligible to participate as respondents.
			Thirty percent of girls have anemia, and of those, ninety-five percent have an iron deficiency. There is a substantial correlation between blood hemoglobin and BMI, as well as intake of iron, protein, fat, folic acid, and riboflavin.
			According to the chi square statistical test results, there is a correlation between the incidence of anemia in young women and LILA, with a p-value of 0.012 (<0.05). An Odd Ratio of 5.040 indicates that female adolescents with abnormal LILA are five times more likely to experience anemia than their normal LILA-holding peers (OR 5.040 95% CI 1.503-16.905).
			The chi-square statistical test results indicate a p-value of 0.026 (<0.05), indicating a correlation between the occurrence of anemia in young women and their menstrual patterns. With an Odd Ratio value of 4.333, young females with irregular menstrual cycles are four times more likely to get anemia than those with normal patterns (OR 5.040 95% CI 1.292-14.530).

4. Discussion

A person is more likely to develop anemia during pregnancy if they had anemia as a teenager. If anemia is not identified and treated as soon as possible, it will negatively affect the fetus's growth and development in the womb, may result in difficulties during pregnancy and childbirth, and may even result in the mother and child's death (Ministry of Health of the Republic of Indonesia, 2018). According to international recommendations, those living in locations where anemia prevalence is more than 40% should take 30–60 mg of blood supplement pills daily for three months. Conversely, it is advised to regularly give 60 mg once a week for three months in regions where anemia prevalence is roughly 20% [1].

Anemia is a worldwide public health issue that impacts both industrialized and developing nations. Anemia is a disorder in which the body cannot utilize its red blood cells' ability to carry enough oxygen to meet its needs. If hemoglobin level is less than 12 dl or red blood cell count is less than 4.2 million/ μ L, it is considered anemia [3]. The findings of a review of fifteen papers indicate that a number of causal factors, including nutritional quality, knowledge, length of menstruation, and parental education, are most commonly associated with the occurrence of anemia in teenage females. Anemia can lower body resistance data, making it easier to get infections. Adolescent girls who experience anemia will also experience a decrease in fitness and concentration, which will result in learning achievement and the ability to participate in activities both inside and outside of school. The consequences of anemia can also last until the teenage girls become pregnant and give birth, including premature births, low birth weight babies (LBW), and the risk of death from bleeding during childbirth [2,3].

Low intake of nutrients from either animal or vegetable sources can cause anemia. This intake has an important role in the production of hemoglobin as a component of red blood cells (erythrocytes). Nutritional status in adolescent girls is often influenced by eating behavior and body image. Eating habits have a big influence on an ideal body. Many teenagers feel dissatisfied with their appearance, especially regarding body perception, where a tall and thin body shape is something that is highly desired by young women. This has a negative effect on poor eating patterns and can increase the risk of poor nutritional status and excess nutrition [3]. Food consumption is closely related to problems with a person's nutritional status. Adolescents who have poor nutritional status are more likely to experience anemia, especially adolescent girls. Anemia is also directly influenced by foods that are deficient in iron. Because during adolescence there will be an increased need for iron [5]. This is in line with research conducted by Indrawatiningsih (2021) which states that there is a relationship between nutritional status and the incidence of anemia in young women.

According to a Triana study published in 2023, there is a connection between young women's anemia incidence and knowledge. Teenage females who are less knowledgeable about anemia are more likely to suffer from anemia than those who are well-informed. Adolescent girls who are ignorant of anemia's symptoms, indicators, problems, and prevention may choose to eat foods they enjoy, even though these meals are low in iron, leading to insufficient iron in young women [1].

According to Notoadmodjo, behavior that is based on knowledge will last longer than behavior that is not based on knowledge, so that teenagers who have good knowledge about anemia will find it easier to prevent anemia in themselves [6]. Knowledge greatly influences the attitudes of each individual. New behavior in a person will make the person experience expositions, namely awareness in the sense of knowing the object being imitated, then feeling interested and starting to pay attention, starting to get used to the new attitude and ending with awareness of having adopted the new attitude [7]. Lawrence Green stated that health behavior includes realizing a behavior that is influenced by three factors, namely predisposing factors, supporting factors and driving factors [7]. Lawrence Green's theory also states that knowledge is one of the factors that influences young women in efforts to prevent anemia.

The length of menstruation in teenagers can be one of the factors causing anemia in teenage girls because if the greater the volume of blood that comes out, the greater the possibility that the teenage girl will experience anemia. Menstruation usually lasts 4-7 days and normally blood loss is 30-80 ml/day [8]. If there is a disruption in the cycle, duration and volume of menstrual blood, it will affect the amount of blood that comes out. When there is a disruption in the duration of menstruation, it will affect the amount of blood that comes out. When there is a lot of blood coming out, a lot of iron will also come out. Iron is the main ingredient for hemoglobin synthesis, so if iron levels decrease, hemoglobin synthesis will decrease [7]. There are various factors that can influence the volume of blood that comes out, namely medications, endometrial thickness, blood disorders and blood clotting disorders. Prolonged menstruation will result in the body experiencing iron deficiency. If iron and red blood cells in the body decrease during menstruation, organs and tissues do not receive sufficient oxygen intake. This is in line with research by Triana (2023) which shows that there is a significant relationship between the length of menstruation and the incidence of anemia in adolescents.

Losing iron when a person experiences menstruation will result in iron reserves decreasing and is called an iron depleting state. If iron deficiency continues, iron reserves will decrease and will eventually run out. This reduction in iron will result in disturbances in the formation of erythrocytes (red blood cells) but clinical anemia has not yet occurred, this condition is called iron deficient erythropoiesis. However, if

the amount of iron continues to decrease, the formation of erythrocytes will be increasingly disrupted, causing hemoglobin levels to begin to fall and iron deficiency anemia will occur (Farida, 2007).

Another factor that may contribute to young women's anemia is parental education. Higher educated parents will be more concerned with their adolescent daughter's food because they understand the nutritional needs of this age group. The better the method of raising and nurturing kids, the more educated the parents are. Parents with education will find it easier to choose and accept knowledge that will benefit them and their family. People with education will find it easy to adjust to new situations and embrace them, which will help them understand health maintenance techniques, particularly preventing anemia in young women [9].

5. Conclusion

The literature evaluation leads to the conclusion that nutritional status, knowledge, length of menstruation, and parental education are the main risk factors for the incidence of anemia in teenage females. This is predicated on an analysis of fifteen articles.

References

- [1] WHO, U. (2014). Global nutrition targets 2025: breastfeeding policy brief (WHO/NMH/NHD14.7). Geneva: World Health Organization.
- [2] Kusnadi, F. N. (2021). Hubungan Tingkat Pengetahuan Tentang Anemia dengan Kejadian Anemia pada Remaja Putri. *Jurnal Medika Utama*, 3(01 Oktober), 1293-1298.
- [3] Sari, P., Herawati, D. M. D., Dhamayanti, M., & Hilmanto, D. (2022). Anemia among Adolescent Girls in West Java, Indonesia: Related Factors and Consequences on the Quality of Life. *Nutrients*, 14(18), 3777. <https://doi.org/10.3390/nu14183777>.
- [4] Martini, M. (2017). Faktor-faktor yang berhubungan dengan kejadian anemia pada remaja putri di MAN 1 Metro. *Jurnal Kesehatan Metro Sai Wawai*, 8(1), 1-7.
- [5] Fauziah, D. A., Wasono, H. A., Putri, D. F., & Husna, I. (n.d.). Studi Pustaka tentang Hubungan Tingkat Kecukupan Gizi Dan Siklus Menstruasi Dengan Anemia Pada Remaja Putri Di Beberapa Wilayah Di Indonesia Tahun 202.
- [6] Permasasari, I., Mianna, R., & Wati, Y. S. (2021). The Effect of Peer Education on Anemia Prevention Behavior Among Adolescence Girls At Senior High School 05 of Pekanbaru. *Jurnal Endurance*, 6(1), 59-69.
- [7] Ansari, M. H., Heriyani, F., & Noor, M. S. (2020). Hubungan Pola Menstruasi dengan Kejadian Anemia pada Remaja Putri di SMPN 18 Banjarmasin. *Homeostasis*, 3(2), Article 2.
- [8] Cahyaning, F. 2018. Gambaran Lama Haid. *Jurnal Jurusan Keperawatan Fakultas Ilmu Kesehatan Universitas Muhammadiyah Surakarta*.
- [9] Basith, A., Agustina, R., & Diani, N. (2017). Faktor-faktor yang berhubungan dengan kejadian anemia pada remaja putri. *Dunia Keperawatan: Jurnal Keperawatan dan Kesehatan*, 5(1), 1-10.
- [10] Indrawatiningsih, Y., Hamid, S. A., Sari, E. P., & Listiono, H. (2021). Faktor-Faktor yang Mempengaruhi Terjadinya Anemia pada Remaja Putri. *Jurnal Ilmiah Universitas Batanghari Jambi*, 21(1), 331-337.
- [11] Ahmed, A., & Mohammed, A. (2022). Anemia and its associated factor among adolescent school girls in GODEY and DEGEHABUR council Somali region, eastern Ethiopia. *BMC nutrition*, 8(1), 1-6.
- [12] Febianingsih, N. P. E., Putra, K. A. D., & Putra, G. Y. (2019). Prevalensi dan Faktor Risiko Anemia pada Remaja Putri di SMAN 1 Abiansemal Badung. *Bali Health Published Journal*, 1(1), 52-62.
- [13] Triana, A. (2023). Faktor Risiko Kejadian Anemia Pada Remaja Putri Di Mas Pp Nuruddin. *Termometer: Jurnal Ilmiah Ilmu Kesehatan dan Kedokteran*, 1(1), 01-07.
- [14] Tarigan, R. A., Roza, N., & Handayani, T. Y. (2023). Determinan Kejadian Anemia Pada Remaja Putri. *Jurnal Kesehatan Sainika Meditory*, 6(2), 421-427.
- [15] Shaban, L., Al-Taiar, A., Rahman, A., Al-Sabah, R., & Mojiminiyi, O. (2020). Anemia and its associated factors among Adolescents in Kuwait. *Scientific Reports*, 10(1), 5857. <https://doi.org/10.1038/s41598-020-60816-7>.

- [16] Gebreyesus, S. H., Endris, B. S., Beyene, G. T., Farah, A. M., Elias, F., & Bekele, H. N. (2019). Anaemia among adolescent girls in three districts in Ethiopia. *BMC Public Health*, 19, 92. <https://doi.org/10.1186/s12889-019-6422-0>.
- [17] Fentie, K., Wakayo, T., & Gizaw, G. (2020). Prevalence of Anemia and Associated Factors among Secondary School Adolescent Girls in Jimma Town, Oromia Regional State, Southwest Ethiopia. *Anemia*, 2020, 5043646. <https://doi.org/10.1155/2020/5043646>.
- [18] Sari, P., Judistiani, R. T. D., Herawati, D. M. D., Dhamayanti, M., & Hilmanto, D. (2022). Iron Deficiency Anemia and Associated Factors Among Adolescent Girls and Women in a Rural Area of Jatinangor, Indonesia. *International journal of women's health*, 14, 1137–1147. <https://doi.org/10.2147/IJWH.S376023>.
- [19] Engidaw, M. T., Wassie, M. M., & Teferra, A. S. (2018). Anemia and associated factors among adolescent girls living in Aw-Barre refugee camp, Somali regional state, Southeast Ethiopia. *PLoS ONE*, 13(10), e0205381. <https://doi.org/10.1371/journal.pone.0205381>.
- [20] Nabilah, S., Wardani, H. E., & Gayatri, R. W. (2020). Correlation of Menstrual Pattern, Nutritional Status and Level of Knowledge With the Incidence of Anemia on Teenage Girls. 121–125. <https://doi.org/10.2991/ahsr.k.201107.030>.
- [21] Pareek, P., Kuwari, S., & Thakur, H. (2022). Determinants of Anemia Among Adolescents Girls. *Current Developments in Nutrition*, 6, 154. <https://doi.org/10.1093/cdn/nzac051.070>.
- [22] Vaira, R., & Karinda, M. (2022). Factors Related Of Anemia In Adolescence Girl. *Science Midwifery*, 10(4), 2490-2495.
- [23] El Shara, F., Wahid, I., & Semiarti, R. (2017). Hubungan status gizi dengan kejadian anemia pada remaja putri di SMAN 2 Sawahlunto Tahun 2014. *Jurnal kesehatan andalas*, 6(1), 202-207.
- [24] Memorisa, G., & Yanuaringsih, G. P. (2020). Hubungan lama menstruasi dengan kejadian anemia pada remaja. *Jurnal Mahasiswa Kesehatan*, 1(2), 165-171.
- [25] Thiagarajan DK, Basit H, Jeanmonod R. Physiology, Menstrual Cycle. [Updated 2022 Oct 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK500020/>.