

## The Relationship Between Knowledge Level about Anemia and Hemoglobin Levels in Adolescent Girls

Icha Aulya Praditaningrum<sup>1\*</sup> and Winarsih Nur Ambarwati<sup>2</sup>

<sup>1,2</sup>Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

\*Email Correspondence: [wna246@ums.ac.id](mailto:wna246@ums.ac.id)

<p>Kata Kunci: Anemia, Pengetahuan, Hemoglobin</p> <p>Keywords: Anemia, Knowledge, Hemoglobin</p> <p>Info article</p> <p>Date sent: 10 November 2025</p>	<p>Anemia masih menjadi masalah kesehatan yang umum di seluruh dunia, terutama pada remaja putri. Menurut data dari World Health Organization, prevalensi anemia pada wanita usia subur mencapai 29,9%, yang mencerminkan tingginya angka anemia di kalangan remaja putri. Kondisi ini dapat mempengaruhi konsentrasi belajar, produktivitas, serta meningkatkan risiko masalah kesehatan reproduksi di masa depan. Penelitian ini bertujuan untuk mengeksplorasi hubungan antara tingkat pengetahuan tentang anemia dan kadar hemoglobin pada remaja putri. Penelitian ini menggunakan desain kuantitatif dengan pendekatan cross-sectional, melibatkan 36 siswi usia 15-17 tahun yang dipilih berdasarkan ketersediaan responden. Tingkat pengetahuan diukur melalui kuesioner dengan 21 pertanyaan yang telah teruji validitas dan reliabilitasnya, dengan nilai cronbach's alpha 0,834. Kadar hemoglobin diperiksa dengan metode cyanmethemoglobin. Hasil penelitian menunjukkan mayoritas responden memiliki pengetahuan baik (88,9%), sementara 52,8% mengalami anemia. Uji chi-square menunjukkan tidak ada hubungan signifikan antara tingkat pengetahuan dan kadar hemoglobin (<math>p=0,542</math>). Temuan ini mengindikasikan bahwa pengetahuan yang baik tidak selalu menjamin kadar hemoglobin yang normal, karena faktor lain seperti pola makan dan kepatuhan dalam mengonsumsi suplemen zat besi juga berperan penting. Diperlukan tindakan kesehatan yang tepat, termasuk pola makan seimbang dan dukungan program edukasi kesehatan</p>
<p>Date revised: 23 December 2025</p> <p>Date received: 13 January 2026</p> <p>DOI Article: <a href="https://doi.org/10.33650/jkp.v14i1.13224">https://doi.org/10.33650/jkp.v14i1.13224</a></p> <p>Page: 86-99</p>	<p><b><i>The Relationship Between Knowledge Level about Anemia and Hemoglobin Levels in Adolescent Girls</i></b></p> <p>Anemia remains a common health problem worldwide, especially among adolescent girls. According to data from the World Health Organization, the prevalence of anemia in women of childbearing age reaches 29.9%, reflecting the high rate of anemia among adolescent girls. This condition can affect concentration at school, productivity, and increase the risk of reproductive health problems in the future. This study aims to explore the relationship between the level of knowledge about anemia and hemoglobin levels in adolescent girls. This study uses a quantitative design with a cross-sectional approach, involving 36 female students aged 15-17 years who were selected based on respondent availability. The level of knowledge was measured using a questionnaire with 21 questions that had been tested for validity and reliability, with a Cronbach's alpha value of 0.834. Hemoglobin levels were examined using the cyanmethemoglobin method. The results showed that the majority of respondents had good knowledge (88.9%), while 52.8% were anemic. The chi-square test showed no significant relationship between knowledge level and hemoglobin levels (<math>p=0.542</math>). These findings indicate that good knowledge does not always guarantee normal hemoglobin levels, as other factors such as diet and adherence to iron supplementation also play an important role. Appropriate health measures are needed, including a balanced diet and support for health education programs.</p>

## Introduction

Anemia is a condition in which the number of red blood cells in the body decreases, which is an indicator of poor nutrition and poor health problems (Habtegiorgis et al., 2022). Lack of hemoglobin causes the supply of oxygen to the body's tissues to be reduced which has an impact on metabolic disorders (Leung et al., 2024). Until now, anemia is still one of the health problems experienced by many adolescents, especially young women who are entering productive age. Anemia is caused by a lack of nutrient intake, especially iron (Leung et al., 2024), vitamin A, B vitamins, folic acid, parasitic infections and congenital conditions (Putra et al., 2020). The most common clinical symptoms of anemia are fatigue, dizziness, shortness of breath and paleness (Chaparro & Suchdev, 2019). *World Health Organization* (WHO) reported that the prevalence of anemia in women of childbearing age reached 29.9%, while in Indonesia the prevalence of anemia reached 27.2% based on Riskesdas data in 2019. In Central Java province, the prevalence of anemia reaches 57.7%, which indicates that anemia is a health issue that requires serious attention. The WHO defines adolescents as the age group of 10 to 19 years, which experiences a rapid growth rate after infancy, which physiologically increases the need for iron to support the formation of hemoglobin. Adolescents, especially young women, are the most vulnerable group to anemia (Endale et al., 2022), due to the increased need for iron for growth and development processes and to replace menstrual blood loss (Nurjanah, 2024).

Adolescent girls have a higher risk of developing anemia when compared to boys, which is caused by the loss of iron during menstruation (Moschonis et al., 2013). The WHO has set hemoglobin levels of less than 12 g/dl in women and less than 13 g/dl in men as indicators of anemia. Irregular periods with heavy bleeding can increase iron loss and decrease the body's ferritin reserves, thus inhibiting the formation of red blood cells (Mansour et al., 2021). In addition, the habit of skipping breakfast, consumption of fast food that is low in iron (Adiyani et al., 2020) and the habit of following a strict diet to maintain weight can result in inadequate nutrient intake (Deivita et al., 2021). This imbalance in nutrient intake leads to a decrease in iron reserves in the body, thereby interfering with the formation of red blood cells and increasing the risk of developing anemia. Anemia in adolescence does not only affect the immune system (Shand & Kidson-Gerber, 2023), but also has an impact on impaired physical performance and neurological development (Zhu et al., 2021) and increased reproductive health challenges during

the transition to adulthood (Gore et al., 2024). In addition, socioeconomic factors such as family economic status, parental income and parental education have also been shown to be associated with the incidence of anemia in adolescent girls, as it will affect the family's ability to provide nutritious food and access to health services (Hasyim, 2018).

These studies show that anemia in adolescents is influenced by nutritional factors, eating habits and physiological conditions. However, the results of studies related to the relationship between knowledge level and hemoglobin status still show mixed findings. This condition indicates a gap between knowledge and the application of health behaviors, so it is necessary to further study the relationship between the level of knowledge about anemia and hemoglobin levels in the context of adolescent girls more specifically. These conditions can be explained through *Theory of Planned Behavior* which states that a person's behavior is not only influenced by knowledge, but also attitudes towards behavior, subjective norms and perceptions of self-control (Retno Heru Setyorini & Era Reviska, 2024).

Therefore, adolescents with good knowledge of anemia do not necessarily have the ability to implement preventive behaviors such as consuming iron-rich foods and obediently taking blood-boosting tablets regularly. In addition, *Health Belief Model* explains that knowledge will be followed by action if the individual feels vulnerable to the disease, understands the severity of the impact, and believes that the benefits of preventive measures are greater than the perceived obstacles (Kusuma Dewi et al., 2025). Psychological and social factors also play a role in reducing the effectiveness of knowledge in the prevention of anemia. Low motivation, negative attitudes towards the consumption of iron supplements due to side effects, peer influence and stigma against the consumption of blood tablets can affect adolescents' compliance in implementing health behaviors. Therefore, knowledge alone is not enough to encourage changes in health behavior without the support of psychological, social and individual perception factors.

The government has run an anemia prevention program by providing iron supplements to adolescents in every school. The program is designed to increase hemoglobin levels and reduce the prevalence of anemia. However, the reality is that the incidence of anemia is still quite high. Research (Khanal et al., 2024) indicates that although the program *Weekly Iron Folic Acid Supplementation* (WIFAS) has been implemented, the prevalence of anemia in adolescent

girls remains at 17.4%. This is due to several factors, one of which is the low knowledge of adolescents about the importance of preventing anemia and lack of compliance in consuming iron supplements. Anemia not only impacts on, but also affects adolescents' academic achievement, decreased cognitive function including decreased study concentration (Gosdin et al., 2021) can affect learning outcomes (Samson et al., 2022) and a decrease in productivity in the future (Khani Jeihooni et al., 2021). Therefore, increasing adolescents' knowledge about anemia is one of the important steps in anemia prevention efforts.

Several previous researchers have shown mixed results regarding the relationship between knowledge and hemoglobin levels. A study at SMA N 05 Pekanbaru showed that adolescents with a good level of knowledge tend to have higher hemoglobin levels. Meanwhile, research at MAN 2 Tasikmalaya found a prevalence of anemia of 61.6% in female students. Although some students have sufficient knowledge, this condition is influenced by low adherence in consuming iron supplements and an unbalanced diet. Research in Bantarsari Village, Bogor also showed a relationship between compliance with iron supplement consumption and the incidence of anemia. The variation in these findings indicates that having good knowledge is not always directly proportional to normal hemoglobin levels. Based on this, this study was conducted to determine the relationship between the level of knowledge about anemia and hemoglobin levels in adolescent girls in vocational high schools, considering the role of other factors that have the potential to affect this relationship such as diet, adherence to the consumption of tablets plus blood and the social and cultural context of adolescent girls. The hypothesis of this study is that adolescent girls who have good knowledge about anemia have normal hemoglobin levels compared to adolescents who have less knowledge. The uniqueness of this research lies in its focus on young women in vocational schools who have different characteristics such as the burden of field practice, irregular diets and limited time in accessing information and health services. The results of this research are expected to be the basis for the development of more contextual anemia education and prevention programs in the school environment such as strengthening the blood supplement tablet program, nutritious food education and collaboration between schools and health service facilities to improve compliance and healthy living behaviors of adolescent girls.

**Method**

This study used a quantitative design with a *cross-sectional* approach, which was used to determine the relationship between the level of knowledge about anemia and hemoglobin levels in adolescent girls at one time. The *cross-sectional* design allows researchers to identify relationships between variables simultaneously, but has limitations in explaining the cause-and-effect relationship directly. Therefore, the findings in this study are correlational and cannot be used to conclude a causal relationship. The population is 84 female students. However, at the time of the research, a total of 37 students were not allowed to go to school because they were carrying out field practice activities. A total of 11 students refused to contribute to the research, leaving 36 students who were willing. The sample selection was carried out using a *total sampling technique* for all students who were willing to become respondents. This study used two instruments, namely a knowledge questionnaire about anemia and a hemoglobin level checksheet. The knowledge questionnaire was compiled based on a review of the literature and knowledge indicators about anemia which included the definition, causes, signs and symptoms, impacts and efforts to prevent anemia. The questionnaire consisted of 21 statements that had gone through validity and reliability tests before being used on the study respondents. Instrument trials were conducted on 30 different respondents from a research sample with characteristics similar to those of the study subjects before being used in the main data collection with a *Cronbach's alpha result* of 0.834. Hemoglobin levels were checked using the cyanmethemoglobin method. In filling out the questionnaire, the researcher realized the potential for a social response, where respondents tended to give answers that were considered correct or in accordance with norms. To minimize this, respondents were given an explanation that the answers given would not affect academic assessments, and were asked to fill out the questionnaire honestly according to their knowledge. The research procedure begins with the research licensing process which begins with taking care of a research permit from the University of Muhammadiyah Surakarta and submitting the letter to the school. After the letter was received, the school asked the researcher to obtain a letter of approval from the Education Office Branch. After obtaining approval from the Education Office Branch, the researcher carried out socialization to the respondents. Socialization is carried out directly by providing an explanation of the purpose of the research, the procedures to be undertaken, the benefits obtained

and potential discomfort that may arise during the examination of hemoglobin levels. Respondents were given the opportunity to ask questions before deciding to participate. All willing respondents are asked to sign an informed consent. Data collection was carried out through filling out a questionnaire about anemia filled out by respondents, then followed by checking hemoglobin levels. The examination of hemoglobin levels was carried out by experienced FIK UMS laboratories which was carried out on Thursday, August 14, 2025. The results of the questionnaire and hemoglobin examination were recorded and categorized according to the standard. The data that has been collected will then be processed and analyzed. The data analysis process is carried out in two stages, namely univariate analysis and bivariate analysis. Univariate analysis to describe the frequency distribution as well as the percentage of each variable. Meanwhile, bivariate analysis was used to determine the relationship between the level of knowledge about anemia and hemoglobin levels. The statistical test used is the *chi-square test*, because the two variables analyzed are categorical with the significance level used being 0.05. Before the test was carried out, the researchers ensured that the data met the assumptions of *the chi-square test*. This research has obtained an ethical feasibility letter from the Health Research Ethics Committee of the University of Muhammadiyah Surakarta with number: 1146/KEPK-FIK/V/2025.

## Research Results

Table 1. Respondent Characteristics

Features	n	%
Classes		
X	21	58.3
XI	15	
Age		
15	20	55.6
16	12	33.3
17	4	11.1

Table 1 shows that there are 36 respondents and most of them are 15 years old, namely 20 respondents (55.6%).

Table 2. Knowledge Level about Anemia

Knowledge Categories	n	%
Good	32	88.9
Enough	3	8.3
Less	1	2.8

Table 2 shows that the majority of respondents have good knowledge about anemia as many as 32 respondents (88.9%), while only a few have less knowledge, namely 1 respondent (2.8%).

Table 3. Distribution of Hemoglobin Levels of Respondents

Category: Hemoglobin	n	%
Normal	17	47.2
Anemia	19	52.8
Quantity	36	100

Table 3 proves that more than half of the respondents (52.8%) fall into the category of anemia.

Table 4. The Relationship between Knowledge Level and Respondents' Hemoglobin Levels

Knowledge	Hemoglobin Up				P Value
	Normal		Anemia		
	n	%	n	%	
Good	16	44.4	16	44.4	0.542
Enough	1	2.8	2	5.6	
Less	0	0	1	2.8	
Total	17	47.2	19	52.8	

Table 4 shows the results of a statistical test that states that there is no relationship between the level of knowledge about anemia and the level of hemoglobin (*p value* 0.542).

## Discussion

The results of this study prove that most of the respondents (88.9%) have good knowledge about anemia, but more than half (52.8%) of the respondents have anemia. The results of the statistical test show the value of *p value* = 0.542 ( $p > 0,05$ ), which shows that the hypothesis put forward is not proven. These results suggest that the research objective of analyzing the relationship between knowledge and hemoglobin levels has been achieved even though the expected relationship was not statistically found. Nevertheless, knowledge is an important component in efforts to prevent anemia. Good knowledge is not always in line with the status of normal hemoglobin levels, because hemoglobin levels are also influenced by other factors such as diet, adherence to the consumption of blood tablets, bleeding during menstruation as well as physiological and environmental factors.

Research (Yusufu et al., 2023) found that even though adolescents already have awareness about anemia, the prevalence of anemia is still high, especially in middle-income

countries. These findings are in line with the results of this study which shows that good knowledge is not necessarily followed by normal hemoglobin status. This condition shows that knowledge is an important component in the prevention of anemia, but it is not enough to reduce the prevalence without being accompanied by changes in health behavior. Several behavioral factors play a major role in the high prevalence of anemia in adolescent girls such as an unbalanced diet, low adherence in the consumption of blood supplement tablets. argues that actions aimed at preventing anemia are not only influenced by knowledge, but also other factors such as social support and socioeconomic conditions. explained that economic limitations, lack of family and environmental support can hinder adolescents in applying their health knowledge, thus affecting the nutritional status of adolescent girls. In a theoretical perspective (Chandra et al., 2022) (Hain et al., 2023) *Health Belief Model* and *Theory of Planned Behavior* Knowledge is seen as an initial factor in shaping health awareness, but behavioral changes are influenced by the perception of vulnerability, perception of benefits, perceived barriers, attitudes, subjective norms and perceived behavioral control (Retno Heru Setyorini & Era Reviska, 2024). Young women who have understood anemia may not have enough motivation and support to implement preventive behaviors.

Findings in the study (Mayasari et al., 2022) found that there was no significant association between knowledge and the incidence of anemia in adolescent girls ( $p$  value = 0.05). This is reinforced by research (Rusmaningrum, 2023) which found that although about 54.7% of adolescent girls had good knowledge of anemia, the prevalence of anemia remained high. The similarity of the results of the study strengthens the results of this study and confirms that knowledge is an important component, but it is not effective enough in reducing the prevalence of anemia if it is not followed by real changes in health behavior. The results of this study can strengthen the evidence that there is a gap between knowledge and health practice in adolescent girls. Many adolescent girls already know the importance of consuming iron and balanced nutrition, but healthy eating habits are not optimal to meet daily nutritional needs, which are caused by several factors such as limited access to nutritious food, unhealthy diets, fast food consumption habits, lack of adherence in consuming blood supplement tablets, and lack of family and environmental support that can hinder the implementation of anemia prevention behaviors.

Instead, research (Kusnadi, 2021) found a relationship between knowledge level and the incidence of anemia in adolescent girls. In the study, adolescents who had good knowledge showed a lower prevalence of anemia. This shows that in a certain context, good knowledge can trigger effective preventive measures. The findings are in line with health behavioral theory which explains that knowledge will have an impact on behavior if it is supported by positive attitudes, social norms and adequate behavioral control. The findings suggest that anaemia prevention needs to be integrated into school policies and health services through education accompanied by environmental support and sustainability of iron supplementation programmes.

In addition to the knowledge factor, anemia in adolescent girls is also closely related to diet and lack thereof. Low iron intake contributes to low hemoglobin levels and lack of protein consumption can inhibit iron transport. Therefore, although respondents have known the importance of consuming iron-rich foods, the reality in the field shows unsupportive habits, such as skipping breakfast, eating a diet that does not include sources of iron, protein and vitamin C and preferring instant foods with low iron content. Research (Adiyani et al., 2020) emphasizing that insufficient nutritional intake, especially iron, remains the main cause of anemia even though adolescents have received education about nutrition. This explains why most of the respondents still experience anemia despite knowing how to prevent it.

Physiological changes in adolescent girls, especially menstruation, are also important factors that affect hemoglobin levels. Menstruation causes iron loss every month. (Cia & Lion, 2022) Explains that menstruation can cause iron loss every month and if the menstrual cycle is irregular or bleeding excessively, iron loss will increase so that the body is unable to replace red blood cells optimally. In the results of this study, it was found that the majority of respondents were at the age of fifteen to sixteen years old, which is early adolescence with unstable menstrual patterns. This instability can trigger more bleeding, so that iron intake from food is not enough to replace blood loss. The findings are reinforced by (Nurrahman et al., 2020) which states that anemia among adolescents is a complex problem that is caused by various factors including knowledge, physiological factors, nutrition and health behaviors.

Adherence to iron supplement consumption is one of the important factors in reducing the prevalence of anemia. Research (Yewodiaw et al., 2025) states that adolescents who regularly take iron supplements have better hemoglobin levels compared to those who are

inconsistent. Side effects such as nausea, indigestion often lead to non-compliance to take iron supplements (Bloor et al., 2021).

The uniqueness of this study is the high proportion of respondents with good knowledge who still experience anemia. This phenomenon suggests that knowledge is only one of many factors that affect the status of hemoglobin. Compared to previous research, this study confirms that changes in health behavior require more focused interventions such as monitoring supplement consumption, family education and eating habits.

The implications of this research are important for the development of nursing science, namely first, this study emphasizes that anemia prevention measures do not only focus on the aspect of information delivery, but are also followed by behavioral changes and support from the environment. Second, schools and health centers can use the results of this research to design programs that not only emphasize education, but also monitor compliance with taking blood supplement tablets. In addition, these findings support the theory of health behavior that states that knowledge is the first step, while new health changes can be achieved if accompanied by positive attitudes and concrete actions that are sustainable.

This study has several limitations, namely the first use of quantitative design with a *cross-sectional* approach that only allows the observation of the relationship between the level of knowledge about anemia and hemoglobin levels at one time, so that it cannot explain the direct cause-and-effect relationship. Second, the relatively small sample number of 36 respondents was due to the availability of female students. Further research is expected to use a longitudinal design and involve a larger number of samples so that the results are more representative and can focus more on developing programs that involve direct behavioral change, such as monitoring iron supplement consumption and ongoing health education, in addition to being able to examine more in-depth socioeconomic factors in preventing anemia.

## **Conclusion**

The results of this study confirm that good knowledge is not enough to guarantee normal hemoglobin status. Other factors such as diet and adherence to iron supplement consumption may play an important role in the incidence of anemia. For further studies, it is recommended to use a longitudinal design to provide a more comprehensive picture of changes in knowledge

levels and hemoglobin levels, as well as involving larger sample numbers and including additional variables such as diet, menstrual history and consistency of blood tablets, in order to gain a more comprehensive understanding.

### Acknowledgments

The author expressed his gratitude to the school for providing permission and support during the data collection process, as well as to all respondents who were willing to participate in this study.

### Bibliography

- Adiyani, K., Heriyani, F., & Rosida, L. (2020). Hubungan status gizi dengan kejadian anemia pada remaja putri di SMA PGRI 4 Banjarmasin. *Homeostasis*, 1(1), 1–7.
- Bloor, S. R., Schutte, R., & Hobson, A. R. (2021). Oral Iron Supplementation—Gastrointestinal Side Effects and the Impact on the Gut Microbiota. In *Microbiology Research* (Vol. 12, Issue 2, pp. 491–502). <https://doi.org/10.3390/microbiolres12020033>
- Chaparro, M. C., & Suchdev, S. P. (2019). Anemia epidemiology, pathophysiology, and etiology in low-and middle-income countries. *Annals of the new York Academy of Sciences*, 1450(1), 15-31. *Physiology & Behavior*, 176(3), 139–148. <https://doi.org/10.1111/nyas.14092>.Anemia
- Cia, A., & Lion, H. F. (2022). Asupan zat besi dan prevalensi anemia pada remaja usia 16-18 tahun. *Window of Health: Jurnal Kesehatan*, 144–150.
- Deivita, Y., Syafruddin, S., Andi Nilawati, U., Aminuddin, A., Burhanuddin, B., & Zahir, Z. (2021). Overview of Anemia; risk factors and solution offering. *Gaceta Sanitaria*, 35, S235–S241. <https://doi.org/https://doi.org/10.1016/j.gaceta.2021.07.034>
- Endale, F., Woldeyohannes, D., Belayneh, F., Tamene, A., Habte, A., Gizachew, A., Sulamo, D., Kebede, Y., Yohannes, J., Mekonen, T., & Akiso, D. (2022). Menstrual abnormality, maternal illiteracy, and household factors as main predictors of anemia among adolescent girls in Ethiopia: Systematic review and meta-analysis. *Women's Health (London, England)*, 18, 17455057221129398. <https://doi.org/10.1177/17455057221129398>
- Gore, M. N., Drozd, M. E., & Patil, R. S. (2024). Anemia Prevalence and Socioeconomic Status among Adolescent Girls in Rural Western India: A Cross-Sectional Study. *Ethiopian Journal of Health Sciences*, 34(1), 57–64. <https://doi.org/10.4314/ejhs.v34i1.7>
- Gosdin, L., Sharma, A. J., Tripp, K., Amoiful, E. F., Mahama, A. B., Selenje, L., Jefferds, M. E., Martorell, R., Ramakrishnan, U., & Addo, O. Y. (2021). A School-Based Weekly Iron and Folic Acid Supplementation Program Effectively Reduces Anemia in a Prospective

- Cohort of Ghanaian Adolescent Girls. *The Journal of Nutrition*, 151(6), 1646–1655. <https://doi.org/10.1093/jn/nxab024>
- Habtegiorgis, S. D., Petrucka, P., Telayneh, A. T., Getahun, D. S., Getacher, L., Alemu, S., & Birhanu, M. Y. (2022). Prevalence and associated factors of anemia among adolescent girls in Ethiopia: A systematic review and meta-analysis. *PloS One*, 17(3), e0264063. <https://doi.org/10.1371/journal.pone.0264063>
- Hasyim, D. (2018). Pengetahuan, sosial ekonomi, pola makan, pola haid, status gizi dan aktivitas fisik dengan kejadian anemia pada remaja putri. *Jurnal Kebidanan Dan Keperawatan Aisyiyah*, 14, 6–14. <https://doi.org/10.31101/jkk.544>
- Khanal, A., Paudel, R., Wagle, C. N., Subedee, S., & Pradhan, P. M. S. (2024). Prevalence of anemia and its associated factors among adolescent girls on Weekly Iron Folic Acid supplementation (WIFAS) implemented and non-implemented schools at Tokha municipality, Kathmandu. *PLOS Global Public Health*, 4(1), e0002515. <https://doi.org/10.1371/journal.pgph.0002515>
- Khani Jeihooni, A., Hoshyar, S., Afzali Harsini, P., & Rakhshani, T. (2021). The effect of nutrition education based on PRECEDE model on iron deficiency anemia among female students. *BMC Women's Health*, 21(1), 256. <https://doi.org/10.1186/s12905-021-01394-2>
- Kusnadi, F. N. (2021). Hubungan Tingkat Pengetahuan Tentang Anemia dengan Kejadian Anemia pada Remaja Putri. *Jurnal Medika Hutama*, 3(01 Oktober), 1293–1298.
- Kusuma Dewi, B., Nurjanah, S., Wisnu Hardi, G., Artauli Lumban Toruan, S., & Bachtiar Efendi, dan. (2025). *Knowledge Levels of Anemia Among Female Adolescents: A Descriptive Study*. 13(2).
- Leung, A. K. C., Lam, J. M., Wong, A. H. C., Hon, K. L., & Li, X. (2024). Iron Deficiency Anemia: An Updated Review. *Current Pediatric Reviews*, 20(3), 339–356. <https://doi.org/10.2174/1573396320666230727102042>
- Mansour, D., Hofmann, A., & Gemzell-Danielsson, K. (2021). A Review of Clinical Guidelines on the Management of Iron Deficiency and Iron-Deficiency Anemia in Women with Heavy Menstrual Bleeding. *Advances in Therapy*, 38(1), 201–225. <https://doi.org/10.1007/s12325-020-01564-y>
- Mayasari, N., Devita, H., & Utami, A. (2022). The Relationship of Knowledge About Anemia with Anemia Satus in Adolescent Women in SMA N 07 Padang. *JURNAL IBU DAN ANAK*, 10(2 SE-Articles). <https://doi.org/10.36929/jia.v10i2.593>
- Moschonis, G., Papandreou, D., Mavrogianni, C., Giannopoulou, A., Damianidi, L., Malindretos, P., Lionis, C., Chrousos, G. P., & Manios, Y. (2013). Association of iron depletion with menstruation and dietary intake indices in pubertal girls: the healthy growth

- study. *BioMed Research International*, 2013, 423263. <https://doi.org/10.1155/2013/423263>
- Nurjanah. (2024). *Gambaran Kejadian Anemia di Kabupaten Indramayu*. 12(2), 1–23.
- Nurrahman, N. H., Anugrah, D. S., Adelita, A. P., Sutisna, A. N., Ovtapia, D., Maisaan, F., Wahyudi, K., Nurshifa, G., Sari, H. E., & Azrah, M. (2020). Faktor dan Dampak Anemia pada Anak-Anak, Remaja, dan Ibu Hamil serta Penyakit yang Berkaitan dengan Anemia. *Journal of Science, Technology and Entrepreneur*, 2(2).
- Putra, K. A., Munir, Z., & Siam, W. N. (2020). Hubungan Kepatuhan Minum Tablet Fe dengan Kejadian Anemia (Hb) pada Remaja Putri Di SMP Negeri 1 Tapen Kabupaten Bondowoso. *Jurnal Keperawatan Profesional*, 8(1), 49–61. <https://doi.org/10.33650/jkp.v8i1.1021>
- Retno Heru Setyorini, & Era Revika. (2024). Using the Theory of Planned Behavior to Explore Factors Associated with the Behavior of Consuming Blood Booster Tablets Among Adolescent Girls in Bantul Regency. *Jurnal Promkes: The Indonesian Journal of Health Promotion and Health Education*, 12(2 SE-Articles), 208–217. <https://doi.org/10.20473/jpk.V12.I2.2024.208-217>
- Rusmaningrum, S. W. (2023). Pengetahuan remaja putri tentang faktor penyebab terjadinya anemia di smp negeri 1 merakurak. *Jurnal Multidisiplin Indonesia*, 2(8), 1994–2000.
- Samson, K. L. I., Fischer, J. A. J., & Roche, M. L. (2022). Iron Status, Anemia, and Iron Interventions and Their Associations with Cognitive and Academic Performance in Adolescents: A Systematic Review. *Nutrients*, 14(1). <https://doi.org/10.3390/nu14010224>
- Shand, A. W., & Kidson-Gerber, G. L. (2023). Anaemia in pregnancy: a major global health problem. *Lancet (London, England)*, 401(10388), 1550–1551. [https://doi.org/10.1016/S0140-6736\(23\)00396-3](https://doi.org/10.1016/S0140-6736(23)00396-3)
- Yewodiaw, T. K., Alemayehu, M. A., & Teshome, D. F. (2025). Anemia status and associated factors among adolescent girls under weekly iron and folic acid supplementation (WIFAS) and non-WIFAS programs in public schools in Janamora district, Northwest Ethiopia 2023; a comparative cross-sectional study. *BMC Nutrition*, 11(1), 50. <https://doi.org/10.1186/s40795-025-01033-1>
- Yusufu, I., Cliffer, I. R., Yussuf, M. H., Anthony, C., Mapendo, F., Abdulla, S., Masanja, M., Tinkasimile, A., Ali, A. S., Mwanyika-Sando, M., & Fawzi, W. (2023). Factors associated with anemia among school-going adolescents aged 10–17 years in Zanzibar, Tanzania: a cross sectional study. *BMC Public Health*, 23(1), 1814. <https://doi.org/10.1186/s12889-023-16611-w>
- Zhu, Z., Sudfeld, C. R., Cheng, Y., Qi, Q., Li, S., Elhoumed, M., Yang, W., Chang, S., Dibley, M. J., Zeng, L., & Fawzi, W. W. (2021). Anemia and associated factors among adolescent

girls and boys at 10-14 years in rural western China. *BMC Public Health*, 21(1), 218.  
<https://doi.org/10.1186/s12889-021-10268-z>