

## Identifikasi Pola Konsumsi Remaja Putri NonAnemia di Kota Padang

### *Identification of Consumption Patterns of Non-Anemic Adolescent Girls in Padang City*

Rati Purnama Sari<sup>1</sup>

<sup>1</sup>Jurusan Kebidanan, Poltekkes Kemenkes Padang, Padang, 25146, Indonesia

Korespondensi Email: ratipurnamasariab@gmail.com

#### **Article Info**

*Article History*

*Submitted, 2025-01-28*

*Accepted, 2025-02-14*

*Published, 2025-03-29*

*Keywords: Hemoglobin Level,; Anemia, Adolescent*

**Kata Kunci:** Kadar Hemoglobin, Anemia, Remaja

#### **Abstract**

*Adolescent girls are at risk of anemia. This study aims to identify the eating patterns of non-anemic adolescent girls. This analytical survey study employed a cross-sectional approach. Samples were selected using a purposive sampling technique and included adolescent girls who met the inclusion criteria. Hemoglobin levels were measured using a digital hemoglobin meter, and eating patterns were assessed using the Food Frequency Questionnaire (FFQ). The results indicate that the majority of 57 teenage girls (67.9%) consumed a higher energy intake. The mean protein intake for adolescent girls was 74.99 grams, while the mean protein requirement is 65 grams. Approximately 72.6% of respondents consumed above the required protein intake, while 27.4% met the requirements adequately. Most adolescents met their energy and macronutrient needs, including protein and carbohydrates, and consumed sufficient vitamin C. Based on the study results, respondents generally had adequate macronutrient intake. However, intake of some micronutrients did not meet the required levels. The study showed that adolescents with normal hemoglobin levels had sufficient protein and vitamin C intake.*

#### **Abstrak**

Remaja putri berisiko mengalami anemia. Penelitian ini bertujuan untuk mengidentifikasi pola makan remaja putri yang tidak anemia. Penelitian survei analitis ini menggunakan pendekatan cross-sectional. Sampel dipilih menggunakan teknik purposive sampling dan mencakup remaja putri yang memenuhi kriteria inklusi. Kadar hemoglobin diukur menggunakan meteran hemoglobin digital, dan pola makan dinilai menggunakan Food Frequency Questionnaire (FFQ). Hasil penelitian menunjukkan bahwa mayoritas dari 57 remaja putri (67,9%) mengonsumsi asupan energi yang lebih tinggi. Asupan protein rata-rata untuk remaja putri adalah 74,99 gram, sedangkan kebutuhan protein rata-rata adalah 65

gram. Sekitar 72,6% responden mengonsumsi lebih dari asupan protein yang dibutuhkan, sementara 27,4% memenuhi kebutuhan secara memadai. Sebagian besar remaja memenuhi kebutuhan energi dan makronutrien mereka, termasuk protein dan karbohidrat, dan mengonsumsi vitamin C yang cukup. Berdasarkan hasil penelitian, responden secara umum memiliki asupan makronutrien yang cukup. Namun, asupan beberapa mikronutrien tidak memenuhi kadar yang dibutuhkan. Penelitian menunjukkan bahwa remaja dengan kadar hemoglobin normal memiliki asupan protein dan vitamin C yang cukup.

## Introduction

Adolescent girls face a heightened risk of anemia, a critical global health issue that is especially widespread in developing regions (Budhathoki et al., 2021; Cairo et al., 2014; Gosdin et al., 2020, 2021; Leung et al., 2024; WHO, 2018). A systematic review found that 23% of adolescents in Ethiopia were anemic (Habtegiorgis et al., 2022). In 2018, statistics from Indonesia indicated that 32% of adolescents were affected by anemia. (Kemenkes RI, 2019).

This condition can impede physical growth and fitness, resulting in tiredness, diminished concentration, and challenges in learning and memory, which may affect academic performance. Anemia in teenage girls frequently persists into pregnancy, increasing the likelihood of complications for both the mother and the baby. These complications include issues during pregnancy and childbirth that can lead to mortality, low birth weight, and impaired infant growth and development. (Garzon et al., 2020; Means, 2020).

Teenage girls face an increased likelihood of developing anemia. A literature review indicated that nutritional status significantly influences the incidence of anemia in adolescents (Deivita et al., 2021). The risk is heightened by high nutrient demands, including increased iron needs and regular blood loss during menstruation. Additionally, poor dietary habits, such as irregular eating schedules, eating on the go, and skipping breakfast, are prevalent among teenagers. (Al-Zangabila et al., 2021). Dietary regularity correlates with the incidence of anemia (Novita, 2019). Furthermore, dietary restrictions aimed at weight management, along with frequent fast food consumption, can impact adolescents' nutritional adequacy. Misconceptions about dieting for an ideal body weight further complicate this issue, leading to choices that fail to meet nutritional needs. Additionally, the prevalence of anemia may rise due to habits such as consuming fast food and drinking tea after meals. (Chaudhuri et al., 2017; Tayel, Dalia; Ezzat, 2015). Many women with anemia exhibit poor nutritional status (Choi et al., 2021).

A study conducted at a school in Padang found that 49.1% of adolescents were affected by anemia. (Manila, 2021). Data from the 2018 Basic Health Survey in West Sumatra reveals that 11.29% of teenagers in Padang City were undernourished, while 14.86% were overnourished (Dinkes Sumbar, 2019). SMK 06 is a vocational institution dedicated to fashion and beauty, and it is exclusively attended by female students (Mursit & Rahmawati, 2018). An initial survey revealed that there was no evaluation of hemoglobin levels or nutritional status among the students. Given this context, researchers are keen to investigate the dietary habits of non-anemic adolescent girls in Padang. The objective of this study was to measure hemoglobin levels, evaluate the nutritional status of adolescent girls, and analyze the dietary habits of non-anemic adolescent girls.

## Method

This research utilized an analytical survey with a cross-sectional design. The study looked at how eating habits affect hemoglobin levels. It was conducted at SMK N 06 Padang in July 2022. The participants were female students from Padang City in 2022. To keep the group similar, the sample was taken from students at SMK N 06 Padang City, specifically from Class X Beauty and X Clothing, totaling 144 female students. A purposive sampling method was used to choose 84 girls who met the study's criteria. To be eligible, participants had to be young women who had started their periods but were not on their period during the study. They needed to be in good health, have normal hemoglobin levels (more than 12 g%), and not have blood disorders like thalassemia or sickle cell anemia. They also could not have chronic diseases like kidney disease, malaria, or intestinal worms. Moreover, participants were required to refrain from using medications that influence hemoglobin levels, such as chemotherapy or ARV, and needed to provide consent to join the study. This study utilized primary data. Hemoglobin levels were determined with a digital device. Consumption habits were evaluated through the Food Frequency Questionnaire (FFQ), which offers a summary of how often energy and nutrients are consumed, including both daily and weekly intake (Sirajudin; Surmita; Astuti T, 2018; Supriasa, 2016). Data processing encompassed editing, coding, entry, cleaning, and analysis. The data analysis involved descriptive analytic. Categorical data, such as anemia and nutritional status, are presented as frequencies and percentages. Numerical data on hemoglobin levels are reported as mean values, standard deviations, and maximum and minimum values. The study received approval from the Health Research Ethics Committee of Universitas Perintis, Indonesia (approval number 125/KEPK). F1/ETIK/2022.

## Results and Discussion

The research was conducted at SMK N 06 Padang, involving 84 female student participants. The participants' ages ranged from 14 to 17 years, with a mean age of 15 years and a standard deviation of 0.67. All participants were adolescents. The data pertaining to hemoglobin levels, percentage of energy intake, and height were normally distributed. Conversely, the data for BMI/age, percentages of iron, protein, fat, carbohydrate, fiber, vitamins A, B, and C, calcium, phosphorus, magnesium, and zinc intake, age, and body weight were not normally distributed.

The data distribution is shown in the two tables below. Table.1 is the data made in numerical scale. Then the data is arranged in a categorical scale and displayed in table.2

Table 1. Distribution of Numerical Scale Data

No	Variable	Standard	Mean	SD	minimum	Maximum
1	Hemoglobin Level	12	15.05	1.53	12.20	18.20
2	Age		15.24	0.65	14	17
3	Energy intake	2,050	2,583.12	692.44	1,201.0	3,956.0
4	Protein Intake	65	74.99	2.49	67	78
5	Carbohydrate Intake	300	423.88	83.35	288.4	474.2
6	Fat Intake	70	48.37	1.75	47.3	51.2
7	Fiber Intake	29	11.18	1.35	9	12
8	Vitamin A Intake	600	306.50	267.64	153	767
9	Vitamin B Intake	1.10	0.72	0.01	0.70	0.72
10	Vitamin C Intake	67.50	75.00	8.72	70	90

No	Variable	Standard	Mean	SD	minimum	Maximum
11	Iron intake	15.00	8.75	1.30	8	11
12	Calcium Intake	1,200	223.42	94.71	166	378
13	Magnesium intake	222.50	307.25	13.51	284	315
14	Zinc intake	9.00	8.50	0.87	7	9
15	Phosphorus Intake	1,250	975.50	46.20	896	1,002
16	Manganese Intake	1.60	9.00	0.00	9	9

The average age of the respondents was 15 years, with a range from 14 to 17 years, indicating that all participants were adolescents. The mean hemoglobin concentration was 15.05 g/dL, with all 84 participants exhibiting normal levels. None of the respondents were experiencing menstruation at the time of the study.

All 84 respondents exhibited normal hemoglobin levels, and none were experiencing menstruation. Although anemia is typically more prevalent during menstruation, these findings contrast with the 2018 Indonesian health research, which documented a 32 percent prevalence of anemia among adolescents (Budhathoki et al., 2021). Nonetheless, alternative research has reported a higher prevalence rate of 45.2% (Nabilah et al., 2020).

Table 2. Distribution of Categorical scale data

No	Variable	categoric	Frequency	Percentage
<b>1</b>	<b>Anemia status</b>	<b>normal</b>	<b>84</b>	<b>100</b>
2	Nutritional status	Malnutrition	1	1.19
		undernourished	6	7.14
		Normal	60	71.4
		Overweight	17	20.2
3	Energy Intake	Less	4	4.8
		Good	23	27.4
		More	57	67.9
4	Protein intake	Good	23	27.4
		More	61	72.6
5	Carbohidrat intake	Good	23	27.4
		More	61	72.6
6	Fat intake	Less	84	100
7	Fiber intake	Less	84	100
8	Iron intake	Less	84	100
9	Calsium intake	Less	84	100
10	Magnesium intake	More	84	100
11	Zinc intake	less	23	27.4
		good	61	72.6
12	Fosfor intake	less	23	27.4
		good	61	72.6
13	Mangan intake	more	84	100
14	Vitamin A intake	Less	61	72.6
		good	23	27.4
15	Vitamin B intake	Less	84	100
16	Vitamin C intake	good	61	72.6
		more	23	27.4

The average weight of the adolescent girls was 48.63 kg, with a mean height of 154 cm. The mean BMI-for-age was -0.28. In terms of the BMI-for-age classification, 60 adolescents (71.4%) were categorized as having a normal BMI-for-age. One individual was classified as malnourished, six were identified as undernourished, and 17 were categorized as overweight.

The mean total energy consumption among female adolescents was 2,583 kcal, in contrast to an average energy requirement of 2,050 kcal. A majority of the 57 participants (67.9%) consumed more energy than necessary. Twenty-three individuals (27.4%) had an adequate energy intake, while four (4.8%) consumed less than required. The mean protein intake was 74.99 grams, with the average requirement being 65 grams; 61 adolescents (72.6%) consumed more protein than required, and 23 (27.4%) met the adequate intake. All adolescents consumed less fat than needed, with an average intake of 48.37 grams compared to the required 70 grams. Most of the 61 adolescents (72.6%) had a higher carbohydrate intake, averaging 432.88 grams, which exceeded the requirement of 300 grams. All 84 adolescents had insufficient fiber intake, averaging 11.18 grams against a requirement of 29 grams. In summary, most adolescents met their energy and macronutrient needs for protein and carbohydrates, but all fell short in fat and fiber intake.

Analysis of dietary patterns revealed that all participants consumed adequate macronutrients and protein. The principal sources of protein included eggs, fresh fish, and chicken. A study involving adolescents revealed through logistic regression analysis that consuming protein exacerbated anemia. (P. Sari, R.T. Dewi, D.M. Diah, M. Dhamayanti, 2022). Hemoglobin levels are related to protein and iron intake (Takyyi et al., 2023). Adequate intake of calories and protein is crucial for sustaining anabolism, which is vital for preventing and treating anemia, even in chronic patients. (Bianchi, 2016). A study conducted in Japan, which was cross-sectional in nature, indicated that consuming fish rich in protein might lower the occurrence of anemia among older men. (Imai & Nakade, 2019). Research conducted in China indicates that the consumption of eggs and meat during the teenage years can potentially decrease the risk (Jie Ma, Jie Huang, Chunzi Zeng, Xuexin Zhong, Weiwei Zhang, Bo Zhang, 2023). A different cross-sectional study involving women before conception found a link between inadequate nutritional intake, particularly in terms of energy and protein, and the occurrence of anemia (Reski et al., 2021). The satisfactory protein intake among participants contributed to maintaining normal hemoglobin levels across all 84 individuals. (Bettati et al., 2009; Gell, 2018; Nabilah et al., 2020). Hemoglobin, an iron-binding protein, plays a vital role in erythrocytes. Adequate protein intake facilitates the synthesis of erythrocyte glutathione (Szwiega et al., 2024). There is a direct relationship between the amount of protein consumed and the levels of hemoglobin (Hendra et al., 2017). A lack of protein can lead to an increased likelihood of nutritional issues, such as anemia. (Wu, 2016). A diet abundant in protein could potentially decrease the chances of experiencing iron deficiency. (Kokubo et al., 2016).

Regarding micronutrient intake, all 84 adolescent girls exhibited insufficient calcium intake, with a mean consumption of 223.42 mg, compared to the recommended 1,200 mg for female adolescents. A majority (72.6%) demonstrated adequate phosphorus intake; however, 23 participants (27.4%) had insufficient intake, with a mean of 975.50 mg against the required 1,250 mg. All participants exceeded the recommended magnesium intake, averaging 307.25 mg, while the requirement was 222.50 mg. Iron intake was universally insufficient, with a mean of 8.75 mg compared to the recommended 15 mg. Most adolescents (72.6%) had adequate zinc intake, yet 23 (27.4%) had insufficient intake, with an average of 8.50 mg against a requirement of 9 mg. All participants consumed manganese in excess, with a mean of 9 mg compared to the recommended 1.6 mg. In summary, the majority of the adolescent girls were deficient in calcium, phosphorus, magnesium, iron, and zinc.

Among the 61 adolescent girls studied, 72.6% exhibited insufficient vitamin A intake, while 23 individuals (27.4%) demonstrated excessive intake. The average vitamin A consumption was 306.50 IU, in contrast to the recommended 600 IU. All 84 participants had inadequate vitamin B intake, with an average of 0.72 mg, compared to the required 1.1 mg. In summary, the intake of vitamins A and B was generally insufficient, whereas vitamin C intake was adequate. The participants exhibited a high consumption of vitamin C relative to their daily requirements, primarily derived from fruits such as oranges. A majority of the girls (72.6%) had adequate vitamin C intake, whereas 23 (27.4%) had excessive intake. The mean vitamin C intake was 75.00 mg, surpassing the recommended 67.50 mg.

Micronutrient shortages, including insufficient vitamin C, have been connected to the occurrence of anemia (Takyi et al., 2020). Combining vitamin C with iron supplements can enhance hemoglobin levels (Deng et al., 2024). Vitamin C plays a crucial role in iron absorption and hemoglobin formation, with low fruit intake impacting these levels. As a coenzyme or cofactor, vitamin C converts ferric iron to ferrous iron in the small intestine, enhancing absorption and preventing anemia. It also inhibits hemosiderin formation and improves iron mobilization. Vitamin C can increase non-heme iron absorption by up to four times and facilitates the transfer of iron from plasma transferrin to liver-stored ferritin (Almatsier, 2009).

Vitamin C facilitates the conversion of folic acid into tetrahydrofolic acid and serves as a significant antioxidant (Sharma, 2015). It functions as an antioxidant in hydroxylation reactions, fortifies blood vessels, prevents hemorrhage, reduces the risk of infection following childbirth, facilitates fetal bone development, activates leukocytes to enhance immune response, and contributes to tissue repair (Almatsier, 2009). A study investigating the administration of vitamin C supplements to pregnant pigs demonstrated a positive impact on birth weight and hemoglobin levels. Supplementation during the third trimester was found to have significant effects on hemoglobin levels (Aznar et al., 2024). The combination of oral iron and vitamin C has been shown to enhance hemoglobin levels in children diagnosed with Iron-Refractory Iron Deficiency Anemia (IRIDA) (Sourabh et al., 2019). Educating adolescents about nutrition can enhance their intake of iron and vitamin C, thereby preventing anemia (Wiafe et al., 2023).

A limitation of this study is its exclusive focus on the dietary patterns of non-anemic individuals, without assessing iron reserves in the blood. Future research should incorporate larger participant cohorts and a more comprehensive range of biomarkers.

## Conclusion

The majority of the respondents had adequate macronutrient intake; however, their micronutrient intake did not meet the required level. Protein intake is sufficient, resulting in normal hemoglobin levels, as it positively correlates with these levels. A high-vitamin C diet may also reduce the risk of anemia. Research on anemia prevalence in adolescent girls during menstruation is recommended for comparison. Further investigation should assess macro-and micronutrient levels in adolescents. Education on diet and providing balanced nutrition for adolescent girls and preconception women should be promoted to reduce nutritional deficiencies, including anemia.

## Acknowledgments

We thank all participants for their involvement in this study.

## References

- Almatsier, S. (2009). *Prinsip Dasar Ilmu Gizi*. Gramedia Pustaka Utama.
- Al-Zangabila, K., Poudel Adhikari, S., Wang, Q., Sunil, T. S., Rozelle, S., & Zhou, H. (2021). Alarmingly high malnutrition in childhood and its associated factors: A

- study among children under 5 in Yemen. *Medicine*, 100(5), e24419. <https://doi.org/10.1097/MD.00000000000024419>
- Aznar, B., Grandia, J., Tejedor, M. T., & Falceto, M. V. (2024). Effect of vitamin C and iron supplementation in pregnant hyper-prolific sows. *Livestock Science*, 280, 105404. <https://doi.org/https://doi.org/10.1016/j.livsci.2024.105404>
- Bettati, S., Viappiani, C., & Mozzarelli, A. (2009). Hemoglobin, an “evergreen” red protein. *Biochimica et Biophysica Acta (BBA) - Proteins and Proteomics*, 1794(9), 1317–1324. <https://doi.org/https://doi.org/10.1016/j.bbapap.2009.03.020>
- Bianchi, V. E. (2016). Role of nutrition on anemia in elderly. *Clin Nutr ESPEN*, 1(11). <https://doi.org/10.1016/j.clnesp.2015.09.003>
- Budhathoki, L., Shrestha, B., Phuyal, N., & Shrestha, L. (2021). Prevalence of Anemia in Adolescent Girls attending Specific Schools of Kavrepalanchok, Nepal. *JNMA; Journal of the Nepal Medical Association*, 59(235), 284–287. <https://doi.org/10.31729/JNMA.6330>
- Cairo, R. C. de A., Silva, L. R., Bustani, N. C., & Marques, C. D. F. (2014). Iron deficiency anemia in adolescents; a literature review. *Nutricion Hospitalaria*, 29(6), 1240–1249. <https://doi.org/10.3305/NH.2014.29.6.7245>
- Chaudhuri, P. K., Chaturvedi, D., & Chaudhary, A. K. (2017). Study of correlation between dietary habits and anemia among adolescent girls in Ranchi and its surrounding area. *International Journal of Contemporary Pediatrics Chaturvedi D et al. Int J Contemp Pediatr*, 4(4), 1165–1168. <https://doi.org/10.18203/2349-3291.ijcp20172022>
- Choi, Y. R., Kim, H. S., Yoon, S. J., Lee, N. Y., Gupta, H., Raja, G., Gebru, Y. A., Youn, G. S., Kim, D. J., Ham, Y. L., & Suk, K. T. (2021). Nutritional Status and Diet Style Affect Cognitive Function in Alcoholic Liver Disease. *Nutrients*, 13(1). <https://doi.org/10.3390/nu13010185>
- 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>
- Deng, J., Ramelli, L., Li, P. Y., Eshaghpour, A., Li, A., Schuenemann, G., & Crowther, M. A. (2024). Efficacy of vitamin C with Fe supplementation in patients with iron deficiency anemia: a systematic review and meta-analysis. *Blood Vessels, Thrombosis & Hemostasis*, 1(4), 100023. <https://doi.org/https://doi.org/10.1016/j.bvth.2024.100023>
- Dinkes Sumbar. (2019). *Riset Kesehatan Sumbar 2018*. [https://drive.google.com/file/d/12Ud\\_3qZwP0JTUyD\\_-MwFQ1b9J9qK7KAp/view](https://drive.google.com/file/d/12Ud_3qZwP0JTUyD_-MwFQ1b9J9qK7KAp/view)
- Garzon, S., Cacciato, P. M., Certelli, C., Salvaggio, C., Magliarditi, M., & Rizzo, G. (2020). Iron Deficiency Anemia in Pregnancy: Novel Approaches for an Old Problem. *Oman Medical Journal*, 35(5), 1–9. <https://doi.org/10.5001/OMJ.2020.108>
- Gell, D. A. (2018). Structure and function of haemoglobins. *Blood Cells, Molecules & Diseases*, 70, 13–42. <https://doi.org/10.1016/J.BCMD.2017.10.006>
- Gosdin, L., Sharma, A. J., Tripp, K., Amoafu, 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. *Journal of Nutrition*, 151(6), 1646–1655. <https://doi.org/10.1093/jn/nxab024>
- Gosdin, L., Tripp, K., Mahama, A. B., Quarshie, K., Amoafu, E. F., Selenje, L., Sharma, D., Jefferds, M. E., Sharma, A. J., Whitehead, R. D., Suchdev, P. S., Ramakrishnan, U., Martorell, R., & Addo, O. Y. (2020). Predictors of anaemia among adolescent

- schoolchildren of Ghana. *Journal of Nutritional Science*, 9. <https://doi.org/10.1017/JNS.2020.35>
- Habtegiorgis, S. D., Petrucka, P., Telayneh, A. T., Shitu Getahun, D., 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>
- Hendra, A., Rahmad, A., Gizi, J., Kesehatan, P., & Aceh, K. (2017). Pengaruh Asupan Protein dan Zat Besi (Fe) terhadap Kadar Hemoglobin pada Wanita Bekerja. *Jurnal Kesehatan*, 8(3), 321–325. <https://doi.org/10.26630/JK.V8I3.509>
- Imai, E. & Nakade, M. (2019). Fish and meat intakes and prevalence of anemia among the Japanese elderly. *Asia Pac J Clin Nutr*, 28(2), 276–284. [https://doi.org/https://doi.org/10.6133/apjcn.201906\\_28\(2\).0010](https://doi.org/https://doi.org/10.6133/apjcn.201906_28(2).0010)
- Jie Ma, Jie Huang, Chunzi Zeng, Xuexin Zhong, Weiwei Zhang, Bo Zhang, Y. L. (2023). Dietary Patterns and Association with Anemia in Children Aged 9-16 Years in Guangzhou, China: A Cross-Sectional Study. *Nutrients*, 15(19). <https://doi.org/10.3390/nu15194133>
- Kemenkes RI. (2019). *Riset Kesehatan Dasar 2018*.
- Kokubo, Y., Kisara, K., Yokoyama, Y., Ohira-Akiyama, Y., Tada, Y., Hida, A., Ishizaki, S., & Kawano, Y. (2016). Habitual dietary protein intake affects body iron status in Japanese female college rhythmic gymnasts: a follow-up study. *SpringerPlus*, 5(1), 862. <https://doi.org/10.1186/s40064-016-2569-7>
- 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>
- Manila, H. D. (2021). Hubungan Pola Makan dengan Kejadian Anemia pada Remaja Putri Kelas X SMA Murni Padang. *Jurnal Kesehatan Saintika Meditory*, 4(1), 77. <https://doi.org/10.30633/JSM.V4I1.1033>
- Means, R. T. (2020). Iron Deficiency and Iron Deficiency Anemia: Implications and Impact in Pregnancy, Fetal Development, and Early Childhood Parameters. *Nutrients*, 12(2). <https://doi.org/10.3390/NU12020447>
- Mursit, H., & Rahmawati, A. (2018). *Hubungan Pengetahuan Tentang Kesehatan Reproduksi dengan Sikap Pencegahan Terhadap Kehamilan Remaja di SMK N 1 Saptosari*. <http://eprints.poltekkesjogja.ac.id/1698/>
- 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>
- Novita, R. (2019). Korelasi Pola Makan dengan Kejadian Anemia pada Kehamilan di Puskesmas Kecamatan Ciputat Timur Tangerang Selatan Provinsi Banten. *Indonesian Journal of Midwifery (IJM)*, 2(2). <https://doi.org/10.35473/IJM.V2I2.260>
- P. Sari, R.T. Dewi, D.M. Diah, M. Dhamayanti, D. H. (2022). Iron Deficiency Anemia and Associated Factors Among Adolescent Girls and Women in a Rural Area of Jatinangor, Indonesia. *Int J Women Health*, 2022(14). <https://doi.org/10.2147/IJWH.S376023>
- Reski, R. N., Hadju, V., Indriasari, R., & Muis, M. (2021). Food intake and anemia among preconception women in Takalar district, Indonesia. *Enfermería Clínica*, 31, S834–S839. <https://doi.org/https://doi.org/10.1016/j.enfcli.2021.10.009>
- Sharma, S. (Ed.). (2015). *Nutrition at a Glance*. Wiley-Blackwell.
- Sirajudin; Surmita; Astuti T. (2018). *Survei Konsumsi Pangan*. PPSDMK Kemenkes RI.
- Sourabh, S., Bhatia, P., & Jain, R. (2019). Favourable improvement in haematological parameters in response to oral iron and vitamin C combination in children with Iron Refractory Iron Deficiency Anemia (IRIDA) phenotype. *Blood Cells, Molecules*,

- and *Diseases*, 75, 26–29.  
<https://doi.org/https://doi.org/10.1016/j.bcmed.2018.12.002>
- Supriasa, I. B. B. I. F. (2016). *Penilaian Status Gizi*. EGC.
- Szwiega, S., Xu, L., Rafii, M., Pencharz, P. B., Kong, D., Tomlinson, C., Elango, R., & Courtney-Martin, G. (2024). Protein intake affects erythrocyte glutathione synthesis in young healthy adults in a repeated-measures trial. *The American Journal of Clinical Nutrition*, 119(2), 371–383.  
<https://doi.org/https://doi.org/10.1016/j.ajcnut.2023.11.008>
- Takyi, S. A., Arko-Mensah, J., Basu, N., Bawuah, S., Dwomoh, D., & Fobil, J. N. (2023). Iron- and protein rich diets may boost hemoglobin levels among informal electronic waste recyclers exposed to metals at Agbogbloshie, Ghana. *Hygiene and Environmental Health Advances*, 8, 100073.  
<https://doi.org/https://doi.org/10.1016/j.heha.2023.100073>
- Takyi, S. A., Basu, N., Arko-Mensah, J., Dwomoh, D., Nti, A. A., Kwarteng, L., Acquah, A. A., Robins, T. G., & Fobil, J. N. (2020). Micronutrient Status of Electronic Waste Recyclers at Agbogbloshie, Ghana. In *International Journal of Environmental Research and Public Health* (Vol. 17, Issue 24).  
<https://doi.org/10.3390/ijerph17249575>
- Tayel, Dalia; Ezzat, S. (2015). Anemia and Its Associated Factors among Adolescents in Alexandria, Egypt Therapeutic Nutrition View project Nutrition Assessment View project. *International Journal of Health Sciences and Research*, 5(10).  
<https://www.researchgate.net/publication/283213538>
- WHO. (2018). Global Nutrition Targets 2025: Anaemia policy brief. In *WHO*. World Health Organization.
- Wiafe, M. A., Apprey, C., & Annan, R. A. (2023). Impact of nutrition education and counselling on nutritional status and anaemia among early adolescents: A randomized controlled trial. *Human Nutrition & Metabolism*, 31, 200182.  
<https://doi.org/https://doi.org/10.1016/j.hnm.2022.200182>
- Wu, G. (2016). Dietary protein intake and human health. *Food and Function*, 7(3), 1251–1265. <https://doi.org/10.1039/c5fo01530h>