October – December, 2025
Original Article
DOI: http://dx.doi.org/10.30867/action.v10i4.2617

AcTion: Aceh Nutrition Journal
Pages: 894 – 902 | p-issn 2527-3310; e-issn 2548-5741

Iron intake, supplement adherence, and perceived social support as predictors of anemia in rural Indonesia: A cross-sectional study

Asupan zat besi, kepatuhan suplementasi, dan dukungan sosial sebagai prediktor anemia ibu hamil di wilayah pedesaan Indonesia: Studi potong lintang

Yayuk Sri Rahayu[1*], Marliana Rahma[2], Nita Farida[3]

[1] Midwifery Diploma Study Program, Faculty of Health Sciences, Sehati Indonesia University, Karawang, Indonesia.
E-mail: yayuk.narafif@gmail.com
[2] Midwifery Diploma Study Program, Faculty of Health Sciences, Sehati University Indonesia, Karawang, Indonesia.
E-mail: marliana.rahma@yahoo.com
[3] Midwifery Diploma Study Program, Faculty of Health Sciences, Horizon University Indonesia.
E-mail: nitahindayah@gmail.com

***Correspondence Author:**
Midwifery Diploma Study Program, Faculty of Health Sciences, Sehati Indonesia University, Karawang, Indonesia.
E-mail: yayuk.narafif@gmail.com

Article History:
Received: June 09, 2025; Revised: July 24, 2025; Accepted: August 08, 2025; Published: December 13, 2025.

Publisher:
Politeknik Kesehatan Aceh
Kementerian Kesehatan RI

Abstract

Anemia among pregnant women remains a significant public health issue in Indonesia, particularly in Purwasari District, where 37.1% of women are anemic. Anemia may be directly influenced by social and supplementation factors, which also affect nutritional status, fetal health, and pregnancy outcomes through environmental support and the fulfillment of essential nutrient needs. This study aimed to analyze the association between social, supplementation, and nutritional factors and anemia among pregnant women in Purwasari District. A quantitative approach with a cross-sectional design was used. The sample consisted of 150 pregnant women who met the inclusion criteria of this study. Eligible participants were pregnant women aged 18–40 years in their second or third trimester. Data were analyzed using logistic regression analysis. The results showed that adequate vitamin C intake (p = 0.004; OR = 2.912), adherence to iron–folic acid (IFA) tablet consumption (p = 0.000; OR = 4.030), side effects of IFA intake (p = 0.003; OR = 3.027), and support from parents or in-laws (p = 0.026; OR = 2.563) were significantly associated with anemia in pregnancy. In conclusion, vitamin C adequacy, IFA adherence and side effects, and family support were significantly related to the occurrence of anemia among pregnant women in the Purwasari District.

Keywords: Anemia, vitamin C intake, iron supplementation, family support

Abstrak

Anemia pada ibu hamil masih menjadi salah satu masalah kesehatan masyarakat yang signifikan di Indonesia terutama di Kecamata Purwasari, dimana 37.1% wanita mengalami anemia. Anemia dapat dipengaruhi secara langsung faktor sosial dan suplementasi, yang juga berdampak pada status gizi, kesehatan janin, dan keberhasilan kehamilan melalui dukungan lingkungan dan pemenuhan kebutuhan gizi esensial. Penelitian ini bertujuan untuk menganalisis hubungan berbagai faktor sosial, suplementasi dan nutrisi terhadap kejadian anemia pada ibu hamil di Kecamatan Purwasari. Penelitian menggunakan pendekatan kuantitatif dengan desain cross-sectional, sampel penelitian terdiri dari ibu hamil yang memenuhi kriteria inklusi sebanyak 150. Kriteria inklusi dalam studi ini adalah wanita hamil berusia 18-40 tahun, yang berada pada trimester kedua dan ketiga kehamilan, dan analisis data dilakukan dengan regresi logistik. Hasil analisis menunjukkan bahwa kecukupan vitamin C (p= 0.004; OR= 2.912), kepatuhan konsumsi tablet tambah darah (TTD) (p= 0.000; OR= 4.030), efek samping konsumsi TTD (p= 0.003; OR= 3.027), serta dukungan orang tua atau mertua (p= 0.026; OR= 2.563) memiliki hubungan signifikan terhadap kejadian anemia. Kesimpulan, kecukupan vitamin C, kepatuhan serta efek samping TTD,

dan dukungan keluarga terbukti berhubungan signifikan dengan kejadian anemia pada ibu hamil di Kecamatan Purwasari.

Kata Kunci: Anemia; vitamin C; suplementasi zat besi, dukungan keluarga

Introduction

Anemia in pregnant women is a significant public health problem in various countries, especially in developing ones. This condition is characterized by low hemoglobin levels in the blood of pregnant women, which affects maternal and fetal health (Rammohan et al., 2024 ; Lauer et al., 2024). The World Health Organization (WHO) defines anemia in pregnant women as hemoglobin levels below 11 g/dL in the first and third trimesters and below 10.5 g/dL in the second trimester (WHO, 2025).

The incidence of anemia among pregnant women in Purwasari District was 37.1%, indicating that more than one-third of pregnant women in this area suffer from hemoglobin deficiency, which can have serious implications for the health of both the mother and fetus. Anemia during pregnancy increases the risk of complications such as premature birth, bleeding, low birth weight, and even maternal and infant mortality. This high prevalence reflects issues related to nutrition, low compliance with iron supplement intake, and social and economic factors influencing maternal health (Kemenkes RI & Unicef Indonesia, 2023).

The causes of anemia in pregnant women are diverse, including iron, folate, and vitamin B12 deficiencies, as well as chronic diseases such as malaria and hookworm infection. In addition, an unbalanced diet, low socioeconomic status, and close spacing of pregnancies contribute to a high incidence of anemia (Faghir-Ganji et al., 2023 ; Chung et al., 2025). These factors are particularly significant in Indonesia because the population's diet, which is low in carbohydrates and animal protein, frequently results in decreased levels of iron, folate, and vitamin B12, as well as chronic illnesses, such as malaria and parasitic infections, which are also common in some endemic areas. In addition, weak social and economic positions affect access to nutritious food and health services, and weak contraceptive practices lead to persistently poor health, which increases the risk of anemia in Indonesian children. The impact of anemia during pregnancy is severe, ranging from the risk of premature delivery and low birth weight to an increased risk of maternal and neonatal mortality (Tsamantioti et al., 2025). Therefore, anemia in pregnant women is a major challenge in improving maternal and child health worldwide (Abdulsalam et al., 2025).

According to a World Health Organization (WHO) report in 2024, approximately 37% of pregnant women worldwide are anemic, with the highest prevalence in South Asia and sub-Saharan Africa (WHO, 2025). Data from UNICEF also show that approximately 50% of anemia cases in pregnant women are caused by iron deficiency, which can be prevented through iron and folic acid supplementation (Kemenkes RI & Unicef Indonesia, 2023). According to the Indonesian Health Survey in 2023, the prevalence of anemia in pregnant women reached 27.7%, an increase from that in previous years (Kemenkes RI, 2023). The government has promoted iron (Fe) supplementation programs for pregnant women; however, coverage and adherence to Fe tablets remain major challenges. Recent studies have shown that sociocultural factors also influence pregnant women's adherence to Fe tablet intake; therefore, a community-based approach is one of the strategies being developed (Conrad et al., 2024 ; Lauer et al., 2024).

Several studies have been conducted to identify the risk factors and interventions to prevent and treat anemia in pregnant women. Hansen et al. (2023) found that iron supplementation significantly reduces the incidence of anemia in pregnant women; however, its effectiveness still depends on the compliance of pregnant women. Highlighted that a lack of iron supplement consumption, age > 30 years, living in rural areas, illiteracy, antenatal visits, and low income can increase adherence to Fe tablet consumption, especially in areas with a high incidence of anemia.

However, there are still research gaps in the understanding of the non-nutritional factors that influence anemia in pregnant women, such as genetic aspects, chronic inflammation, and psychosocial factors that may contribute to this condition (Sharief et al., 2024; Kebede et al., 2025). Additionally, innovative approaches to interventions remain under-researched in developing countries. However, this study does not discuss these factors but focuses on social

and behavioral factors. Therefore, this study focused on a multifactorial analysis of the incidence of anemia in pregnant women. Based on the background and research gaps identified, this study aimed to analyze the risk factors for anemia in pregnant women using a multifactorial approach that included nutritional (vitamin C intake, vitamin B12 intake, and adherence to taking blood tablets), social (fathers' support and parent/parent-in-law support), and maternal health aspects. With this study, it is hoped that new insights can be gained into the factors that contribute to anemia in pregnant women, as well as more effective intervention strategies to prevent and treat maternal anemia.

Methods

This quantitative, cross-sectional study aimed to analyze the risk factors for anemia in pregnant women in Karawang Regency. This design was chosen because it enables researchers to efficiently examine factors related to anemia in infants in a single session, in accordance with the research goal of identifying the cause rather than analyzing the cause-and-effect relationship (Nasution et al., 2023). This study was conducted in December 2024 in the Purwasari District of Karawang Regency.

Purwasari Sub-district, Karawang Regency, was chosen as the research location based on data showing a high prevalence of anemia among pregnant women in this area, as well as social and economic factors that may affect the incidence of anemia in the area. In addition, Karawang has good access to health services, which allows for optimal research implementation. The participants in this study were pregnant women who underwent ANC at health centers and clinics selected as research sites. To ensure that the sample is typical of the pregnant women population in that area, the study examined a few health issues that are specifically dependent on the high level of pregnant women's services.

The study population comprised all pregnant women who visited the health facilities involved in the study during the data collection period. A total of 150 samples were obtained using purposive sampling techniques based on the Slovin formula. The inclusion criteria for this study were pregnant women aged 18-40 years, in their second and third trimesters of pregnancy, willing to participate in this study by signing informed consent, and having medical records that recorded hemoglobin levels in the last three months. The exclusion criteria were pregnant women with health conditions that could interfere with the study results, such as anemia due to chronic diseases other than iron deficiency or mothers undergoing blood transfusion therapy.

Data were collected through structured interviews using a validated questionnaire and hemoglobin levels were measured using a Hemocue device, which was measured directly by a team of trained researchers. The questionnaire included demographic aspects, iron-folic acid (IFA) tablet consumption compliance, IFA side effects, knowledge level, attitude, husband support, parent/parent-in-law support using a questionnaire based on the participant's memory or opinion, and consumption patterns (vitamin C and vitamin B12) using a food frequency questionnaire (FFQ).

The collected data were then processed and analyzed in two stages: descriptive analysis to describe the characteristics of respondents and the distribution of research variables in the form of frequency tables, and inferential analysis using the chi-square test to examine the relationship between independent and dependent variables that affect the incidence of anemia in pregnant women.

Data were analyzed using SPSS software, and the results of the data analysis are presented in the form of tables and scientific narratives that provide interpretations of the research findings. The obtained data will also be compared with the results of previous studies to determine the suitability or differences that may occur in the results. The significance threshold used was $p<0.05$ to accurately interpret the results.

This research obtained an ethical permit from the Ethics Commission of the Hang Tuah Surabaya STIKes Health Research (Number: PE/237/XII/2024/KEP/SHT), all of which were in accordance with the principles of health research ethics, including maintaining the confidentiality of respondent data and ensuring that participation in research is voluntary without any element of coercion, and participants filled out a consent form and could withdraw at any time.

Result and Discussion

Table 1. Socio-demographic characteristics of pregnant women in Purwasari District

Mother's Characteristics	n	%
Education		
Higher Education	6	4.0
High School	38	25.3
Secondary School	51	34.0
Elementary School	14	9.0
Jobs		
Workers	8	5.3
Housewife	130	86.7
Employee	6	4.0
Self-employed	6	4.0
Age		
At risk <20 >35 years	22	14.6
Not at risk 20-35 years	128	85.4

Table 1 shows that 34% of mothers had a secondary school education, which is higher than the other education levels of mothers, such as elementary school, high school, and university (9.0%, 25.3%, and 4.0%, respectively). Housewives accounted for 86.7% of the mothers, which was higher than the percentage of mothers who worked as laborers, employees, and self-employed (5.3%, 4.0%, and 4.0%, respectively). Mothers who were not at risk accounted for 85.4%, which was higher than the percentage of mothers who were at risk (14.6%).

Table 2. Logistic regression analysis of social and nutritional factors associated with anemia

Variable	OR	95% CI	p-value
Vitamin C Intake	2.912	1.445-5.869	0.004
Vitamin B12 Intake	0.479	0.238–0.964	0.057
Adherence to Blood Intake Tablets	4.030	1.885-8.615	0.000
Side effects of taking blood tablets	3,027	1,494–6,132	0.003
Knowledge	1,781	0.852-3.724	0.177
Attitude	0.762	0.309–1.876	0.711
Media Exposure	1.668	0.781-3.566	0.259
Father's support	1.625	0.816-3.235	0.225
Parent/Parent-in-law Support	2.563	1.186-5.537	0.026

Table 2 shows that women with sufficient vitamin C intake were significantly less likely to experience anemia. Vitamin B12 showed a p-value of 0.057, which was borderline. Statistically, there was no significant relationship, but it approached significance and may be clinically relevant. The analysis of iron-folic acid (IFA) tablet consumption compliance obtained a value of 0.000, which means there was a significant relationship with the incidence of anemia in pregnant women. The OR value was 4.030, indicating that anemia in pregnant women is 4.030 times more likely to occur due to IFA consumption compliance. The analysis of side effects showed a value of 0.003, indicating a significant relationship between the incidence of anemia and the use of iron supplements during pregnancy. The OR value was 3.027, which means that the perceived side effects had a 3.027 times lower risk of anemia in pregnant women.

Knowledge analysis showed a value of 0.177, indicating no significant relationship with the incidence of anemia in pregnant women. Analysis of attitude showed a p = 0.177, which means that there was no significant relationship with the incidence of anemia in pregnant women. The analysis of media exposure obtained a value of 0.259, which means that there was no significant relationship with the incidence of anemia in pregnant women. Analysis of fathers' support showed a value of 0.225, which means that there was no significant relationship between the incidence of anemia and the support of fathers. The analysis of parent/parent-in-law support showed a value of 0.026, indicating no significant relationship with the incidence of anemia in pregnant women. The OR value was 2.563, indicating that parental/parent-in-law support was associated with a 2.563 times higher risk of anemia in pregnant women.

Vitamin C plays an important role in increasing the absorption of non-heme iron from food; therefore, it can help prevent iron deficiency anemia in pregnant women (Tateishi et al., 2023). Vitamin C can reduce iron ions from the ferric form (Fe3+) to the ferrous form (Fe2+), which is more easily absorbed by the intestinal mucosa (Marie et al., 2023). Therefore, pregnant women who consume adequate

amounts of vitamin C tend to have better hemoglobin levels. A study showed that vitamin C supplementation during pregnancy can help reduce the risk of complications such as preeclampsia, stunted fetal growth, and maternal anemia (Jaisamrarn et al., 2023 ; Qiu et al., 2024).

Vitamin B12 plays a role in red blood cell formation through DNA synthesis and homocysteine methylation (Simonenko et al., 2024). Vitamin B12 deficiency during pregnancy has been associated with various complications, including megaloblastic anemia (Anwar et al., 2024). One study found that mothers with vitamin B12 deficiency had a significantly higher incidence of oligohydramnios, fetal hydrocephalus, and neural tube defects than those with normal vitamin B12 levels (Gougoutsi et al., 2024). Although the results of this study did not show a significant association, it is still important for pregnant women to receive adequate vitamin B12 intake, as most pregnant women experience vitamin B12 deficiency during pregnancy, with the prevalence increasing from the first to the third trimester (Anwar et al., 2024; Gougoutsi et al., 2024).

Adequate knowledge of anemia and its prevention is important for reducing the prevalence of anemia in pregnant women. A study in Nigeria found that 56.30% of participants had poor knowledge of anemia during pregnancy, and there was a significant relationship between knowledge level and anemia (Olusesan et al., 2023). This shows that higher knowledge obtained from health education delivered by health workers or electronic media can increase pregnant women's understanding of anemia prevention (Pratiwi et al., 2020; Pratiwi et al., 2022). However, good knowledge is not always associated with effective preventive practices. Another study by Yao et al. (2024) emphasized that, although many mothers showed a positive attitude, they still experienced anemia; attitude is the mother's presupposition in accepting or rejecting a health action. Despite having good knowledge, there was still a negative attitude due to fear of IFA side effects or circulating health myths. Educational campaigns with a local cultural approach are a solution for changing this attitude (Olusesan et al., 2023; Yao et al., 2024).

However, when comparing pregnant women's understanding of and attitudes toward anemia, the study's findings were not significant. This is due to the fact that knowledge and attitude by themselves do not always translate into action. Anemia is significantly influenced by several factors, including dietary practices, access to nutritious food, economic status, social ties, and an individual's health. Furthermore, the association between knowledge, attitude, and anemia could not be as strong as it could be because the cross-sectional study design could not ensure cause-and-effect relationships.

Iron and folic acid (IFA) supplementation during pregnancy is a key intervention for preventing anemia in pregnancy. However, adherence to supplementation is often low. A study by Saeed et al. (2024) revealed that approximately 80% of pregnant women adhered to IFA tablet supplementation, with the main determinants being the number of antenatal visits and knowledge about anemia. In contrast, a study in Uganda showed that forgetfulness, drug side effects, and fear of side effects were the main reasons for non-adherence to IFA tablet supplementation (Ssewankambo & Nakaziba, 2023; Al Rahmad, 2023). Side effects such as nausea, constipation, or gastritis, which often occur with daily consumption of iron supplements, may exacerbate non-adherence (Banerjee et al., 2024). Based on earlier research findings that anemia is caused by noncompliance with iron consumption, this study is also consistent with the situation in Indonesia (Elvira et al., 2022; Yani et al., 2023).

Family support, such as from husbands and parents or parents-in-law, plays an important role in improving pregnant women's adherence to health interventions (Darebo et al., 2024). Highlighted that the family empowerment model significantly increased the compliance of pregnant women in taking iron supplements, which had an impact on the hemoglobin levels of pregnant women, suggesting that family involvement can strengthen the effectiveness of health interventions. Pregnant women lacking parent/parent-in-law support were 2.56 times more likely to experience anemia. This suggests that although information from the media can increase awareness, behavior change is more dependent on direct support from immediate family members, especially mothers and in-laws (Rammutla & Sundani, 2024; Putra et al., 2025). In addition, digital health interventions have been shown to be effective in improving

adherence to iron supplementation and hemoglobin levels in pregnant women, demonstrating the potential of technology to support maternal health (Pratiwi et al., 2022).

These findings confirm the importance of a multidimensional approach to address anemia in pregnant women. Improved knowledge and positive attitudes should be supported by interventions that consider the side effects of supplementation and strengthen family and social support. The integration of digital technology into maternal health interventions also shows great potential for improving adherence and health outcomes in pregnant women. This holistic approach can significantly contribute to reducing the prevalence of anemia in pregnant women and improving overall maternal and infant health outcomes.

The researchers acknowledge that the possible limitations of this study are not sufficiently highlighted in the discussion. The researchers included a description of the study's limitations to increase scientific integrity and transparency. The use of a cross-sectional design, which makes it impossible to prove causal links; the use of self-reported data, which could introduce subjective bias; and possible respondent recall bias, which could compromise data accuracy, are some of the pertinent limitations. The purpose of these improvements was to offer a more thorough comprehension of how to interpret the study findings.

Conclusion

Vitamin C adequacy, parent/parent-in-law support, side effects, and adherence to IFA tablet consumption were significantly associated with the incidence of anemia in pregnant women, whereas factors such as knowledge, attitude, media exposure, father's support, and vitamin B12 intake were not significant. This study highlights the need for educating pregnant women about vitamin C supplementation, family bonding during prenatal care, and the side effects of iron to improve consumer health.

Acknowledgments

The authors would like to thank the local government and community for permitting this research.

References

Abdulsalam, M., Tessema, M., Mohsin, M., Malik, T., & Abdulsalam, F. I. (2025). Determining factors associated with anaemia in pregnant women visiting the antenatal care unit at St. Paul's Hospital, Addis Ababa, Ethiopia: Unmatched case-control study. *Women and Children Nursing, 3*(1), 27–34.

Al Rahmad, A. H. (2023). Scoping review: The role of micronutrients (Fe, Zn, iodine, retinol, folate) during pregnancy. *Jurnal Kesehatan Manarang, 9*(1), 1–13. https://doi.org/10.33490/jkm.v9i1.812

Anne Marie, U., Murererehe, J., Rehman, M., Chittilla, M., Uwambaye, P., & Razzaque, M. S. (2023). Oral manifestations of iron imbalance. *Frontiers in Nutrition, 10*, 1272902. https://doi.org/10.3389/fnut.2023.1272902

Anwar, S., Kumar, V., & Raut, R. (2024). A review on factors causing vitamin B12 deficiency in pregnant women and infants. *[Nama Jurnal tidak tersedia], 12*(1), 1450. https://doi.org/10.1016/S0140-6736(24)00185-5

Azzam, A., Khaled, H., Alrefaey, A. K., Basil, A., Ibrahim, S., Elsayed, M. S., ... & Halim, H. W. A. (2025). Anemia in pregnancy: A systematic review and meta-analysis of prevalence, determinants, and health impacts in Egypt. *BMC Pregnancy and Childbirth, 25*(1), 29. https://doi.org/10.1186/s12884-024-07111-9

Banerjee, A., Athalye, S., Shingade, P., Khargekar, V., Mahajan, N., Madkaikar, M., & Khargekar, N. (2024). Efficacy of daily versus intermittent oral iron supplementation for prevention of anaemia among pregnant women: A systematic review and meta-analysis. *EClinicalMedicine, 74*, 102742. https://doi.org/10.1016/j.eclinm.2024.102742

Chung, G. K. K., Sharma, B., Vargas, D. C., Lee, W., Sun, K. S., Hung, H., ... & Yeoh, E. K. (2025). Prevalence and determinants of anemia in South Asian diaspora women residing in Hong Kong: An exploratory cross-sectional study. *Journal of Migration and Health, 11*,

100312. https://doi.org/10.1016/j.jmh.2025.100312

Conrad, A., Burns, J., Sherburne, L., Kaled, M. D., Souley, H., & Nielsen, J. (2024). Understanding behavioral drivers of iron and folic acid supplementation and vitamin A- and iron-rich food consumption among women and adolescent girls in Niger. *Public Health Nutrition, 27*(e249), 1–8. https://doi.org/10.1017/S1368980024002192

Darebo, T. D., Spigt, M., Teklewold, B., Badacho, A. S., Mayer, N., & Teklewold, M. (2024). The sexual and reproductive healthcare challenges when dealing with female migrants and refugees in low- and middle-income countries: A qualitative evidence synthesis. *BMC Public Health, 24*(1), 520. https://doi.org/10.1186/s12889-024-17916-0

Elvira, E., Nurvinanda, R., & Sagita, A. (2022). Factors associated with anemia in pregnant women. *Citra Delima Scientific Journal of Citra Internasional Institute, 6*(2), 111–118. https://doi.org/10.33862/citradelima.v6i2.295

Faghir-Ganji, M., Amanollahi, A., Nikbina, M., Ansari-Moghaddam, A., & Abdolmohammadi, N. (2023). Prevalence and risk factors of anemia in first, second, and third trimesters of pregnancy in Iran: A systematic review and meta-analysis. *Heliyon, 9*(3), e14197. https://doi.org/10.1016/j.heliyon.2023.e14197

Ge, S., Ali, S., Haldane, V., Bekdache, C., Tang, G. H., & Sholzberg, M. (2025). An approach to hemequity: Identifying the barriers and facilitators of iron deficiency reduction strategies in low- to middle-income countries. *British Journal of Haematology*, 428–442. https://doi.org/10.1111/bjh.19984

Gougoutsi, V., Pouliakis, A., Argyrios, T., Tolia, M., Nazos, N. A., Panagopoulos, P., & Kokoris, S. (2024). The critical role of the early evaluation of iron and vitamin B12 deficiency in pregnancy. *Cureus, 16*(8), 1–11. https://doi.org/10.7759/cureus.67592

Hansen, R., Sejer, E. P., Holm, C., & Schroll, J. B. (2023). Iron supplements in pregnant women with normal iron status: A systematic review and meta-analysis. *Acta Obstetricia et Gynecologica Scandinavica, 102*(9), 1147–1158. https://doi.org/10.1111/aogs.14607

Jaisamrarn, U., Esteban-Habana, M. A., Padolina, C. S., Decena, D. C. D., Dee, M. T., Damodaran, P., … & Hu, H. (2023). Vitamins and minerals, education, and self-care need during preconception to 1000 days of life in Southeast Asia: An expert panel opinion. *SAGE Open Medicine, 11*, 20503121231173377. https://doi.org/10.1177/20503121231173377

Kebede, S. S., Asmelash, D., Duguma, T., Wudineh, D., Alemayehu, E., Gedefie, A., & Mesfin, G. (2025). Global prevalence of iron deficiency anemia and its variation with different gestational age: Systematic review and meta-analysis. *Clinical Nutrition Open Science, 59*, 68–86. https://doi.org/10.1016/j.nutos.2024.12.002

Lauer, J. M., Bhaise, S., Dhurde, V., Gugel, A., Shah, M., Hibberd, P. L., Patel, A., & Locks, L. M. (2024). Maternal anemia during pregnancy and infant birth outcomes: A prospective cohort study in Eastern Maharashtra, India. *Current Developments in Nutrition, 8*(11), 104476. https://doi.org/10.1016/j.cdnut.2024.104476

Ministry of Health of the Republic of Indonesia. (2023). *Indonesian Health Survey (SKI).* Ministry of Health. [URL tidak tersedia]

Ministry of Health of the Republic of Indonesia, & UNICEF Indonesia. (2023). *Maternal nutrition in Indonesia: Landscape analysis and recommendations.* UNICEF Indonesia. https://www.unicef.org/indonesia/media/21766/file/Gizi%20Ibu%20di%20Indonesia%20-%20Analisis%20Lanskap%20dan%20Rekomendasi.pdf

Nasution, A. S., Arifianto, N., Qurniyawati, E., Desmawati, E., Setiarsih, D., Andari, S., … & Puspita, D. (2023). *Introduction to health methodology.* Sada Kurnia Pustaka.

Nasution, A. S., & Nasution, A. (2020). Nutrition puzzles as an effort to promote balanced nutrition behavior in students. *Indonesian Public Health Media, 16*(1), 89–99. https://doi.org/10.30597/mkmi.v16i1.8606

Olusesan, O. O., Nkanga, E. A., Oyerinde, I. E., Akintoye, O., Asekun-Olarinmoye, I., & Alabi, Q. K. (2023). Factors affecting anemia in pregnant women in Ibeju-Lekki, Lagos State, Nigeria. *INQUIRY: The Journal of Health Care, 60*, 1–8. https://doi.org/10.1177/00469580231159961

Pratiwi, S., Makiyah, S. N. N., & Kartini, F. (2022). The effect of health promotion with video media on knowledge and behavior about anemia in pregnant mothers. *Jurnal Health Sains, 3*(9), 1403–1408. https://doi.org/10.46799/jhs.v3i9.594

Putra, E. S., Irfan, A., Nopindra, A., Al Rahmad, A. H., & Dahliansyah, D. (2025). Nutrition education based on the "My T Plate" model enhances adolescents' knowledge in preventing central obesity. *Proceeding International Conference Health Polytechnic of Jambi, 5*, 213–217. [DOI tidak tersedia]

Qiu, C., Tao, T., Xia, Z., & Fang, J. (2024). Clinical efficacy of polysaccharide iron complex plus vitamin C in the treatment of iron deficiency anemia in pregnancy and their effect on iron metabolism. *Tropical Journal of Pharmaceutical Research, 23*(1), 109–115. https://doi.org/10.4314/tjpr.v23i1.14

Rammohan, A., Chu, H., Awofeso, N., & Goli, S. (2025). Adolescent pregnancy, maternal and child anaemia: Empirical analysis from India, Bangladesh, and Nigeria. *Maternal & Child Nutrition, 21*(1), e13723. https://doi.org/10.1111/mcn.13723

Rammutla, M. C., & Sundani, N. D. (2024). Social media's influence on the attitudes of younger daughters-in-law towards their mothers-in-law: A South African context. *Innovation Journal of Social Sciences and Economic Review, 6*(1), 34–42. https://doi.org/10.36923/ijsser.v6i1.247

Saeed, M. S., Adam, G. K., Hussein, S. M., Alhabardi, N., & Adam, I. (2024). Prevalence and factors associated with adherence to iron-folic acid supplementation among pregnant women in Eastern Sudan: A cross-sectional study. *Patient Preference and Adherence, 18*(8), 1665–1674. https://doi.org/10.2147/PPA.S476738

Sharief, S. A. (2024). Normocytic anemia in pregnant women: A scoping review. *Medical Journal of Malaysia, 79*(5), 646–657. https://e-mjm.org/2024/v79n5/normocytic-anemia.pdf

Simonenko, S. Y., Bogdanova, D. A., & Kuldyushev, N. A. (2024). Emerging roles of vitamin B12 in aging and inflammation. *International Journal of Molecular Sciences, 25*(9). https://doi.org/10.3390/ijms25095044

Ssewankambo, U., & Nakaziba, R. (2023). Adherence to iron and folic acid supplementation and associated factors among mothers receiving antenatal care in Lira District, Uganda. *Nursing Communications, 7*(1), e2023021. https://doi.org/10.53388/in2023021

Tateishi, Y., Toyoda, S., Murakami, H., Uchida, R., Ichikawa, R., Kikuchi, T., ... & Suzuki, K. (2023). A short-term intervention of ingesting iron along with methionine and threonine leads to a higher hemoglobin level than that with iron alone in young healthy women: A randomized, double-blind, parallel-group, comparative study. *European Journal of Nutrition, 62*(7), 3009–3019. https://doi.org/10.1007/s00394-023-03213-w

Tsamantioti, E., Alfvén, T., Hossin, M. Z., & Razaz, N. (2025). Maternal anaemia and risk of neonatal and infant mortality in low- and middle-income countries: A secondary analysis of 45 national datasets. *BMJ Global Health, 10*(3). https://doi.org/10.1136/bmjgh-2023-014654

WHO. (2025). Anaemia. *World Health Organization.* https://www.who.int/news-room/fact-sheets/detail/anaemia

Yani, M., Azhari, A., Al Rahmad, A. H., Bastian, F., Ilzana, T. M., Rahmi, C. R., ... & Salsabila, S. (2023). The relationship between menarche and nutritional status in junior

high school students in Aceh Besar: A study from 30 years of armed conflict area, Aceh, Indonesia. *AcTion: Aceh Nutrition Journal, 8*(4), 635–641. https://doi.org/10.30867/action.v8i4.1310

Yanuaringsih, G. P., Wigati, P. W., & Sutrisni. (2024). Control behaviors of fathers and pregnant women on adherence of pregnant women to take blood supplement tablets. *Contagion: Scientific Periodical Journal of Public Health and Coastal Health, 6*(1), 764–775. [DOI tidak tersedia]

Yao, B., Xu, M., Cheng, F., Peng, M., & Mao, X. (2024). Knowledge, attitudes, and practices among patients with anemia towards disease management. *Frontiers in Public Health, 12*, 1380710. https://doi.org/10.3389/fpubh.2024.1380710