ISSN 2620-8423 (print) | 2620-5653 (online)

The relationship between nutritional status and preconceptional anemia in premarital women: A secondary data analysis

Faiza Arvianabilla[1], Winarsih Nur Ambarwati[2,*], Rohani Mamat[3]

[1,2] School of Nursing, Faculty of Health Science, Universitas Muhammadiyah Surakarta, Indonesia.
[3] Faculty of Medicine and Health Science, University Malaysia Sabah, Malaysia.
wna246@ums.ac.id*
*corresponding author

ARTICLE INFO

Article history
Received, 14-th October 2025
Revised, 15-th November 2025
Accepted, 12-nd December 2025

Keywords
Premarital Women;
Anemia;
Nutrition status;

ABSTRACT

Background: Anemia is a major public health issue in Indonesia, contributing to pregnancy complications and adverse maternal and infant outcomes. However, limited research has explored preconceptional anemia among premarital women. Objective: To determine the prevalence of anemia and to examine its relationship with nutritional status among premarital women. Methods: This cross-sectional study used secondary data from premarital health examinations conducted at a Community Health Center in Sukoharjo Regency, Central Java, throughout 2023. Six hundred women were included. The data were processed using descriptive statistics and the Chi-square test. Results: The prevalence of anemia among premarital women was 24.3%, which was higher than the national prevalence of 22.3%. Most participants were 20-35 years old and had normal body mass index (BMI). The highest prevalence of anemia occurred among women with normal BMI (30.4%), followed by underweight (27.3%) and overweight (17.3%). Statistical analysis indicated a significant association between nutritional status and anemia ($p = 0.011$). Conclusion: Nutritional status significantly affects anemia risk among premarital women. Normal BMI does not always reflect adequate micronutrient intake. Strengthening preconception services through routine anemia screening, iron folic acid supplementation, and nutrition education is crucial to improve maternal health outcomes.

1. Introduction

Preconception health plays a vital role in ensuring successful pregnancy and safe childbirth. Maternal health before conception strongly determines fetal growth and maternal well-being. The preconception period involves preparing both partners to achieve optimal health before pregnancy begins (Pentecost & Meloni, 2020). In Indonesia, most couples plan for pregnancy soon after marriage (O'Donnell et al., 2020). However, health issues such as anemia are often present before conception (Wantini et al., 2023).

Anemia is defined as a hemoglobin concentration below 11.9 g/dL in women (World Health Organization, 2025). Nutritional deficiencies, particularly in iron, folate, and vitamin B12, are major causes of anemia (Krishnan et al., 2021). Women are also more vulnerable to anemia due to menstrual blood loss and reproductive demands. Chronic illness, infections, and genetic disorders further contribute to its occurrence (Hess et al., 2023; Marginean et al., 2023). If left untreated, anemia can lead to fatigue, decreased concentration, and reduced immunity (Safiri et al., 2021). In reproductive

health, it increases the risk of infertility, miscarriage, premature birth, and postpartum complications such as hemorrhage (Channar et al., 2023; Rahman et al., 2020; Wang et al., 2025; Young et al., 2023).

There is still a need for more evidence on the role of nutritional status in anemia among premarital women, because risk factors change over time and the relationship between nutritional status and anemia needs to be monitored continuously. Therefore, this study aimed to analyze the relationship between nutritional status and preconceptional anemia and to describe the prevalence of anemia among premarital women. The results of this study are expected to provide a scientific basis (evidence base) for planning preconception interventions, thereby reducing the risk of pregnancy complications, improve health outcomes, and ultimately reduce maternal morbidity and mortality.

2. Method

This study applied a cross-sectional analytical design using secondary data from medical records of premarital health examinations conducted at a Community Health Center in Sukoharjo Regency from January to December 2023. A total of 600 women were included through total sampling. Variables included age, hemoglobin level, and nutritional status categorized by BMI according to WHO classification.

Data were analyzed using descriptive statistics and the Chi-square test with SPSS version 25 with descriptive analysis and Chi-square test. This study has obtained permission from the Community Health Center and the local Health Office, and was carried out by maintaining anonymity, data confidentiality and honest reporting in accordance with the principles of research ethics.

3. Results

Table 1. Respondent characteristics

Variables	Category	Frequency (n)	Percentage (%)
Age	<20	57	9.5
	20-35	504	84.0
	>35	39	6.5
Anemia status	Normal	454	75.7
	Anemia	146	24.3
Nutritional status	Normal	227	37.8
	Underweight	110	18.3
	Overweight	150	25.0
	Obese	113	18.8
Total Sample		**600**	**100**

Based on Table 1, most respondents were aged 20 to 35 years (84.0%), whereas only 9.5% were under 20 years old and 6.5% were over 35 years old, which was the smallest age group in the study. Most respondents had normal hemoglobin status (75.7%), while 24.3% had anemia. The distribution of respondent's nutritional status showed that the largest category was normal nutrition at 37.8%, followed by overweight (25.0%), obesity (18.8%), and underweight (18.3%). This indicates that more than half of the respondents were in the abnormal nutritional status category.

Table 2. The crosstab between nutritional status and the Incidence of anemia in premarital women (n = 600)

Nutritional status	Normal n (%)	Anemia n (%)	Total n (%)
Normal	158 (26.3)	69 (11.5)	227 (100)
Underweight	80 (13.3)	30 (5.0)	110 (100)
Overweight	124 (20.7)	26 (4.3)	150 (100)
Obesity	92 (15.3)	21 (3.5)	113 (100)
Total	**454 (75.7)**	**146 (24.3)**	**600 (100)**

Based on Table 2, the highest prevalence of anemia was found in the group with normal nutritional status (30.4%) and underweight (27.3%), while the lowest prevalence was found in the overweight group (17.3%). The chi-square test showed a significant relationship between nutritional status and the incidence of anemia (p = 0.011).

4. Discussion

The majority of participants were aged 20-35 years, indicating that most were within reproductive age. A total of 24.3% of respondents were anemic, while the most common nutritional category was normal BMI, followed by overweight, obese, and underweight. However, when combined, abnormal BMI categories constituted more than half of the participants, reflecting a double burden of malnutrition in this population (Fachruddin & Pratiwi, 2024).

According to the WHO (2023), anemia in women is defined as a hemoglobin level below 11.9 g/dL. Based on this criterion, the prevalence found in this study (24.3%) is higher than the national average of 22.3% (Nainggolan et al., 2022). This rate is considered a moderate public health concern that warrants attention (Garcia-Casal et al., 2023). Interestingly, anemia was more prevalent among women with normal BMI than in other groups, suggesting that a normal BMI does not necessarily reflect adequate micronutrient intake. Individuals with a normal BMI may still experience deficiencies in iron, folate, or vitamin B12 (Marginean et al., 2023). Similar findings were also reported by Nainggolan et al. (2022), while other studies found higher anemia rates among underweight women (Kamruzzaman, 2021; Acharya et al., 2024).

This may relate to the fact that the most common type of anemia in premarital women is iron deficiency anemia, which generally occurs due to insufficient nutritional intake, especially iron (Kusdalinah et al., 2023). Iron status is closely linked to overall nutritional status, which also influences blood volume (Sulpat et al., 2025). The indicator of nutritional status is a BMI (Body Mass Index) (Wu et al., 2024). Individuals with a low BMI tend to have a smaller total blood volume and limited iron stores due to low energy and nutrient intake, thereby increasing the risk of iron deficiency anemia (Enggardany et al., 2021).

In contrast, individuals with a high BMI may also experience anemia, usually due to inflammation caused by excess body fat, which inhibits the absorption and utilization of iron, resulting in lower iron availability in the body (Alshwaiyat et al., 2021). These variations highlight that anemia is a multifactorial condition influenced by dietary diversity, socioeconomic factors, sanitation, infection, and genetic predisposition (Morakinyo et al., 2020; Osborn et al., 2021; Sunuwar et al., 2020). Differences across populations may also stem from variations in food access and regional dietary patterns (Zhao et al., 2023).

Nutritional factors remain crucial in understanding these findings. Studies have shown that energy intake, dietary diversity, and nutritional knowledge significantly influence nutritional status and indirectly affect anemia prevalence (Sumon et al., 2021). Therefore, individuals with normal BMI but poor dietary limited food variety and insufficient nutrient intake) diversity may still experience micronutrient deficiencies that contribute to anemia. The interplay of these factors reinforces the need for integrated nutrition and health interventions targeting women of reproductive age.

The high prevalence of anemia among women of reproductive age is concerning, as preconception anemia increases the risk of pregnancy complications such as preeclampsia, gestational hypertension, preterm labor, and postpartum hemorrhage. Anemia during pregnancy can also lead to intrauterine growth restriction, low birth weight, fetal hypoxia, and higher perinatal mortality (Wang et al., 2025). These consequences emphasize the importance of addressing anemia before conception as part of reproductive health efforts.

Preventive strategies should focus on early detection and nutritional interventions, including iron folic acid supplementation, dietary counseling, and health education. Integrating anemia screening into premarital or preconception check-ups can help identify anemia early and reduce pregnancy risks.

The Ministry of Health Regulation No. 21 of 2021 also underscores the importance of preconception services, including physical examinations, nutritional assessments, immunizations, and counseling.

However, uneven implementation of these services remains across regions (Ambarwati, 2024). Therefore, strengthening the role of Community Health Centers (*Puskesmas*) as preconception care providers, supported by cross-sectoral collaboration, trained personnel, and adequate logistics, is crucial. These efforts align with national strategies to reduce anemia prevalence among women of reproductive age and improve maternal health outcomes in Indonesia. This study is limited because of the use of secondary data, absence of dietary and socioeconomic variables, cross-sectional design and data collection from a single health center, which may affect generalizability of the findings.

5. Conclusion

Anemia remains a significant health problem among premarital women and is related to nutritional status. Although many women had normal nutritional status, the incidence of anemia remained high, indicating that normal nutritional status does not always reflect adequate nutrient intake. The results also confirm that nutritional status influences the risk of anemia, but other factors such as consumption patterns, reproductive health, and environmental conditions also contribute. Strengthening preconception services through regular screening, micronutrient support, and public health education can help reduce anemia and prevent pregnancy complications. Based on the results of this study, it is recommended to enhance the preconception monitoring system, including routine assessment of hemoglobin levels, dietary patterns, menstrual health, and improve early anemia management in premarital women. Future studies should incorporate more detailed dietary assessments, broader regional representation, and follow-up designs to better identify the causes of anemia.

Acknowledgment

The author would like to thank the Nursing Science Study Program, Faculty of Health Sciences, Muhammadiyah University of Surakarta, and all parties who have provided assistance in completing this research.

References

Alshwaiyat, N. M., Ahmad, A., Hassan, W. M. R. W., & Al-Jamal, H. A. N. (2021). Association between obesity and iron deficiency (Review). *Experimental and Therapeutic Medicine*, *22*(5). https://doi.org/10.3892/etm.2021.10703

Ambarwati, W. N. (2024). *Exploring the concept and nature of premarital preconception care in Indonesia: A qualitative comparative case study design* [Thesis]. University of Leeds United Kingdom.

Channar, H. B., Islam, M. U., Halepoto, A., Rahimon, M., Abbasi, W. A., & Ali, Q. (2023). Anemia Association with Socio -Demographic and Dietary Related Factors among Women of Childbearing Age: A Review Article. *Journal of Health and Rehabilitation Research*, *3*(2), 1078–1084. https://doi.org/10.61919/jhrr.v3i2.256

Enggardany, R., Yovita Hendrati, L., & Hairi, N. N. (2021). Relationship between Body Mass Index (BMI) and Anemia Among Adolescent Indonesian Girls (Analysis of The Indonesia Family Life Survey 5th Data). *Amerta Nutr*, 347–352. https://doi.org/10.20473/amnt.v5i4.2021

Fachruddin, I. I., & Pratiwi, H. (2024). Double Burden of Malnutrition Among Women of Reproductive Age and Its Associated Factors In Makassar District. *Media Gizi Indonesia*, *19*(2), 172–179. https://doi.org/10.20473/mgi.v19i2.172-179

Garcia-Casal, M. N., Dary, O., Jefferds, M. E., & Pasricha, S. R. (2023). Diagnosing anemia: Challenges selecting methods, addressing underlying causes, and implementing actions at the public health level. In *Annals of the New York Academy of Sciences* (Vol. 1524, Issue 1, pp. 37–50). John Wiley and Sons Inc. https://doi.org/10.1111/nyas.14996

Hess, S. Y., Owais, A., Jefferds, M. E. D., Young, M. F., Cahill, A., & Rogers, L. M. (2023). Accelerating action to reduce anemia: Review of causes and risk factors and related data needs. In *Annals of the New York Academy of Sciences* (Vol. 1523, Issue 1, pp. 11–23). John Wiley and Sons Inc. https://doi.org/10.1111/nyas.14985

Krishnan, V., Zaki, R. A., Nahar, A. M., Jalaludin, M. Y., & Majid, H. A. (2021). The longitudinal relationship between nutritional status and anaemia among Malaysian adolescents. *The Lancet Regional Health - Western Pacific*, *15*. https://doi.org/10.1016/j.lanwpc.2021.100228

Kusdalinah, Suryani, D., Nugroho, A., & Yunita. (2023). Effect of Combination Intake of Protein, Vitamin C, And Blood Boost Tablets on Hemoglobin Levels of Adolescent Girls. *National Nutrition Journal*, *The 2nd Bengkulu International Conference on Health (B-ICON 2022) 2023.18(1SP): 21–26*. https://doi.org/10.20473/mgi.v18i1SP

Marginean, C. M., Pirscoveanu, D., Popescu, M., Docea, A. O., Radu, A., Popescu, A. I. S., Vasile, C. M., Mitrut, R., Marginean, I. C., Iacob, G. A., Firu, D. M., & Mitrut, P. (2023). Diagnostic Approach and Pathophysiological Mechanisms of Anemia in Chronic Liver Disease—An Overview. In *Gastroenterology Insights* (Vol. 14, Issue 3, pp. 327–341). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/gastroent14030024

Morakinyo, O. M., Adebowale, A. S., Obembe, T. A., & Oloruntoba, E. O. (2020). Association between household environmental conditions and nutritional status of women of childbearing age in Nigeria. *PLoS ONE*, *15*(12 December). https://doi.org/10.1371/journal.pone.0243356

Nainggolan, O., Hapsari, D., Titaley, C. R., Indrawati, L., Dharmayanti, I., & Kristanto, A. Y. (2022). The relationship of body mass index and midupper arm circumference with anemia in nonpregnant women aged 19-49 years in Indonesia: Analysis of 2018 Basic Health Research data. *PLoS ONE*, *17*(3 March). https://doi.org/10.1371/journal.pone.0264685

O'Donnell, J., Utomo, I. D., & McDonald, P. (2020). Premarital sex and pregnancy in Greater Jakarta. *Genus*, *76*(1). https://doi.org/10.1186/s41118-020-00081-8

Osborn, A. J., Muhammad, G., Ravishankar, S., & Mathew, A. (2021). Prevalence and correlates of anemia among women in the reproductive age (15-49 years) in a rural area of Tamil Nadu: An exploratory study. *Journal of Education and Health Promotion*, *10*(1). https://doi.org/10.4103/jehp.jehp_1526_20

Pentecost, M., & Meloni, M. (2020). "It's Never Too Early": Preconception Care and Postgenomic Models of Life. *Frontiers in Sociology*, *5*. https://doi.org/10.3389/fsoc.2020.00021

Rahman, M. A., Khan, M. N., & Rahman, M. M. (2020). Maternal anaemia and risk of adverse obstetric and neonatal outcomes in South Asian countries: A systematic review and meta-analysis. In *Public Health in Practice* (Vol. 1). Elsevier B.V. https://doi.org/10.1016/j.puhip.2020.100021

Safiri, S., Kolahi, A. A., Noori, M., Nejadghaderi, S. A., Karamzad, N., Bragazzi, N. L., Sullman, M. J. M., Abdollahi, M., Collins, G. S., Kaufman, J. S., & Grieger, J. A. (2021). Burden of anemia and its underlying causes in 204 countries and territories, 1990–2019: results from the Global Burden of Disease Study 2019. *Journal of Hematology and Oncology*, *14*(1). https://doi.org/10.1186/s13045-021-01202-2

Sulpat, E., Mardhika, A., Fadliyah, L., Tyas, A. P. M., Harianto, S., & Dyah Marsinta, F. (2025). The Impact of Nutritional Status on The Risk of Anemia in Pregnant Women: A Cross-Sectional Study. *JoViN Journal of Vocational Nursing*, *6*(1), 91–96. https://doi.org/https://doi.org/10.20473/jovin.v6i1.70760

Sumon, K., Sayem, M. A., Sayed, A., Al Mamun, M., Bharati, P., Chakrabarty, S., Taleb, A., & Golam Hossain, M. (2021). Two Level Logistic Regression Model of Factors Influencing in Early Childbearing and its Consequences on Nutritional Status of Bangladeshi Mothers: Nationally Representative Data. In *International Journal of Statistics in Medical Research* (Vol. 10).

Sunuwar, D. R., Singh, D. R., Chaudhary, N. K., Pradhan, P. M. S., Rai, P., & Tiwari, K. (2020). Prevalence and factors associated with anemia among women of reproductive age in seven South and Southeast Asian countries: Evidence from nationally representative surveys. *PLoS ONE*, *15*(8 August). https://doi.org/10.1371/journal.pone.0236449

Wang, R., Xu, S., Hao, X., Jin, X., Pan, D., Xia, H., Liao, W., Yang, L., & Wang, S. (2025). Anemia during pregnancy and adverse pregnancy outcomes: a systematic review and meta-analysis of cohort studies. In *Frontiers in Global Women's Health* (Vol. 6). Frontiers Media SA. https://doi.org/10.3389/fgwh.2025.1502585

Wantini, N. A., Maydianasari, L., & Agni, A. S. (2023). The Description of Future Bride Nutritional Status Included Incidence of Anemia, Chronic Energy Deficiency (CED), and Nutritional Status Based on Body Mass Index. *Jurnal Ners Dan Kebidanan (Journal of Ners and Midwifery)*, *10*(2), 239–246. https://doi.org/10.26699/jnk.v10i2.art.p239-246

World Health Organization. (2025, November 13). *Anaemia*. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/anaemia

Wu, Y., Li, D., & Vermund, S. H. (2024). Advantages and Limitations of the Body Mass Index (BMI) to Assess Adult Obesity. In *International Journal of Environmental Research and Public Health* (Vol. 21, Issue 6). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/ijerph21060757

Young, M. F., Oaks, B. M., Rogers, H. P., Tandon, S., Martorell, R., Dewey, K. G., & Wendt, A. S. (2023). Maternal low and high hemoglobin concentrations and associations with adverse maternal and infant health outcomes: an updated global systematic review and meta-analysis. *BMC Pregnancy and Childbirth*, *23*(1). https://doi.org/10.1186/s12884-023-05489-6

Zhao, J., Zuo, L., Sun, J., Su, C., & Wang, H. (2023). Geographic and urban–rural disparities in dietary energy and macronutrient composition among women of childbearing age: findings from the China health and nutrition survey,1991–2015. *Nutrition Journal*, *22*(1). https://doi.org/10.1186/s12937-023-00851-y