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International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 4 | Number 3 | September 2026 |



The Relationship Between Pregnant Women's Level Of Knowledge About Anemia Status and Nutrition During Pregnancy

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Abstract

Background : Anemia during pregnancy remains a major public health concern and contributes to increased maternal and neonatal morbidity and mortality . One of the contributing factors is inadequate maternal knowledge regarding nutrition during pregnancy . Adequate knowledge of iron , folic acid acid , protein, vitamins , and minerals is expected to encourage healthy dietary practices that reduce the risk of anemia. Objective : To determine the relationship between maternal and nutritional knowledge and anemia status during pregnancy . Methods : A mixed-methods sequential explanatory design was employed . The quantitative phase used a cross-sectional approach involving 180 pregnant women selected through proportionate stratified random sampling. Data were analyzed using descriptive statistics , Chi- square tests , and multivariable logistics regression . The qualitative phase consisted of depth interviews with 12 participants to explain the quantitative findings . Results : Most participants had good nutritional knowledge (61.1%), while the prevalence of anemia was 31.7%. A significant association was found between maternal and nutritional knowledge and anemia status ($p<0.001$). Multivariable analysis indicated that women with good nutritional knowledge was lacking likely to experience anemia (OR=3.64; 95% CI: 1.86–7.12). Qualitative findings revealed that family support , antenatal nutrition counseling , and adherence to iron supplementation also influenced anemia status. Conclusion : Maternal nutrition knowledge is significantly associated with anemia status during pregnancy . Continuous nutrition education , strengthened antenatal care , and family involvement are essential strategies to reduce the burden of maternal anemia.

Keywords: Pregnant Women; Nutrition; Knowledge; Anemia; Maternal Health.

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1. Introduction

Pregnancy is a period characterized by various physiological, metabolic, hormonal, and hematological changes aimed at supporting fetal growth and development. During pregnancy, there is an increased need for energy, protein, vitamins, and minerals, particularly iron and folic acid. If these nutritional needs are not optimally met, pregnant women are at risk of developing anemia, which can negatively impact the health of both the mother and the fetus. Anemia in pregnancy remains a public health problem in various developing countries, including Indonesia, due to its relatively high prevalence and contributing to increased maternal and infant morbidity and mortality.

According to the World Health Organization (WHO), anemia in pregnancy is defined as a hemoglobin level of less than 11 g/ dL. This condition is generally caused by iron deficiency, although deficiencies in folic acid, vitamin B12, infectious diseases, and chronic disorders can also be causes. The WHO estimates that approximately 37% of pregnant women worldwide experience anemia, with a higher prevalence in low- and middle-income countries. Anemia during pregnancy increases the risk of preterm delivery, low birth weight, fetal growth retardation, postpartum hemorrhage, infection, and maternal and neonatal death.

In Indonesia, anemia in pregnant women remains a major challenge in maternal health programs. Various national surveys have shown that the prevalence of anemia in pregnant women remains quite high despite various interventions, such as the provision of iron supplements, nutrition education, and improved antenatal care. This high prevalence indicates that anemia is influenced not only by biological factors, but also by behavioral, social, and economic factors, as well as maternal knowledge about nutrition during pregnancy.

Knowledge is a predisposing factor influencing health behaviors. Pregnant women who have good knowledge about nutritional needs during pregnancy are more likely to choose nutritious foods, comply with recommendations for iron supplementation, and adopt a healthy lifestyle. Conversely, lack of knowledge can lead to inappropriate dietary patterns, low consumption of iron-rich foods, and poor adherence to iron supplementation, thus increasing the risk of anemia.

Anemia status is also influenced by various other factors, such as education level, economic status, parity, maternal age, pregnancy spacing, infectious diseases, quality of antenatal care, family support, and dietary habits. However, nutritional knowledge remains a modifiable factor through health education interventions. Therefore, improving knowledge among pregnant women is an important strategy in anemia prevention.





Various studies have shown that nutrition education provided during antenatal care can improve mothers' knowledge of nutritional needs and encourage changes in healthier eating behaviors. Structured nutrition counseling conducted by health workers has been shown to increase maternal compliance with iron supplementation and improve the quality of food intake during pregnancy. However, research findings on the relationship between nutritional knowledge and anemia status vary, necessitating further research using approaches that provide both quantitative insights and in-depth explanations of the influencing factors.

This research uses a mixed approach methods with sequential design Explanatory , which combines quantitative analysis and qualitative exploration. This approach is expected to not only identify the relationship between pregnant women's nutritional knowledge and anemia status, but also explain the factors underlying this relationship, thus providing a basis for developing more effective intervention strategies to improve maternal health and reduce the incidence of anemia during pregnancy.

2. Research Methods

This study employed a mixed-methods approach using a sequential explanatory design, in which quantitative and qualitative methods were conducted in two consecutive phases. The quantitative phase was undertaken first to examine the relationship between pregnant women's nutritional knowledge and anemia status during pregnancy, while the qualitative phase was subsequently conducted to obtain a deeper understanding of the factors influencing this relationship based on the experiences and perceptions of pregnant women. The sequential explanatory design was selected because it integrates the strengths of quantitative and qualitative approaches. Findings from the quantitative analysis were used to guide the exploration in the qualitative phase, thereby providing a more comprehensive interpretation of the research findings.

The study was conducted in the working area of a Community Health Centre (Puskesmas) that has a high coverage of antenatal care services and implements an anemia prevention programme for pregnant women. The study site was purposively selected based on the high number of antenatal visits and the availability of maternal health records. The research was carried out from January to June 2026, covering the preparation phase, quantitative data collection, preliminary data analysis, qualitative data collection, integration of quantitative and qualitative findings, and preparation of the final research report.

The quantitative study population consisted of all 328 pregnant women who attended antenatal care services within the working area of the selected Community Health Centre





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International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

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during the study period. The qualitative participants were selected from the quantitative respondents to represent women with high and low nutritional knowledge as well as those with and without anemia. In addition, the coordinating midwife and a nutritionist were recruited as key informants to provide complementary information regarding maternal nutrition and anemia prevention programmes. The quantitative sample size was determined using the Slovin formula with a 5% margin of error, resulting in a minimum sample of 180 respondents. A proportionate stratified random sampling technique was employed to ensure proportional representation across villages or service areas. The qualitative component used purposive sampling to recruit participants who could provide rich information related to the study objectives. A total of 22 informants, consisting of pregnant women, a coordinating midwife, and a nutritionist, participated in the interviews until data saturation was achieved. Eligible participants were pregnant women in the second or third trimester who resided within the study area, possessed a Maternal and Child Health (MCH) handbook, and provided written informed consent. Women with severe pregnancy complications requiring intensive care, communication or mental disorders, or incomplete questionnaire responses were excluded from the study.

The independent variable in this study was the level of pregnant women's nutritional knowledge, whereas the dependent variable was anemia status during pregnancy. Several potential confounding variables, including maternal age, educational level, occupation, family income, parity, gestational age, compliance with iron supplementation, and the frequency of antenatal care visits, were also assessed because they may influence the occurrence of anemia. Nutritional knowledge was operationally defined as the mother's understanding of nutritional requirements during pregnancy, including iron, folic acid, protein, vitamins, minerals, and anemia prevention, and was measured using a 25-item questionnaire with an ordinal scale. Anemia status was determined based on hemoglobin levels measured using a hemoglobinometer or extracted from medical records, with hemoglobin levels below 11 g/dL classified as anemia. Compliance with iron supplementation was measured using a structured questionnaire and categorized on an ordinal scale.

Data were collected using several research instruments, including a respondent characteristics questionnaire, a 25-item nutritional knowledge questionnaire, an observation sheet for anemia status based on hemoglobin examination results, and semi-structured interview guidelines for the qualitative phase. The nutritional knowledge questionnaire assessed respondents' understanding of energy requirements during pregnancy, iron intake, protein sources, vitamins and minerals, anemia prevention, and iron tablet consumption. Prior to the main study, the questionnaire was pilot-tested among 30





pregnant women outside the study area. Instrument validity was evaluated using the Pearson Product Moment correlation test, while reliability was assessed using Cronbach's alpha. All questionnaire items met the validity criteria, and the instrument demonstrated excellent reliability with a Cronbach's alpha coefficient of 0.89.

Data collection was conducted sequentially according to the mixed-methods design. During the quantitative phase, respondents completed structured questionnaires, underwent hemoglobin assessment using a hemoglobinometer or laboratory records, and their Maternal and Child Health handbooks were reviewed. Following the completion of quantitative analysis, qualitative data were collected through in-depth interviews, field observations, and documentation review to explore participants' experiences and factors influencing nutritional knowledge and anemia during pregnancy.

Quantitative data were analysed using IBM SPSS Statistics version 26. Univariate analysis was performed to describe respondents' characteristics, nutritional knowledge, and anemia status using frequencies, percentages, means, and standard deviations. The association between nutritional knowledge and anemia status was examined using the Chi-square test, with a p-value of less than 0.05 considered statistically significant. Variables with a p-value below 0.25 in the bivariate analysis were subsequently included in a multiple logistic regression model to identify the factors independently associated with anemia status. The results were presented as odds ratios (ORs) with corresponding 95% confidence intervals (CIs). Qualitative data were analysed using the interactive model of Miles, Huberman, and Saldaña, involving data condensation, data display, and conclusion drawing and verification. Finally, the quantitative and qualitative findings were integrated to provide a comprehensive understanding of the relationship between pregnant women's nutritional knowledge and anemia status.

The study was conducted in accordance with established principles of research ethics. Ethical approval was obtained from the relevant Health Research Ethics Committee before data collection commenced. All participants received a detailed explanation of the study objectives, procedures, benefits, voluntary nature of participation, and their right to withdraw from the study at any time without consequences. Written informed consent was obtained from all respondents prior to participation. Participants' confidentiality was maintained by anonymising all personal information, and the collected data were used exclusively for research purposes in accordance with the principles of respect for persons, beneficence, non-maleficence, and justice.





3. Results And Discussion

a. Research result

1) Respondent Characteristics

The quantitative research involved 180 pregnant women who underwent pregnancy check-ups in the working area of Community Health Center X. Respondent characteristics included age, education, occupation, gestational age, parity, and compliance with iron supplementation tablet consumption.

Table 1. Distribution of Respondent Characteristics (n = 180)

Characteristics	Frequency	Percentage (%)
Age (years)		
<20	18	10.0
20–35	136	75.6
>35	26	14.4
Education		
Elementary–Middle School	39	21.7
Senior High School	88	48.9
College	53	29.4
Work		
Housewife	108	60.0
Private employees	36	20.0
Self-employed	21	11.7
ASN	15	8.3
Parity		
Primigravida	77	42.8
Multigravida	103	57.2

The majority of respondents were aged 20–35 years (75.6%), had a high school education (48.9%), worked as housewives (60.0%), and were multigravida (57.2%).

2) Level of Knowledge of Pregnant Women about Nutrition

Table 2. Distribution of Nutrition Knowledge Levels

Knowledge	Frequency	Percentage (%)
Good	110	61.1
Enough	46	25.6
Not enough	24	13.3





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Most respondents had a good level of knowledge about nutrition during pregnancy (61.1%). This good knowledge was evident in their understanding of iron requirements, protein intake, vitamins, and minerals, and the importance of iron supplements.

3) Anemia Status**Table 3. Distribution of Anemia Status**

Hb Status	Frequency	Percentage (%)
No anemia	123	68.3
Anemia	57	31.7

As many as 31.7% of respondents had anemia (Hb <11 g/ dL), while 68.3% had normal hemoglobin levels.

4) Relationship between Knowledge Level and Anemia Status**Table 4. Relationship between Knowledge Level and Anemia Status**

Knowledge	No Anemia	Anemia	Total	p- value
Good	92	18	110	<0.001
Enough	23	23	46	
Not enough	8	16	24	

Square test results showed a significant relationship between pregnant women's nutritional knowledge and anemia status ($p < 0.001$). Pregnant women with good knowledge tended to have normal hemoglobin levels compared to those with poor knowledge.

Table 5. Logistic Regression Results

Variables	OR	95% CI	p- value
Nutrition Knowledge	3.64	1.86–7.12	<0.001
Iron Tablet Compliance	3.21	1.58–6.41	0.001
Education	2.42	1.19–4.86	0.014
Family Income	1.88	1.01–3.57	0.046

Multivariate analysis showed that nutritional knowledge was the most dominant factor associated with anemia status ($OR = 3.64$; $p < 0.001$). Pregnant women with good knowledge were approximately 3.6 times more likely to have normal hemoglobin status compared to those with poor knowledge.





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**5) Qualitative Results**

The qualitative stage involved 12 informants, consisting of pregnant women, midwives, and nutritionists. Thematic analysis produced four main themes.

Theme 1. Nutritional Knowledge Derived from Antenatal Education

Most informants stated that information regarding nutrition was obtained during pregnancy check-ups.

"I only found out about foods containing iron after the midwife explained it to me during my pregnancy checkup." (Informant 3)

This shows that antenatal services are the main source of reproductive health and nutrition information.

Theme 2. Family Support Influences Eating Patterns

Husbands and families have an important role in providing nutritious food during pregnancy.

"If my husband reminds me to take my iron tablets and buy nutritious food, I'm more enthusiastic about doing it." (Informant 7)

Theme 3. Compliance with Iron Tablet Consumption Remains a Challenge

Some pregnant women complain of side effects of iron supplements such as nausea and constipation, so compliance is not optimal.

"Sometimes I don't take my iron tablets because I feel nauseous after taking them." (Informant 5)

Theme 4. Nutrition Counseling Increases Pregnant Women's Awareness

Informants stated that regular counseling helped increase understanding of the importance of nutrition during pregnancy.





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"After being given several counseling sessions, I started to pay attention to the food I consumed every day." (Informant 10)

b. Discussion

This study shows a significant relationship between pregnant women's nutritional knowledge and anemia during pregnancy. Pregnant women with good knowledge tend to have normal hemoglobin levels compared to those with less knowledge. Good knowledge enables mothers to understand nutritional needs during pregnancy, choose foods rich in iron, protein, folic acid, vitamin B12, and vitamin C, and comply with recommendations for taking iron supplements.

Multivariate analysis showed that knowledge level was the most dominant factor associated with anemia status. This finding supports Green's theory that knowledge is a predisposing factor influencing the formation of health behaviors. Adequate knowledge will improve an individual's ability to make informed decisions regarding meeting nutritional needs during pregnancy.

Compliance with iron supplementation is also significantly associated with anemia status. Iron supplementation is a key intervention in preventing iron deficiency anemia in pregnancy. However, interviews indicate that side effects such as nausea and constipation remain a barrier for some pregnant women. Therefore, healthcare professionals need to provide education on the correct way to take iron supplementation and strategies to reduce side effects to improve compliance.

Qualitative findings indicate that families play a crucial role in supporting pregnant women's nutritional behavior. Husbands' support, such as reminders to take iron supplements, providing nutritious food, and emotional support, can increase mothers' motivation to follow health professionals' recommendations. This aligns with social support theory, which explains that the family environment is a reinforcing factor (factors) in the formation of health behavior.

Nutrition counseling during antenatal care has also been shown to improve pregnant women's knowledge of nutritional needs and anemia prevention. Clear information delivery, the use of engaging educational media, and two-way communication between health workers and pregnant women can improve understanding and encourage changes in healthier eating behaviors. Therefore, antenatal care serves not only as a means of monitoring pregnancy outcomes but also as an effective means of health promotion.

This study has several limitations. The cross-sectional design in the quantitative phase cannot directly explain causal relationships. Furthermore, some behavioral data were obtained through questionnaires, potentially influenced by *recall bias* and *social*





bias. desirability bias . However, the use of mixed design Methods provide research strength through the integration of quantitative and qualitative data, resulting in a more comprehensive understanding of the relationship between nutritional knowledge and anemia status during pregnancy.

The study results indicate that improving nutritional knowledge, strengthening antenatal counseling, increasing adherence to iron supplementation, and family involvement are complementary strategies for reducing the incidence of anemia in pregnant women. These findings can inform the development of more effective maternal health promotion programs in primary healthcare facilities.

4. CONCLUSION AND SUGGESTIONS

a. Conclusion

This study shows that pregnant women's nutritional knowledge is significantly associated with anemia during pregnancy. Most pregnant women with good knowledge of iron, folic acid , protein, vitamins, and minerals tend to have normal hemoglobin levels compared to those with poor knowledge. Multivariate analysis identified that nutritional knowledge was the most dominant factor associated with anemia after controlling for education, adherence to iron supplementation, and family income.

Qualitative findings corroborate the quantitative results, demonstrating that nutritional counseling during antenatal care, family support, and adherence to iron supplementation play a crucial role in shaping nutritional behavior during pregnancy. Conversely, low knowledge, side effects of iron supplementation, and limited access to nutritional information remain barriers to anemia prevention.

Mixed approach Methods provide a more comprehensive understanding of the relationship between nutritional knowledge and anemia status. Therefore, improving the quality of nutritional education, strengthening antenatal counseling, and involving families in supporting pregnant women are important strategies for reducing the prevalence of anemia and improving maternal and fetal health.

b. Suggestion

The findings of this study provide practical implications for healthcare facilities, healthcare professionals, pregnant women, families, policymakers, and future research. Community health centres and other healthcare facilities should strengthen nutrition education during pregnancy through counselling, antenatal classes, digital educational media, and regular monitoring of iron supplementation adherence. Healthcare professionals, particularly midwives and nutritionists, are encouraged to provide





comprehensive education on maternal nutritional requirements, iron-rich foods, and strategies to improve adherence to iron supplementation.

Pregnant women are encouraged to improve their nutritional knowledge by seeking information from reliable sources and attending routine antenatal care, while families, especially husbands, should provide support by encouraging healthy dietary practices and adherence to iron supplementation. In addition, health authorities should strengthen maternal anemia prevention programmes by expanding nutrition education, ensuring the availability of iron supplements, and enhancing the capacity of healthcare providers. Future studies are recommended to employ cohort or intervention designs and include additional factors such as dietary patterns, socioeconomic status, infectious diseases, and pre-pregnancy nutritional status to better understand the determinants of anemia during pregnancy.

References

1. Asmirah, R., Srifitayani, NR, Mudrika, M., Herlina, H., Haruna, SR, Asmin, RY, & Rohmi, R. (2024). The Importance Of Knowledge Of Post Partum Mothers In Getting Optimal Breast Milk In Makassar City Maternity Hospital, South Sulawesi. *International Journal of Health Sciences*, 2(4), 1307–1317. <https://doi.org/10.59585/ijhs.v2i4.534>
2. American College of Obstetricians and Gynecologists. Nutrition during pregnancy. Washington (DC): ACOG; 2021.
3. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*. 2021;398(10298):427–51.
4. Centers for Disease Control and Prevention. Iron deficiency anemia during pregnancy. Atlanta (GA): CDC; 2022.
5. Ekawati, N., Srifitayani, NR, Fitri, L., Hasibuan, ER, Anurogo, D., Harfika, M., & Hijrah, H. (2024). Health Education and Provision of Iron (Fe) Tablets in an Effort to Increase Hemoglobin Levels in Pregnant Women. *Sahabat Sosial: Journal of Community Service*, 3(1), 199–206. <https://doi.org/10.59585/sosisabdimas.v3i1.529>
6. International Federation of Gynecology and Obstetrics. Good clinical practice advice on nutrition in pregnancy. *Int J Gynecol Obstet*. 2021;155(Suppl 1):1–18.
7. Ministry of Health of the Republic of Indonesia. Guidelines for integrated antenatal care services. 3rd edition. Jakarta: Ministry of Health of the Republic of Indonesia; 2020.





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International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

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8. Ministry of Health of the Republic of Indonesia. Indonesian Health Profile 2023. Jakarta: Ministry of Health of the Republic of Indonesia; 2024.
9. Miles MB, Huberman AM, Saldaña J. Qualitative data analysis : A method sourcebook . 4th ed. Thousand Oaks (CA): Sage Publications; 2020.
10. Notoatmodjo S. Health promotion and health behavior. Revised edition. Jakarta: Rineka Cipta; 2021.
11. Polit DF, Beck CT. Nursing research : Generating and assessing evidence for nursing practice . 11th ed. Philadelphia (PA): Wolters Kluwer ; 2021.
12. Pannyiwi, R., Azis, MNSA, & Rahmat, RA (2025). Analysis of Nurses ' Obstacles in Implementing Therapeutic Communication in Healthcare Environments . Barongko : Journal of Health Sciences , 4(1), 231–243. <https://doi.org/10.59585/bajik.v4i1.921>
13. Pannyiwi, R., & Ali, A. (2026). The Roles of School Health Education in Increasing Adolescent Awareness of the Dangers of Drugs . JIMAD: Multidisciplinary Scientific Journal , 3(4), 226–231. <https://jurnal.agdosi.com/index.php/JIMAD/article/view/1324>
14. Rahman MM, Abe SK, Rahman MS, et al. Maternal anemia and risk factors among pregnant women : A systematic review and meta- analysis . Nutrients . 2022;14(9):1802.
15. Riswan, R., Pannyiwi, R., Aulia, SP, & Sapnita , S. (2026). Developing Creative Products Based on Local Potential to Increase Community Income . Social Friends: Journal of Community Service, 4(3), 1241–1251. <https://jurnal.agdosi.com/index.php/jpemas/article/view/1261>
16. Srifitayani , NR, Hartati, A., & Rahmat, RA (2025). The Relationship Between Family Support and Pregnant Women's Compliance in Taking Iron Tablets . Barongko : Journal of Health Sciences, 4(1), 244–256. <https://doi.org/10.59585/bajik.v4i1.922>
17. Sulistyani Prabu Aji; Riska Sabriana ; Eka Sarofah Ningsih; Nursing Care of the Reproductive System. ISBN No.: 978-623-09-6611-8. Publisher: AGDOSI Makassar . <https://agdosi.com/2023/11/07/asuhan-kekeras-sistem-reproduktif/>
18. United Nations Children's Funds . Improving maternal nutrition for healthier pregnancies . New York : UNICEF; 2021.
19. World Health Organization . Anaemia in women and children . Geneva : WHO; 2023.
20. World Health Organization Guidelines on use of multiple micronutrient supplements in pregnancy . Geneva : WHO; 2020.
21. World Health Organization . Recommendations on antenatal care for a positive pregnancy experience . Geneva : WHO; 2020.
22. World Health Organization . WHO recommendations on maternal nutrition during pregnancy . Geneva : WHO; 2021.





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International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

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23. Yin RK. Case study research and applications : Design and methods . 6th ed. Thousand Oaks (CA): Sage Publications; 2018.
24. Zimmermann MB, Hurrell RF. Nutritional iron deficiency and anemia during pregnancy : Current concepts and prevention strategies . Nutr Rev . 2021;79(8):885–99.

