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The Relationship between Pregnant Women's Knowledge of Nutritional Fulfillment and Anemia Status in the Community Health Center Work Area

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Abstract

Background Anemia during pregnancy remains an important maternal health problem. It May be caused by inadequate intake of essential nutrients , particularly iron , folate , and vitamin B12. Maternal knowledge regarding nutritional fulfillment during pregnancy May influence food selection and anemia prevention behaviors . Objective This study aimed to determine the relationship between pregnant women's knowledge of nutritional fulfillment and anemia status. Methods A quantitative analytic study with a cross-sectional design was conducted in September 2026 in the working area of a community health center . The sample consisted of 84 pregnant women selected using purposive sampling. Knowledge of nutritional fulfillment was assessed using a structured questionnaire , while anemia status was determined based on hemoglobin measurement using a standardized hemoglobin testing device . Data were analyzed using the chi-square test with a significance level of 0.05. Results Thirty-four pregnant women (40.5%) had good nutritional knowledge , while 50 (59.5%) had poor knowledge . Hemoglobin assessment showed that 32 women (38.1%) were anemic and 52 (61.9%) were non- anemic . The prevalence of anemia was 48.0% among women with poor knowledge and 23.5% among those with good knowledge . The chi-square test demonstrated a significant relationship between nutritional knowledge and anemia status (p=0.023). Conclusion There was a significant relationship between pregnant women's knowledge of nutritional fulfillment and anemia status. Strengthening antenatal nutrition education regarding iron-rich foods , folate , vitamin B12, protein, vitamin C, dietary diversity , and adherence to iron-folic AC ID supplementation is recommended .

Keywords Pregnant Women, Nutritional Knowledge, Nutritional Fulfillment, Anemia, Hemoglobin

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1. Introduction

Pregnancy is a period of increased nutritional requirements, as the mother's body undergoes physiological changes to support fetal growth and development. Adequate intake of energy, protein, iron, folate, vitamin B12, vitamin C, and other micronutrients is essential for maintaining maternal health and supporting optimal fetal development (Chaparro & Suchdev, 2019; World Health Organization [WHO], 2016).

One of the most common nutritional problems during pregnancy is anemia. The WHO defines anemia as a condition in which the number of red blood cells or hemoglobin concentration is lower than normal. Anemia remains a major public health concern, particularly among women and children, including pregnant women. Globally, approximately 37% of pregnant women experience anemia, highlighting the importance of appropriate prevention and management strategies (WHO, 2025; Chaparro & Suchdev, 2019).

Anemia during pregnancy can adversely affect both maternal and fetal health. It may cause fatigue, reduced physical capacity, and an increased risk of maternal and perinatal complications. Evidence indicates that maternal anemia is associated with adverse maternal and neonatal outcomes, emphasizing the importance of early detection and appropriate management during pregnancy (Smith et al., 2019; Chaparro & Suchdev, 2019).

Adequate nutritional intake is one of the important strategies for preventing anemia during pregnancy. Iron is essential for hemoglobin synthesis, while folate and vitamin B12 contribute to red blood cell formation. Vitamin C also enhances the absorption of non-heme iron from plant-based foods, thereby supporting iron availability in the body (Centers for Disease Control and Prevention [CDC], 1998; Milman, 2012; Chaparro & Suchdev, 2019).

The WHO recommends a diverse and nutrient-rich diet as part of appropriate maternal nutrition. Consuming foods containing iron, folate, vitamin B12, and other essential micronutrients can help meet the increased nutritional requirements during pregnancy. Dietary diversity and adequate nutrient intake are important considerations in maternal nutrition and anemia prevention (WHO, 2016; Diana et al., 2019).

In addition to dietary management, iron and folic acid supplementation is an essential component of antenatal care. The WHO recommends daily supplementation with 30–60 mg of elemental iron and 400 µg of folic acid during pregnancy to prevent maternal anemia and reduce the risk of adverse pregnancy outcomes (WHO, 2012). Evidence from a systematic review and meta-analysis also supports the importance of iron supplementation during pregnancy in preventing iron deficiency and anemia (Peña-Rosas et al., 2012).

However, nutritional adequacy is influenced not only by food availability but also by maternal knowledge and dietary practices. Maternal knowledge can influence the ability to identify appropriate food sources, select nutrient-rich foods, maintain regular meal patterns, combine iron-containing foods with vitamin C sources, and recognize dietary practices that may inhibit iron absorption. Therefore, nutrition-related knowledge

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is an important aspect of maternal nutritional behavior and anemia prevention (Souganidis et al., 2012; Nahrisah et al., 2020).

Dietary factors have also been associated with anemia risk during pregnancy. Inadequate intake of energy and essential nutrients, limited consumption of iron-rich foods, and insufficient dietary diversity may contribute to inadequate nutritional status. A study of anemic pregnant women on Madura Island, Indonesia, identified inadequate dietary quantity among respondents, demonstrating the importance of assessing dietary intake and diversity in maternal nutrition (Diana et al., 2019). Other studies have also examined nutritional and sociodemographic factors associated with anemia among pregnant women (Gedefaw et al., 2015; Owais et al., 2021).

In Indonesia, maternal knowledge of anemia has been examined in relation to maternal and child anemia and health-related behaviors. Souganidis et al. (2012) reported an association between maternal knowledge of anemia and behaviors targeted at anemia prevention. Educational interventions may also improve knowledge, dietary practices, and adherence to iron supplementation among pregnant women. Nahrisah et al. (2020) demonstrated the potential benefits of an educational handbook and counseling intervention for improving anemia-related knowledge, food intake, and iron tablet compliance among anemic pregnant women in Indonesia.

Furthermore, nutrition education is an important strategy for improving adherence to iron and folic acid supplementation. A systematic review and meta-analysis by Engidaw et al. (2025) evaluated the effects of nutrition education during pregnancy on supplementation compliance and anemia outcomes in low- and middle-income countries. These findings support the importance of nutrition education as part of comprehensive antenatal care.

Based on this background, maternal knowledge regarding nutritional fulfillment is an important factor to examine in relation to anemia status during pregnancy. Understanding this relationship may help identify opportunities to strengthen maternal nutrition education and anemia prevention programs. Therefore, this study aimed to determine the relationship between pregnant women's knowledge of nutritional fulfillment and anemia status in the working area of a Community Health Center (Puskesmas)..

2. Methods

This study employed a quantitative analytical design with a cross-sectional approach to examine the relationship between pregnant women’s knowledge of nutritional needs and anemia status. The study was conducted in the working area of a Community Health Center in September 2026, involving 84 pregnant women selected through purposive sampling. Eligible participants were pregnant women attending antenatal care who provided informed consent, could communicate and complete questionnaires, and agreed to hemoglobin testing. Women with emergency conditions, acute illnesses requiring treatment, incomplete questionnaires, or inability to undergo hemoglobin testing were excluded.

The independent variable was nutritional knowledge, while the dependent variable was anemia status; maternal age, gestational age, education, occupation, parity, and iron–

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folic acid tablet adherence were recorded as characteristics. Nutritional knowledge was assessed using a structured questionnaire covering dietary requirements, iron, folate, vitamin B12, vitamin C, dietary diversity, and anemia prevention, with scores categorized as good or poor. Anemia status was determined by measuring hemoglobin levels using a calibrated hemoglobin meter and applying relevant antenatal care guidelines.

Data were collected through structured interviews, questionnaires, hemoglobin examinations, and reviews of antenatal records after informed consent was obtained. Univariate analysis described participant characteristics, knowledge levels, and anemia status, while the chi-square test assessed the association between knowledge and anemia status, with statistical significance set at $p < 0.05$. Research ethics included informed consent, confidentiality, anonymity, fairness, and participants' right to withdraw at any time.

3. Results And Discussion

a. Result

Table 1. Characteristics of Pregnant Women

Characteristics	n	%
Age		
<20 years	4	4.8
20–34 years	67	79.8
≥35 years	13	15.5
Gestational age		
First trimester	17	20.2
Second Trimester	31	36.9
Third Trimester	36	42.9
Education		
Basic education	26	31.0
Secondary education	45	53.6
Higher education	13	15.5
Parity		
Primigravida	32	38.1
Multigravida	52	61.9

The majority of respondents, 67 (79.8%), were aged 20–34. Based on gestational age, the majority of respondents, 36 (42.9%), were in their third trimester .

Table 2. Distribution of Knowledge about Nutritional Fulfillment

Level of knowledge	n	%
Good	34	40.5
Not enough	50	59.5
Total	84	100

A total of 34 respondents (40.5%) had good knowledge and 50 respondents (59.5%) had poor knowledge regarding nutritional fulfillment during pregnancy.

Table 3. Distribution of Anemia Status Based on Hemoglobin Levels

Status	n	%
Anemia	32	38.1

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No anemia	52	61.9
Total	84	100

A total of 32 pregnant women (38.1%) experienced anemia based on the results of hemoglobin examinations.

Table 4. Relationship between Pregnant Women's Knowledge about Nutritional Fulfillment and Anemia Status

Knowledge	Anemia n (%)	No anemia n (%)	Total	p
Good	8 (23.5)	26 (76.5)	34	
Not enough	24 (48.0)	26 (52.0)	50	0.023
Total	32 (38.1)	52 (61.9)	84	

The results of the analysis showed that anemia was more common in pregnant women with less knowledge, namely 24 people (48.0%), compared to mothers with good knowledge, namely 8 people (23.5%). The chi-square test showed a p value of 0.023 ($p < 0.05$), so there was a significant relationship between pregnant women's knowledge about nutritional fulfillment and anemia status. Based on the table, pregnant women with less knowledge have a higher proportion of anemia than mothers with good knowledge.

b. Discussion

The study results showed that most pregnant women had inadequate knowledge of nutritional needs during pregnancy. This indicates that not all respondents fully understood the nutritional requirements necessary to support maternal and fetal health. Nutritional knowledge involves not only identifying healthy foods but also understanding nutrient types, food sources, increased nutritional requirements during pregnancy, strategies to improve iron absorption, and the importance of supplementation. The World Health Organization (WHO, 2025) emphasizes that anemia has multiple causes, including nutritional deficiencies, infections, inflammation, chronic diseases, and inherited hematological conditions. Therefore, nutrition education during antenatal care should be practical and provide examples of locally available foods containing iron, protein, folate, vitamin B12, and vitamin C (Chaparro & Suchdev, 2019).

A total of 38.1% of respondents in this study experienced anemia, indicating that anemia remains an important concern in maternal health services. Maternal anemia can be influenced by several factors, including iron and folic acid supplementation, nutritional status, infections, parity, socioeconomic conditions, and underlying diseases (Gedefaw et al., 2015; Chaparro & Suchdev, 2019). A meta-analysis examining factors associated with maternal anemia in Indonesia also identified chronic energy deficiency, higher parity, lower educational attainment, and limited health knowledge as relevant factors. Hemoglobin examination is essential to establish anemia status because nutritional knowledge and dietary patterns alone cannot confirm whether a pregnant woman is anemic (Chaparro & Suchdev, 2019; WHO, 2025).

The results showed a significant relationship between pregnant women's knowledge of nutritional needs and anemia status ($p = 0.023$). The proportion of anemia was higher among mothers with inadequate knowledge than among those with good knowledge.

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Knowledge may influence health-related behavior by helping individuals understand health information and apply it in daily life. Pregnant women who understand the importance of iron may be better equipped to select appropriate foods and follow supplementation recommendations. These findings are consistent with Souganidis et al. (2012), who examined the relationship between maternal knowledge of anemia and anemia-related health behaviors in Indonesia. Nevertheless, this association does not establish that inadequate knowledge directly causes anemia. Maternal anemia is multifactorial and must be interpreted alongside other nutritional, clinical, and socioeconomic factors (Chaparro & Suchdev, 2019).

Dietary diversity is an important component of meeting nutritional requirements during pregnancy. Consuming foods from different food groups can improve the likelihood of obtaining adequate amounts of essential nutrients. Research among anemic pregnant women on Madura Island, Indonesia, found that many respondents had inadequate energy and nutrient intake, despite some achieving minimum dietary diversity (Diana et al., 2019). These findings suggest that nutrition education should go beyond encouraging women to consume a variety of foods. Education should also address appropriate portion sizes, meal frequency, food combinations, and the selection of nutrient-dense foods.

Iron is particularly important during pregnancy because iron requirements increase to support maternal red blood cell production and fetal development. Dietary sources include meat, fish, poultry, and other iron-containing foods, while plant-based foods can provide non-heme iron. Consuming vitamin C-rich foods alongside plant sources of iron can enhance non-heme iron absorption (CDC, 1998; Milman, 2012; Chaparro & Suchdev, 2019). In addition to dietary management, the WHO recommends daily iron and folic acid supplementation during pregnancy, with 30–60 mg of elemental iron and 400 µg of folic acid, to prevent maternal anemia and improve pregnancy outcomes (WHO, 2012).

The findings of this study highlight the need to strengthen nutrition education within antenatal care services. Education can be delivered through individual counseling, prenatal classes, printed materials, digital media, and practical menu demonstrations. A systematic review and meta-analysis by Engidaw et al. (2025) evaluated nutrition education interventions during pregnancy in relation to adherence to iron-folic acid supplementation and anemia outcomes in low- and middle-income countries. Similarly, Nahrisah et al. (2020) demonstrated the potential benefits of an integrated pictorial handbook and counseling intervention in improving anemia-related knowledge, food intake, and iron tablet compliance among anemic pregnant women in Indonesia. These findings support the use of educational approaches that are accessible, understandable, repeatable, and responsive to pregnant women's needs.

Community health centers play a strategic role in anemia prevention because they provide antenatal care and health education directly to pregnant women. Educational activities should emphasize dietary diversity, sources of heme and non-heme iron, folate and vitamin B12 intake, the role of vitamin C in iron absorption, appropriate timing of tea or coffee consumption in relation to iron-rich meals, adherence to iron and folic acid

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supplementation, recognition of possible anemia symptoms, and regular hemoglobin examinations. These measures are consistent with the WHO recommendations on antenatal care and daily iron and folic acid supplementation during pregnancy (WHO, 2012, 2016)..

4. Conclusion

The study concludes that most pregnant women had insufficient knowledge of nutritional requirements during pregnancy (50; 59.5%), while 32 (38.1%) experienced anemia. Anemia was more prevalent among pregnant women with insufficient knowledge, and a significant association was found between nutritional knowledge and anemia status ($p = 0.023$). Therefore, nutrition education should be strengthened as an essential component of antenatal care to support anemia prevention. Community health centers and healthcare workers are encouraged to provide regular nutrition education and individualized counseling on dietary diversity, iron, folate, vitamin B12, vitamin C, and adherence to iron–folic acid supplementation. Pregnant women should improve their nutritional knowledge, consume a balanced and varied diet, and follow healthcare workers' supplementation recommendations. Further research should examine additional factors associated with anemia, including dietary diversity, nutritional status, family income, parity, gestational age, infectious diseases, supplementation adherence, and tea and coffee consumption.

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