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## Analysis Of Factors Related To The Incidence Of Anemia In Pregnant Women In The Working Area Of The Community Health Center

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### Abstract

Background : Anemia during pregnancy remains a significant public health problem worldwide and contributes to maternal and neonatal morbidity and mortality . Multiple factors , including nutritional status, iron supplementation adherence , maternal knowledge , dietary habits and antenatal care utilization , may influence the occurrence of anemia during pregnancy. Objective : To analyze factors associated with anemia among pregnant women in the working area of the Community Health Center. Methods : An analytical observational study with a cross-sectional design was conducted among 180 pregnant women attending antenatal care services . Samples were selected using proportional random sampling. Data were analyzed using Chi- square tests and multivariate logistics regression. Results : The prevalence of anemia was 34.4% . Nutritional status, adherence to iron supplementation , maternal knowledge , dietary habits , and antenatal care visits were significant associated with anemia ( $p < 0.05$ ). Multivariate analysis identified adherence to iron supplementation as the strongest associated factor (AOR = 4.12; 95% CI: 2.01–8.43). Conclusion : Anemia among pregnant women is associated with nutritional status, maternal knowledge , dietary habits , antenatal care utilization , and adherence to iron supplementation . Improving maternal education and adherence to iron supplementation May reduce the prevalence of anemia.

**Keywords :** Anemia; Pregnant Women ; Iron Supplementation ; Nutritional Status; Maternal Knowledge .

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## 1. Introduction

Anemia is one of the most common nutritional problems in pregnant women and remains a major challenge in efforts to improve maternal and child health. The World Health Organization (WHO) defines anemia in pregnancy as a hemoglobin level of less than 11 g/ dL in the first and third trimesters , or less than 10.5 g/ dL in the second trimester . Most cases of anemia in pregnancy are caused by iron deficiency, although deficiencies in folic acid and vitamin B12, infectious diseases, and chronic diseases can also be causes.

Globally, the WHO estimates that more than one-third of pregnant women suffer from anemia. In developing countries, the prevalence of anemia tends to be higher due to low iron intake, high infection rates, limited access to health services, and unfavorable socioeconomic conditions. In Indonesia, anemia in pregnant women remains a public health problem that requires serious attention because it contributes to high rates of maternal and infant morbidity and mortality.

Anemia during pregnancy can cause various complications, including fatigue, decreased work capacity, impaired immune function, premature delivery, low birth weight, postpartum hemorrhage , and an increased risk of maternal and neonatal death. Therefore, preventing and managing anemia is an important aspect of antenatal care.

Various studies have shown that the incidence of anemia in pregnant women is influenced by biological, behavioral, and socioeconomic factors. These factors include maternal age, education level, occupation, parity, nutritional status, pregnancy spacing, adherence to iron supplementation, dietary habits, knowledge about anemia, and frequency of antenatal visits. Compliance with iron supplementation is one of the factors most consistently reported to be associated with anemia, as iron supplementation plays a crucial role in meeting increased iron requirements during pregnancy.

A mother's nutritional status before and during pregnancy also affects the body's iron reserves. Mothers with malnutrition or a mid-upper arm circumference (MUAC) <23.5 cm are at higher risk of anemia than mothers with good nutritional status. Knowledge of the importance of nutrition, consumption of iron-rich foods and vitamin C, and adherence to antenatal care also determine the success of anemia prevention during pregnancy.

Despite the government's implementation of various programs, such as providing at least 90 iron supplements during pregnancy, providing nutrition education, and increasing antenatal care coverage, the prevalence of anemia among pregnant women remains relatively high in various regions. This situation indicates that various factors influence the success of anemia prevention programs, requiring further study based on regional characteristics.





This study aims to analyze factors related to the incidence of anemia in pregnant women in the working area of Community Health Center X. The results of the study are expected to be a basis for health workers in developing more effective intervention strategies to reduce the incidence of anemia in pregnant women through strengthening education, improving nutritional status, increasing compliance with iron supplementation tablets, and optimizing antenatal care.

## 2. Research Methods

This study employed a quantitative research method with an analytical observational design using a cross-sectional approach. This design was selected because it enables the researcher to identify the relationship between various risk factors and the incidence of anemia among pregnant women by measuring the independent and dependent variables simultaneously at a single point in time. The cross-sectional approach is widely used in epidemiological research because it is efficient in identifying factors associated with specific health problems within a defined population.

The study was conducted in the working area of the Community Health Center (Puskesmas), which was selected based on the high number of antenatal care (ANC) visits and the persistent occurrence of anemia among pregnant women as reported by the Maternal and Child Health (MCH) program. The research was carried out from February to April 2026, while data collection was conducted over one month through face-to-face interviews, assessment of nutritional status, and documentation of hemoglobin examination results.

The study population consisted of all pregnant women who attended antenatal care services within the Community Health Center working area during the study period, totaling 328 individuals. The sample size was calculated using the analytical formula for a cross-sectional study with a 95% confidence level, 80% statistical power, and the estimated proportion of anemia cases based on previous studies. The calculation indicated a minimum sample size of 164 respondents. To anticipate possible dropouts or incomplete data, the sample size was increased by approximately 10%, resulting in a final sample of 180 pregnant women.

A proportional random sampling technique was applied in this study. Pregnant women who met the eligibility criteria in each village or Community Health Center service area were first grouped according to their respective populations, after which respondents were selected randomly in proportion to the target population in each area. This sampling technique ensured that every eligible pregnant woman had an equal opportunity to participate in the study while improving the representativeness of the sample. Eligible





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respondents included pregnant women in the first, second, or third trimester who were registered as antenatal care patients at the Community Health Center, had documented hemoglobin examination results in their Maternal and Child Health (MCH) handbook or medical records, were willing to participate by signing an informed consent form, and were able to communicate effectively. Pregnant women experiencing acute bleeding, diagnosed with hematological disorders such as thalassemia or hemolytic anemia, suffering from severe chronic illnesses such as end-stage renal disease or malignancy, or having incomplete research data were excluded from the study.

The dependent variable was the incidence of anemia among pregnant women based on hemoglobin levels according to the World Health Organization (WHO) criteria. Pregnant women were classified as having anemia if their hemoglobin level was less than 11 g/dL during the first and third trimesters or less than 10.5 g/dL during the second trimester, whereas those with hemoglobin levels within or above the normal range were classified as non-anemic. The independent variables included maternal age, educational level, occupation, family income, parity, pregnancy spacing, gestational age, nutritional status measured by mid-upper arm circumference (MUAC), compliance with iron supplementation, knowledge regarding anemia, frequency of antenatal care visits, dietary habits, and history of infectious diseases.

Operationally, the incidence of anemia was determined according to WHO hemoglobin criteria and measured using a digital hemoglobin analyzer (HemoCue) or documented laboratory results from medical records. Maternal age referred to the respondent's age at the time of data collection and was obtained from the questionnaire or the Maternal and Child Health handbook. Educational level referred to the highest level of formal education completed by the respondent, while parity was defined as the number of previous live births. Nutritional status was assessed using mid-upper arm circumference (MUAC) and categorized as  $\geq 23.5$  cm or  $< 23.5$  cm. Compliance with iron supplementation was defined as the consumption of at least 90 iron tablets during pregnancy and was verified through the Maternal and Child Health handbook or questionnaire. Knowledge regarding anemia was measured using a validated and reliable questionnaire, the frequency of antenatal care visits was obtained from the Maternal and Child Health handbook, and dietary habits were assessed using a Food Frequency Questionnaire (FFQ) that measured the frequency of consuming iron-rich foods.

The research instruments consisted of a respondent characteristics questionnaire covering maternal age, educational level, occupation, parity, and family income; a validated and reliable anemia knowledge questionnaire; a Food Frequency Questionnaire (FFQ) to assess the consumption pattern of iron-rich foods; a MUAC measuring tape to determine





nutritional status; a HemoCue hemoglobin analyzer or laboratory hemoglobin records to determine hemoglobin levels; and the Maternal and Child Health handbook to verify antenatal care visits and compliance with iron supplementation.

The collected data were processed through several stages, including editing to examine the completeness and consistency of the responses, coding by assigning numerical codes to each variable, data entry into IBM SPSS Statistics version 26, data cleaning to identify and correct input errors, and tabulation to organize the processed data into tables for analysis.

Data analysis consisted of univariate, bivariate, and multivariate analyses. Univariate analysis was performed to describe respondent characteristics and the distribution of all study variables using frequencies, percentages, means, standard deviations, medians, or ranges according to the type of data. Bivariate analysis was conducted to examine the relationship between each independent variable and the incidence of anemia using the Chi-square test or Fisher's Exact Test when the expected cell count was less than five. The strength of the association was expressed as the Odds Ratio (OR) with a 95% Confidence Interval (CI). Variables with a p-value of less than 0.25 in the bivariate analysis were subsequently entered into a multiple logistic regression model to identify the most dominant factors associated with the incidence of anemia after controlling for potential confounding variables. The multivariate analysis results were presented as Adjusted Odds Ratios (AORs), 95% Confidence Intervals, and p-values, with statistical significance established at  $\alpha = 0.05$ .

Ethical approval for this study was obtained from the Health Research Ethics Committee before the commencement of the research. All respondents received a complete explanation regarding the objectives, benefits, and procedures of the study, as well as their right to refuse participation or withdraw from the study at any stage without affecting the healthcare services they received. Written informed consent was obtained from all respondents prior to data collection. The confidentiality of participants was maintained by assigning identification codes instead of personal identifiers, and all collected data were used exclusively for research purposes.

### 3. Research Results And Discussion

#### a. Research result

This study involved 180 pregnant women who underwent antenatal care at a community health center (Puskesmas) and met the inclusion criteria. All respondents had hemoglobin (Hb) levels available, allowing for analysis of the relationship between various factors and the incidence of anemia.





## 1) Respondent Characteristics

**Table 1. Distribution of Characteristics of Pregnant Women (n = 180)**

| Characteristics          | Frequency (n) | Percentage (%) |
|--------------------------|---------------|----------------|
| Age (years)              |               |                |
| <20                      | 18            | 10.0           |
| 20–35                    | 128           | 71.1           |
| >35                      | 34            | 18.9           |
| Education                |               |                |
| Elementary/Middle School | 42            | 23.3           |
| Senior High School       | 96            | 53.3           |
| College                  | 42            | 23.3           |
| Work                     |               |                |
| Doesn't work             | 110           | 61.1           |
| Work                     | 70            | 38.9           |
| Parity                   |               |                |
| Primigravida             | 74            | 41.1           |
| Multigravida             | 106           | 58.9           |
| Nutritional Status (MUI) |               |                |
| <23.5 cm                 | 52            | 28.9           |
| ≥23.5 cm                 | 128           | 71.1           |

The majority of respondents were aged 20–35 years (71.1%) , had a high school education (53.3%) , were unemployed (61.1%), and were multigravida (58.9%). Most pregnant women had good nutritional status based on the LILA measurement (71.1%).

## 2) Distribution of Anemia Incidence

**Table 2. Distribution of Anemia Incidence in Pregnant Women**

| Anemia Status | n   | %    |
|---------------|-----|------|
| Anemia        | 62  | 34.4 |
| No anemia     | 118 | 65.6 |

A total of 62 pregnant women (34.4%) had anemia, while 118 pregnant women (65.6%) had normal hemoglobin levels. These figures indicate that anemia remains a significant health problem in the study area.





### 3) Distribution of Factors Studied

**Table 3. Distribution of Risk Factors**

| Variables                       | Category   | n   | %    |
|---------------------------------|------------|-----|------|
| Compliance with TTD consumption | Obedient   | 132 | 73.3 |
|                                 | Not obey   | 48  | 26.7 |
| Knowledge                       | Good       | 98  | 54.4 |
|                                 | Not enough | 82  | 45.6 |
| ANC Visit                       | Complete   | 144 | 80.0 |
|                                 | Incomplete | 36  | 20.0 |
| Dietary habit                   | Good       | 115 | 63.9 |
|                                 | Not enough | 65  | 36.1 |

Most respondents were compliant in taking iron tablets (73.3%), had good knowledge about anemia (54.4%), made complete ANC visits (80.0%), and had a good diet (63.9%).

### 4) Bivariate Analysis

**Table 4. Relationship of Factors with the Incidence of Anemia**

| Variables          | OR   | 95% CI    | p- value |
|--------------------|------|-----------|----------|
| Age                | 1.28 | 0.69–2.35 | 0.381    |
| Education          | 1.54 | 0.82–2.90 | 0.174    |
| Parity             | 1.41 | 0.76–2.62 | 0.246    |
| Nutritional status | 3.42 | 1.74–6.71 | <0.001*  |
| Signature          | 4.75 | 2.34–9.66 | <0.001*  |
| Compliance         |      |           |          |
| Knowledge          | 2.86 | 1.49–5.49 | 0.001*   |
| ANC                | 2.47 | 1.10–5.56 | 0.026*   |
| Dietary habit      | 3.18 | 1.65–6.11 | <0.001*  |

Bivariate analysis showed that nutritional status , compliance with iron supplement tablet consumption , level of knowledge , ANC visits , and dietary patterns were significantly associated with the incidence of anemia in pregnant women.





## 5) Multivariate Analysis

**Table 5. Logistic Regression Results**

| Variables            | AOR  | 95% CI    | p- value |
|----------------------|------|-----------|----------|
| Signature Compliance | 4.12 | 2.01–8.43 | <0.001   |
| Nutritional status   | 3.35 | 1.60–7.01 | 0.001    |
| Dietary habit        | 2.81 | 1.34–5.88 | 0.006    |
| Knowledge            | 2.43 | 1.16–5.09 | 0.019    |
| ANC                  | 1.89 | 0.91–3.95 | 0.086    |

Logistic regression results showed that adherence to iron supplementation was the most dominant factor associated with anemia. Pregnant women who were noncompliant with iron supplementation were approximately 4.12 times more likely to develop anemia than those who were compliant, after controlling for other variables.

### b. Discussion

This study shows that the prevalence of anemia among pregnant women in the community health center (Puskesmas) coverage area is 34.4% . Based on the WHO classification, this figure still indicates that anemia in pregnancy is a public health problem with a moderate to high prevalence rate. This situation indicates that anemia prevention efforts through iron supplementation, nutrition education, and antenatal care still need to be strengthened.

The study results showed that nutritional status was significantly associated with the incidence of anemia. Pregnant women with a mid-life circumference (MUAC) <23.5 cm had a higher risk of anemia compared to women with good nutritional status. This condition can be explained because poor nutritional status reflects low iron reserves and intake of other essential nutrients needed during pregnancy. Iron deficiency causes decreased hemoglobin synthesis, thereby increasing the risk of anemia. These results align with various studies showing that nutritional status is a major determinant of anemia in pregnant women.

Compliance with iron supplementation was the most dominant factor in this study. Pregnant women who did not adhere to iron supplementation had a higher risk of anemia than those who did. Iron supplementation helps meet the increased iron needs during pregnancy, especially in the second and third trimesters when needs increase due to fetal growth and increased maternal blood volume. Non-compliance can be caused by side effects, lack of knowledge, forgetting to take the tablets, or low family support. These findings underscore the importance of ongoing education and adherence monitoring by healthcare professionals.





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Mothers' knowledge about anemia is also related to the incidence of anemia. Mothers with low knowledge tend to be less aware of the importance of consuming iron-rich foods, how to properly take iron supplements, and the impact of anemia on maternal and fetal health. Good knowledge will encourage positive behavioral changes in maintaining nutritional intake and utilizing health services during pregnancy.

Diet is another factor significantly associated with anemia. Mothers who rarely consume heme iron sources such as red meat, liver, fish, and poultry, or non-heme iron sources such as green vegetables and nuts, have a higher risk of anemia. Furthermore, consuming tea or coffee with meals can inhibit iron absorption, while consuming fruits rich in vitamin C can enhance iron absorption. Therefore, nutritional counseling during antenatal care should emphasize choosing the right types of food and consuming them at the right time.

The frequency of antenatal care (ANC) visits also showed an association in bivariate analysis, although it was no longer significant after controlling for other variables in multivariate analysis. This indicates that the benefit of ANC visits on anemia prevention is likely mediated by the quality of services received, such as iron supplementation, hemoglobin testing, nutritional counseling, and health education. Therefore, improving the quality of ANC services is as important as increasing the number of visits.

This study has several limitations. The cross-sectional design cannot confirm causality because risk factors and anemia incidence were measured at the same time. Furthermore, several variables, such as dietary habits and adherence to iron supplementation, were obtained through interviews, potentially introducing recall bias. Nevertheless, the use of hemoglobin level data from medical records and the KIA handbook increased the validity of the dependent variable measurements.

The study results indicate that the incidence of anemia in pregnant women is influenced by a combination of biological, behavioral, and health care factors. Compliance with iron supplementation, nutritional status, diet, and knowledge are the most important factors. Therefore, interventions that integrate nutrition education, monitoring iron supplementation compliance, improving the quality of ANC care, and family involvement are expected to reduce the prevalence of anemia in pregnant women and improve maternal and infant health.





#### 4. Conclusion And Suggestions

##### a. Conclusion

Based on the results of a study of 180 pregnant women in the working area of Community Health Center X, it can be concluded that the prevalence of anemia is 34.4% , which indicates that anemia in pregnancy is still a public health problem that requires serious attention. The results of the bivariate analysis showed that nutritional status, compliance with taking iron tablets (TTD), level of knowledge, diet, and frequency of antenatal visits (ANC) were significantly associated with the incidence of anemia in pregnant women.

Multivariate analysis showed that adherence to iron supplementation was the most dominant factor associated with anemia, followed by nutritional status, diet, and knowledge . Pregnant women who were non-compliant with iron supplementation had a higher risk of anemia than those who were. These findings suggest that anemia prevention efforts depend not only on iron supplementation but also require increased health education, improved nutritional status, strengthened nutritional consumption behavior, and optimized antenatal care.

The results of this study provide evidence that comprehensive interventions involving health workers, families, and the community are needed to reduce the prevalence of anemia in pregnant women. Strengthening health promotion, monitoring adherence to iron supplement consumption, and early detection of anemia through quality antenatal care (ANC) services are expected to improve maternal health and reduce the risk of pregnancy and childbirth complications.

##### b. Suggestion

Based on the findings of this study, Community Health Centers, healthcare professionals, and the Health Department should strengthen anemia prevention and control programs by improving routine screening, nutritional counseling, iron supplementation services, health education, and monitoring of pregnant women. Pregnant women are encouraged to adhere to iron supplementation, consume a balanced diet rich in iron and vitamin C, avoid beverages that inhibit iron absorption, and attend regular antenatal care visits. Furthermore, future studies are recommended to employ prospective cohort or longitudinal designs and include additional variables, such as serum ferritin levels, micronutrient status, helminth infections, and sociocultural factors, to provide a more comprehensive understanding of the determinants of anemia during pregnancy.





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