

DETERMINANTS OF ANEMIA AMONG THIRD TRIMESTER PREGNANT WOMEN

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Abstract

The Indonesian Health Survey (SKI) 2023 revealed that 27.7% of pregnant women suffered from anemia. Data from the Larangan Utara Public Health Center (UPT Puskesmas) in Tangerang City indicated an upward trend in anemia cases among women in their third trimester of pregnancy. In 2022, anemia was identified in 122 women (13.7%) out of 887 who were examined for hemoglobin levels, and the number increased to 135 women (15.5%) out of 867 in 2023. This study aimed to determine the primary factors contributing to anemia among third-trimester pregnant women at the Larangan Utara Public Health Center, Tangerang City, in 2024. The research adopted a quantitative approach with a logistic regression design. A total of 60 respondents were included through a total sampling technique. Data collection was conducted using a structured questionnaire, and analysis was performed using multivariate linear regression. The findings indicated that three main factors were significantly associated with anemia: Chronic Energy Deficiency (CED) ($p = 0.000$), educational level ($p = 0.031$), and compliance with iron (Fe) tablet intake ($p = 0.035$). Among these, Chronic Energy Deficiency was identified as the most dominant factor influencing anemia occurrence. In conclusion, anemia among third-trimester pregnant women is influenced by chronic energy deficiency, educational level, and adherence to Fe tablet consumption, with CED being the most significant determinant. It is recommended that healthcare providers at the Larangan Utara Public Health Center implement more effective prevention and management strategies, including nutrition education, infection control, and enhanced monitoring for high-risk pregnant women.

Keywords: Anemia, Causes, Chronic Energy Deficiency, Pregnant Women

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1. Introduction

Anemia during pregnancy is a condition in which the hemoglobin level is below 11.0 g/dL during the first and third trimesters and below 10.5 g/dL during the second trimester. This

condition indicates a reduced capacity of the blood to transport oxygen to body tissues, which may adversely affect both maternal and fetal health. The population groups most vulnerable to anemia include children under five years of age,

particularly infants and children around two years old, adolescent girls who are menstruating, pregnant women, and postpartum women. Globally, anemia is estimated to affect approximately 500 million women aged 15–49 years and 269 million children aged 6–59 months. In 2019, approximately 30% (539 million) of women and 37% (32 million) of pregnant women aged 15–49 years worldwide were affected by anemia [1].

Pregnant women with anemia are at greater risk of preterm birth, maternal and neonatal mortality, and increased susceptibility to infection. Iron deficiency during pregnancy may impair fetal growth and development both before and after birth. According to the 2018 Basic Health Research (Riskesdas), 48.9% of pregnant women in Indonesia were diagnosed with anemia. In addition, the Indonesia Health Profile reported that 84.6% of anemia cases occurred among pregnant women aged 15–24 years, indicating the high prevalence of anemia among young women of reproductive age [2].

Anemia during pregnancy is defined as a condition in which the hemoglobin concentration is below 11 g/dL. It results from a reduced number of red blood cells or a low hemoglobin concentration that is insufficient to meet the increased physiological demands during pregnancy. Consequently, the oxygen-carrying capacity of the blood is reduced, which may negatively affect maternal health and fetal development [3]. According to the WHO Global Anemia Estimates 2025, the prevalence of anemia among pregnant women reached 35.5% in 2023. Cunningham et al. (2022), in Williams Obstetrics, defined anemia during pregnancy as a condition in which hemoglobin and hematocrit levels fall below the normal reference values adjusted for gestational age. Iron deficiency remains the leading cause of anemia during pregnancy because the increased iron requirements are not adequately compensated by dietary iron intake [4].

According to Utami et al. (2024), several factors contribute to the increased incidence of anemia during pregnancy, including socioeconomic status, maternal knowledge, educational level, cultural factors, and non-adherence to iron supplementation. The combination of these factors increases the risk of anemia during pregnancy. In addition, pregnant women with poor nutritional status are more likely to develop anemia than those with normal nutritional status [5].

Anemia during pregnancy may result in serious adverse outcomes for both the mother and fetus. It increases the risk of miscarriage, preterm birth, intrauterine growth restriction, and cardiac decompensation, particularly when the hemoglobin level falls below 6 g/dL. Furthermore, anemia has been associated with hyperemesis gravidarum, hydatidiform mole, and premature rupture of membranes. During labor, anemia may impair uterine contractions, resulting in reduced maternal pushing ability during the first and second stages of labor, prolonged labor, and an increased risk of secondary postpartum hemorrhage and uterine atony. During the postpartum period, women with anemia are also at greater risk of uterine subinvolution, postpartum hemorrhage, puerperal infection, sudden cardiac decompensation after delivery, and mastitis [6].

The prevention of anemia during pregnancy can be achieved by improving maternal knowledge and promoting positive attitudes, particularly through education regarding the importance of balanced nutrition during pregnancy. This educational intervention may be delivered during antenatal care (ANC) visits, which, under current national recommendations, should be conducted at least six times throughout pregnancy.

Education on the prevention and management of anemia during pregnancy plays an important role in increasing maternal awareness of the risks and consequences of anemia, as well as the importance of early detection

and timely intervention. Improved knowledge and positive attitudes are expected to encourage healthy behaviors that help prevent anemia during pregnancy. If anemia occurs, pregnant women are expected to seek appropriate and timely management. Sukmawati (2019) reported a significant association between maternal educational level and attitudes toward the prevention and management of anemia during pregnancy [7]. Other studies have identified maternal age [8], parity, maternal knowledge [9], pregnancy interval [10], educational level [11], chronic energy deficiency [12], and antenatal care attendance [13] as factors associated with anemia during pregnancy.

2. Method

Quantitative approach with logistic regression analysis was used to evaluate the association between one or more independent variables and the dependent variable through inferential statistical analysis. The independent variables included maternal age, parity, pregnancy interval, educational level, chronic energy deficiency (CED), frequency of antenatal care (ANC) visits, and adherence to iron (Fe) tablet supplementation, while the dependent variable was the occurrence of anemia among pregnant women.

The study was conducted at Larangan Primary Health Center in December 2024 using a total sampling technique. All eligible third-trimester pregnant women who met the inclusion criteria were recruited, resulting in a total sample of 60 participants. Data were collected using a structured questionnaire developed based on the study indicators. The data collection process began with a preparatory phase, including identification of the research problem, obtaining research approval, and coordinating with the relevant stakeholders. This was followed by questionnaire administration and direct field observation to ensure that the

collected data were accurate, complete, and representative.

3. Results and Discussion

Table 1. Main Determinants of Anemia Among Third Trimester Pregnant Women

Variable	P Value	OR	95% CI
Adherence to iron (Fe) tablet supplementation	0.035	0.120	0.017 – 0.863
Non-adherent			
Educational level	0.031	0.110	0.015 – 0.814
Low			
Chronic energy deficiency (CED)	0.000	0.021	0.003 – 0.132
CED (MUAC <23.5 cm)			

As presented in Table 1, three variables were significantly associated with anemia among third-trimester pregnant women: adherence to iron (Fe) tablet supplementation, educational level, and chronic energy deficiency (CED).

Adherence to iron (Fe) tablet supplementation was significantly associated with anemia among third-trimester pregnant women ($p=0.035$; $OR=0.120$; 95% CI: 0.017–0.863). Educational level was also significantly associated with anemia ($p=0.031$; $OR=0.110$; 95% CI: 0.015–0.814). Chronic energy deficiency (CED) demonstrated the strongest association with anemia ($p<0.001$; $OR=0.021$; 95% CI: 0.003–0.132). Among the variables included in the logistic regression model, CED emerged as the dominant determinant of anemia among third-trimester pregnant women, indicating that maternal nutritional status should be prioritized in strategies aimed at preventing and managing anemia during pregnancy.

Anemia during pregnancy is defined as a pathological condition characterized by a hemoglobin

concentration of less than 11 g/dL. This condition results from a reduced number of erythrocytes or insufficient hemoglobin levels to meet the increased physiological demands of pregnancy. Consequently, the oxygen-carrying capacity of the blood decreases, potentially leading to adverse maternal and fetal outcomes [3]. According to the WHO Global Anemia Estimates 2025, the prevalence of anemia among pregnant women reached 35.5% in 2023. Williams Obstetrics defines anemia during pregnancy as a condition in which hemoglobin and hematocrit concentrations fall below the gestational age-specific reference values. Iron deficiency remains the primary cause of anemia during pregnancy because the increased physiological demand for iron is often not matched by adequate dietary intake [4].

Anemia during pregnancy is medically defined as a condition in which the maternal hemoglobin concentration is below 11.0 g/dL during the first and third trimesters or below 10.5 g/dL during the second trimester. Population groups at the highest risk of anemia include children under 5 years of age, particularly infants and toddlers younger than 2 years, adolescent girls during menstruation, pregnant women, and postpartum women. Globally, anemia is estimated to affect approximately 500 million women aged 15–49 years and 269 million children aged 6–59 months. In 2019, approximately 30% (539 million) of women worldwide were affected by anemia, including 37% (32 million) of pregnant women aged 15–49 years [1]. Pregnant women with anemia are at increased risk of adverse pregnancy outcomes, including preterm birth, maternal and neonatal mortality, and increased susceptibility to infection. Iron deficiency during pregnancy may also impair fetal growth and development during both the intrauterine period and after birth. According to the 2018 Basic Health Research (Riskesdas), 48.9% of pregnant women in Indonesia were

affected by anemia. Furthermore, the Indonesia Health Profile reported that 84.6% of anemia cases occurred among pregnant women aged 15–24 years, indicating a high prevalence of anemia among young women of reproductive age [2].

The present study identified several variables that were significantly associated with anemia among third-trimester pregnant women, including maternal age ($p<0.001$), parity ($p<0.001$), pregnancy interval ($p<0.001$), educational level ($p=0.030$), chronic energy deficiency (CED) ($p<0.001$), frequency of antenatal care (ANC) visits ($p<0.001$), and adherence to iron (Fe) tablet supplementation ($p=0.003$). These findings suggest that these variables play important roles in the occurrence of anemia among third-trimester pregnant women and should be considered when developing prevention and intervention strategies.

Multivariable logistic regression analysis identified three variables that remained significantly associated with anemia: adherence to iron (Fe) tablet supplementation ($p=0.035$; OR=0.120; 95% CI: 0.017–0.863), educational level ($p=0.031$; OR=0.110; 95% CI: 0.015–0.814), and chronic energy deficiency (CED) ($p<0.001$; OR=0.021; 95% CI: 0.003–0.132). Among these variables, CED demonstrated the strongest association with anemia and was identified as the dominant determinant of anemia among third-trimester pregnant women. These findings highlight the importance of prioritizing maternal nutritional status in strategies aimed at preventing and managing anemia during pregnancy.

Previous studies [14][15] have demonstrated statistically significant associations between gestational age, adherence to iron (Fe) tablet supplementation, the frequency of antenatal care (ANC) visits, and the occurrence of anemia among third-trimester pregnant women. Adherence to iron supplementation was assessed based on the number of tablets consumed,

compliance with the recommended method of administration, and the frequency of intake. Pregnant women who consumed at least 90 iron tablets throughout pregnancy and took one tablet daily as recommended were more likely to remain free from anemia. Consistent adherence to iron supplementation plays an important role in restoring iron stores, increasing hemoglobin concentrations, and preventing pregnancy- and childbirth-related complications. Therefore, adherence to iron supplementation not only contributes to reducing the risk of anemia but also provides optimal protection for the health of both the mother and the fetus.

Maternal educational level was also identified as another dominant factor associated with anemia among third-trimester pregnant women. This finding is consistent with previous studies demonstrating that educational attainment influences maternal knowledge, attitudes, and health-related behaviours regarding nutritional status and adherence to iron supplementation during pregnancy. A previous study (16) also reported a significant association between maternal educational level, household economic status, and the occurrence of anemia among third-trimester pregnant women. In this context, educational attainment reflects the highest level of formal education completed by pregnant women and influences their knowledge, attitudes, and health-related behaviors. This knowledge includes an understanding of balanced nutrition, the importance of iron (Fe) supplementation, and strategies for preventing anemia. Theoretically, women with secondary or higher educational attainment are at lower risk of developing anemia than those with lower educational levels. Pregnant women with higher educational attainment generally have better socioeconomic conditions, enabling them to obtain adequate nutritional intake to prevent anemia. In addition, higher educational attainment is

associated with healthier behaviors, including regular antenatal care attendance, greater attention to personal health, and exclusive breastfeeding practices. Education is a process designed to influence individuals or groups to adopt behaviors that promote better health outcomes. Higher educational attainment enhances awareness of the importance of maintaining personal and environmental health, thereby encouraging the appropriate use of healthcare services. Through education, individuals acquire the knowledge, understanding, and skills necessary to develop healthy attitudes and behaviors [11].

Theoretically, adequate nutritional intake plays a crucial role in maintaining maternal nutritional status during pregnancy. Pregnant women who do not consume a balanced diet that provides sufficient macronutrients and micronutrients are at increased risk of nutritional deficiencies. One consequence of prolonged inadequate energy and nutrient intake is chronic energy deficiency (CED), which may subsequently increase the risk of anemia.

The findings of this study indicate that chronic energy deficiency (CED) was the primary factor associated with anemia among third-trimester pregnant women, with an odds ratio (OR) of 0.021 and a 95% confidence interval (CI) ranging from 0.003 to 0.132. Based on these findings, pregnant women with CED were estimated to have a 0.003-fold likelihood of developing anemia during the third trimester. Chronic energy deficiency (CED) is a condition characterized by prolonged inadequate energy and nutrient intake, which may adversely affect maternal health. Clinically, CED is commonly characterized by generalized weakness, pallor, and a mid-upper arm circumference (MUAC) below the normal threshold.

4. Conclusion

Based on the study findings, adherence to iron (Fe) tablet supplementation was significantly associated with a reduced risk of anemia among pregnant women. Pregnant women who did not adhere to the recommended iron supplementation regimen had a 0.120-fold higher likelihood of developing anemia than those who adhered to the recommendations. Maternal educational level was also significantly associated with anemia during the third trimester, with women who had lower educational attainment having a 0.110-fold higher risk of anemia than those with higher educational attainment. Chronic energy deficiency (CED) was identified as the dominant factor associated with anemia. Pregnant women with CED, defined as a mid-upper arm circumference (MUAC) of <23.5 cm, had a 0.021-fold higher risk of developing anemia than those without CED.

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