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Attitude As Dominant Predictor Of Pregnancy Anemia Incidence: A Cross-Sectional Analysis In Urban Jakarta

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ABSTRACT

Background: Anemia remains a major public health problem during pregnancy, affecting approximately 40% of pregnancies globally and 27.7% of pregnant women in Indonesia. Although maternal knowledge and attitudes are considered important behavioral factors, evidence regarding their association with anemia among pregnant women in urban Indonesian settings remains limited.
Method: A cross-sectional analytic study was conducted from July to August 2025 involving 60 pregnant women attending urban health facilities in East Jakarta. Knowledge and attitudes were assessed using validated questionnaires (Cronbach's α=0.79–0.82). Anemia status was determined using a Sahli hemoglobinometer, with hemoglobin levels <11 g/dL classified as anemia. Data were analyzed using Chi-square tests and binary logistic regression with the Forward Likelihood Ratio method.
Result: The prevalence of anemia was 45.0% (27/60). Bivariate analysis showed that negative maternal attitude was significantly associated with anemia (OR=8.50; 95% CI: 2.10–34.20; p=0.002), whereas poor knowledge was not significantly associated (p=0.152). In multivariate analysis, negative maternal attitude remained significantly associated with anemia (aOR=7.85; 95% CI: 2.10–29.35; p<0.001). The final model explained 68.4% of the variance (Nagelkerke R^2) and demonstrated good calibration (Hosmer–Lemeshow p=0.742).
Conclusion: Negative maternal attitude was significantly associated with anemia among pregnant women in this study. These findings suggest that maternal attitudes may be an important factor to consider in antenatal health promotion and anemia prevention programs. Further longitudinal studies are needed to clarify the direction and causal nature of this relationship.

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INTRODUCTION

Pregnancy anemia remains one of the most significant nutritional and public health challenges affecting maternal health worldwide. According to the World Health Organization (WHO), approximately 37–40% of pregnant women globally experience anemia, with the highest burden occurring in low- and middle-income countries (WHO, 2025). Anemia during pregnancy is associated with numerous adverse maternal and neonatal outcomes, including preterm birth, low birth weight, intrauterine growth restriction, postpartum hemorrhage, maternal morbidity, and increased maternal mortality risk (Cresswell, 2023; WHO, 2025). Despite considerable international efforts to improve maternal nutrition through iron-folic acid supplementation programs and strengthened antenatal care services, pregnancy anemia remains highly prevalent, indicating that current prevention strategies have not fully addressed the complexity of its determinants.

Southeast Asia continues to report one of the highest regional burdens of pregnancy anemia worldwide, with prevalence estimates reaching approximately 48.2% in several countries (WHO, 2025). Indonesia faces a similar challenge. Data from the Indonesian Health Survey (Survei Kesehatan Indonesia/SKI) 2023 reported that 27.7% of pregnant women were affected by anemia, representing an increase from 21.2% recorded in the 2018 National Basic Health Research Survey (Riskesdas) (Ministry of Health of the Republic of Indonesia, 2024). This upward trend is concerning because it occurred despite nationwide implementation of iron supplementation and maternal nutrition programs. Moreover, recent epidemiological evidence suggests that pregnancy anemia is not confined to rural or underserved populations. Urban communities, which generally have better access to healthcare services and health information, continue to experience substantial anemia prevalence, suggesting that factors beyond healthcare availability may contribute to persistent maternal anemia (Dinas Kesehatan Provinsi DKI Jakarta, 2024).

The etiology of pregnancy anemia is multifactorial and extends beyond nutritional deficiencies alone. Although iron deficiency remains the leading biological cause, contemporary evidence highlights the important contribution of behavioral, psychological, and social determinants to maternal health outcomes. Behavioral factors influence adherence to iron supplementation, dietary practices, health-seeking behavior, antenatal care attendance, and responsiveness to health education interventions (Yao et al., 2024). Consequently, understanding behavioral determinants is essential for developing more effective and sustainable anemia prevention strategies among pregnant women.

Within the Knowledge–Attitude–Practice (KAP) framework, attitude occupies a central role because it serves as a bridge between knowledge and behavior. While knowledge provides awareness and understanding, attitudes influence motivation, beliefs, perceptions, and willingness to adopt preventive actions. Pregnant women with positive attitudes toward anemia prevention are more likely to comply with iron supplementation recommendations, consume iron-rich foods, attend antenatal care regularly, and actively engage in maternal health programs (Triharini et al., 2018; Yao et al., 2024). Conversely, negative attitudes may reduce adherence to preventive behaviors even when adequate knowledge is present. This phenomenon reflects the widely recognized "knowledge–behavior gap," whereby individuals may understand health recommendations but fail to implement them consistently in daily practice.

Previous studies in Indonesia have explored the relationship between maternal knowledge, attitudes, and anemia-related behaviors. Several studies reported that positive attitudes were associated with better compliance with iron tablet consumption and healthier maternal practices (Ariningtyas et al., 2024; Herlina, 2025; Triharini et al., 2018). However, most existing studies have primarily focused on behavioral outcomes rather than actual anemia status and have relied predominantly on bivariate analytical approaches. Consequently, it remains unclear whether maternal attitude independently contributes to pregnancy anemia after accounting for other related variables. Furthermore, evidence from urban Indonesian settings remains limited despite the

distinctive characteristics of urban populations, including greater exposure to health information, changing dietary patterns, increasing consumption of processed foods, and varying levels of health literacy.

This knowledge gap is important because understanding the relative contribution of maternal attitudes may help improve the effectiveness of current antenatal interventions. If maternal attitudes exert a stronger influence on anemia outcomes than knowledge alone, maternal health programs should move beyond information-based education and incorporate behavioral strategies aimed at strengthening positive beliefs, motivation, self-efficacy, and adherence to preventive recommendations. Such evidence could support the development of more comprehensive and behavior-oriented approaches to pregnancy anemia prevention.

To our knowledge, few studies in urban Indonesia have specifically examined the independent association between maternal attitudes and pregnancy anemia using multivariable logistic regression analysis. Therefore, this study aimed to analyze the relationship between maternal knowledge, maternal attitudes, and pregnancy anemia among pregnant women attending urban health facilities in East Jakarta. In addition, the study sought to determine whether maternal attitude remained independently associated with pregnancy anemia after statistical adjustment. The findings are expected to contribute to the growing evidence on behavioral determinants of maternal health and provide practical implications for strengthening antenatal anemia prevention programs in urban Indonesian settings.

METHOD

Research Design

This study employed an observational analytical design using a cross-sectional approach to examine the association between maternal knowledge, attitudes, and the incidence of anemia among pregnant women. A cross-sectional design was selected because it enables the assessment of exposure and outcome variables simultaneously at a single point in time, allowing the identification of factors associated with pregnancy anemia. The study was conducted between July and August 2025 in several urban health facilities located in East Jakarta, Indonesia. The target population consisted of pregnant women attending antenatal care services during the study period.

Sample Selection

The study population consisted of all pregnant women attending antenatal care services at selected urban health facilities in East Jakarta during the study period. A total of 150 pregnant women were registered for antenatal care. The minimum sample size was calculated using the Slovin formula with a 10% margin of error, resulting in a required sample of 60 participants. A purposive sampling technique was applied to recruit participants who met the predefined eligibility criteria. Inclusion criteria included pregnant women in the second or third trimester who were willing to participate and provided written informed consent. Pregnant women who were absent during the data collection period or physically unable to complete the assessment procedures were excluded. Based on these criteria, 60 pregnant women were enrolled in the study.

Purposive sampling was selected to ensure that participants met the specific characteristics relevant to the study objectives. However, this non-probability sampling approach may limit the generalizability of the findings and introduce potential selection bias. Therefore, the results should be interpreted with caution and may not fully represent all pregnant women in East Jakarta or other urban settings.

Several demographic and obstetric characteristics, including maternal age, educational level, parity, and gestational age, were collected as descriptive variables. However, due to the limited sample size and the exploratory nature of the study, not all potential confounding factors associated with pregnancy anemia such as nutritional status, adherence to iron supplementation,

and socioeconomic status could be included in the final regression model. Future studies with larger samples are recommended to incorporate these variables to provide a more comprehensive understanding of the determinants of pregnancy anemia.

Data Collection Procedures

Data were collected through direct assessment and structured questionnaires. The dependent variable was pregnancy anemia, defined as a hemoglobin concentration below 11 g/dL according to World Health Organization criteria. Hemoglobin levels were measured using a Sahli hemoglobinometer under standardized procedures. Measurements were conducted in the morning between 07:00 and 09:00 WIB to ensure consistency.

The independent variables included maternal knowledge and maternal attitudes regarding anemia prevention during pregnancy. Knowledge was assessed using a validated 10-item questionnaire with a score range of 0–100 and demonstrated good reliability (Cronbach's $\alpha = 0.82$). Maternal attitude was measured using a validated 12-item Likert-scale questionnaire ranging from 1 to 5 points, with a reliability coefficient of Cronbach's $\alpha = 0.79$. The content validity ratio (CVR) of all questionnaire items exceeded 0.70, indicating satisfactory content validity. Data collection was supervised by three trained enumerators to ensure consistency and completeness of responses.

Data Analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics were used to summarize participant characteristics and study variables. Univariate analysis was conducted using frequencies, percentages, and measures of central tendency where appropriate. Bivariate analysis using the Chi-Square test was applied to examine the association between maternal knowledge, maternal attitudes, and anemia incidence. Crude Odds Ratios (ORs) with 95% Confidence Intervals (CIs) were calculated to estimate the magnitude of associations.

Variables meeting the selection criteria in the bivariate analysis were subsequently entered into a multivariable binary logistic regression model using the Forward Likelihood Ratio (Forward LR) method to identify independent predictors of pregnancy anemia. Adjusted Odds Ratios (aORs) with 95% Confidence Intervals were reported. Model performance was evaluated using the Hosmer–Lemeshow goodness-of-fit test, Nagelkerke R^2, and classification accuracy. Statistical significance was determined at a p-value of <0.05. The reporting of this observational study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure methodological transparency and reporting quality.

Ethical Considerations

This study received ethical approval from the Ethics Committee of Universitas Mohammad Husni Thamrin Jakarta under approval number 082/S.Ket/KEPK/UMHT/VII/2025 dated July 16, 2025. Prior to participation, all respondents received information regarding the study objectives, procedures, potential benefits, and confidentiality measures. Written informed consent was obtained from all participants. Participation was entirely voluntary, and respondents were informed of their right to withdraw from the study at any stage without consequences. All collected data were anonymized and used solely for research purposes in accordance with ethical principles governing human subject research.

RESULTS AND DISCUSSION

Results

This study included 60 pregnant women attending antenatal care services at urban health facilities in East Jakarta between July and August 2025. The analysis examined the association between maternal knowledge and attitudes regarding anemia prevention and the incidence of pregnancy anemia.

Tabel 1. Distribution of Study Variables (n = 60)

Variable	Category	n	%
Knowledge	Adequate/Good	46	76.7
	Poor	14	23.3
Attitude	Positive	46	76.7
	Negative	14	23.3
Anemia Status	Anemia	27	45.0
	Normal	33	55.0

Most participants demonstrated adequate knowledge regarding anemia prevention during pregnancy (76.7%), while 23.3% had poor knowledge. Similarly, positive attitudes toward anemia prevention were reported by 76.7% of respondents, whereas 23.3% exhibited negative attitudes. The prevalence of anemia among study participants was 45.0% (n = 27).

Tabel 2. Bivariate Analysis of Factors Associated with Pregnancy Anemia

Variable	Anemia n (%)	Normal n (%)	OR	95% CI	p-value
Attitude					
Negative	12 (85.7)	2 (14.3)	8.50	2.10–34.20	0.002
Positive	15 (32.6)	31 (67.4)	Reference	–	–
Knowledge					
Poor	8 (57.1)	6 (42.9)	2.10	0.80–5.60	0.152
Adequate/Good	19 (41.3)	27 (58.7)	Reference	–	–

Chi-square analysis demonstrated a statistically significant association between maternal attitude and pregnancy anemia incidence (OR = 8.50; 95% CI = 2.10–34.20; p = 0.002). Pregnant women with negative attitudes were more likely to experience anemia compared with those with positive attitudes. In contrast, maternal knowledge was not significantly associated with anemia incidence (OR = 2.10; 95% CI = 0.80–5.60; p = 0.152).

Tabel 3. Multivariate Logistic Regression Analysis of Pregnancy Anemia

Predictor	β	S.E.	Wald	p-value	aOR	95% CI
Negative Attitude	2.059	0.674	9.342	<0.001	7.85	2.10–29.35
Constant	-2.141	0.892	5.762	0.016	0.12	–

The multivariable logistic regression analysis identified maternal attitude as the only significant independent predictor of pregnancy anemia. Pregnant women with negative attitudes had 7.85 times higher odds of developing anemia compared with those with positive attitudes (aOR = 7.85; 95% CI = 2.10–29.35; p < 0.001). The final model demonstrated a Nagelkerke R^2 value of 0.684, indicating that approximately 68.4% of the variability in anemia status was explained by the model. The Hosmer–Lemeshow goodness-of-fit test showed adequate model fit (p = 0.742), and the overall classification accuracy was 86.7%.

Discussion

The prevalence of anemia among pregnant women in this study was 45.0%, substantially exceeding the national prevalence of 27.7% reported in the 2023 Indonesian Health Survey (SKI). This finding highlights that anemia remains a significant maternal health problem, even in urban areas where healthcare access and antenatal services are relatively more available. The prevalence observed in the present study is consistent with reports from other Indonesian urban settings, including Semarang, Surabaya, and Makassar, where anemia prevalence among pregnant women ranged from moderate to high levels (Romdani et al., 2023; Syarifah et al., 2024; Widyaningsih et al., 2025). Similar trends have also been reported in several low- and middle-income countries, indicating that urbanization alone does not guarantee improved maternal nutritional status or reduced anemia risk. Despite better healthcare infrastructure, factors such as inadequate dietary intake, poor adherence to iron supplementation, increasing consumption of low-nutrient processed foods, and behavioral barriers continue to contribute to the persistence of anemia among pregnant women (Ameline et al., 2025; WHO, 2025).

The most important finding of this study was that maternal attitude emerged as the strongest factor associated with pregnancy anemia. Pregnant women with negative attitudes toward anemia prevention had significantly higher odds of experiencing anemia compared with those who demonstrated positive attitudes (aOR = 7.85; 95% CI: 2.10–29.35; $p < 0.001$). This finding supports previous studies showing that positive maternal attitudes are associated with better adherence to iron-folic acid supplementation, increased utilization of antenatal care services, and healthier nutritional practices during pregnancy (Ariningtyas et al., 2024; Herlina, 2025; Triharini et al., 2018). Within the Knowledge Attitude Practice (KAP) framework, attitudes represent a critical intermediary component that transforms knowledge into actual behavior. Women may possess adequate information regarding anemia prevention; however, if they perceive iron tablets as unnecessary, fear side effects, underestimate the consequences of anemia, or lack motivation to follow health recommendations, preventive behaviors are unlikely to be consistently implemented. Consequently, attitudes may exert a stronger influence on health outcomes than knowledge alone because they directly affect behavioral intentions and adherence to recommended practices (Yao et al., 2024).

The findings also suggest that maternal attitudes may reflect broader psychosocial determinants of health behavior. Positive attitudes toward pregnancy care are often associated with higher self-efficacy, stronger family support, greater trust in healthcare providers, and increased motivation to engage in preventive actions. Conversely, negative attitudes may contribute to poor compliance with supplementation programs and inadequate dietary modification, thereby increasing the likelihood of developing anemia. This explanation is supported by behavioral health theories, which emphasize that beliefs, perceptions, and motivation are essential drivers of sustained health behavior change (Triharini et al., 2018; Yao et al., 2024). Therefore, antenatal interventions focusing solely on information dissemination may be insufficient unless accompanied by strategies designed to improve maternal perceptions, confidence, and commitment toward anemia prevention.

In contrast, maternal knowledge was not significantly associated with anemia in the final multivariable model. Although women with poor knowledge demonstrated a higher crude risk of anemia, the association lost statistical significance after adjustment. This finding indicates that knowledge alone may not be sufficient to influence maternal health outcomes when it is not translated into positive attitudes and preventive behaviors. Similar findings have been reported in previous studies demonstrating that adequate knowledge does not necessarily guarantee compliance with iron supplementation or adoption of appropriate nutritional practices during pregnancy (Saleh & Agustin, 2022; Yao et al., 2024). This phenomenon, often referred to as the "knowledge–behavior gap," suggests that health education programs should move beyond

increasing awareness and focus on strengthening behavioral determinants that facilitate actual behavior change.

The logistic regression model demonstrated acceptable performance, as indicated by the Nagelkerke R^2 value of 0.684 and a satisfactory Hosmer–Lemeshow goodness-of-fit test ($p = 0.742$). These findings suggest that the model possessed moderate-to-high explanatory capability within the study sample. Nevertheless, the observed association should be interpreted with caution because several established determinants of pregnancy anemia were not included in the analysis. Nutritional status, dietary diversity, adherence to iron supplementation, socioeconomic conditions, infection status, and gestational age have been consistently identified as important contributors to maternal anemia and may have influenced the magnitude of the association observed in this study (Ameline et al., 2025; WHO, 2025). Consequently, maternal attitude should not be interpreted as the sole determinant of anemia but rather as one of several interrelated behavioral factors contributing to maternal health outcomes.

Several limitations should be acknowledged. First, the cross-sectional design precludes conclusions regarding temporal relationships and causality between maternal attitudes and anemia status. Therefore, it cannot be determined whether negative attitudes contributed to anemia development or whether existing health conditions influenced maternal attitudes. Second, the use of purposive sampling may limit external validity and reduce the generalizability of findings to broader populations of pregnant women. Third, the relatively small sample size and the absence of several biological, nutritional, and socioeconomic variables may have introduced residual confounding and affected the precision of the estimated odds ratios. Future longitudinal and prospective cohort studies involving larger and more diverse populations are recommended to better elucidate the causal pathways linking maternal attitudes, health behaviors, and pregnancy anemia. Furthermore, intervention studies evaluating attitude-focused behavioral counseling may provide valuable evidence for developing more effective antenatal anemia prevention programs in Indonesia.

CONCLUSION

The prevalence of anemia among pregnant women in this study was 45.0%, which was higher than the national prevalence reported in Indonesia. Maternal attitude was significantly associated with pregnancy anemia and emerged as the strongest factor in the final regression model. These findings indicate that maternal attitudes may be an important behavioral factor related to anemia among pregnant women. Antenatal programs should therefore consider behavioral components in addition to nutritional education and supplementation. Nevertheless, the cross-sectional nature of this study does not allow causal inferences, and further longitudinal studies are required to verify the observed associations.

LIMITATION

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design precludes the establishment of causal relationships between maternal attitudes and pregnancy anemia, limiting the findings to associations only. Second, the use of purposive sampling and a relatively small sample size may reduce the generalizability of the results to broader populations of pregnant women. Third, several important determinants of anemia, including nutritional status, dietary intake, adherence to iron-folic acid supplementation, socioeconomic conditions, and infection history, were not included in the analysis and may have contributed to residual confounding. Additionally, maternal knowledge and attitudes were assessed using self-reported questionnaires, which may be subject to recall and social desirability bias. Despite these limitations, the study provides valuable insights into the potential role of maternal attitudes in pregnancy anemia and highlights the importance of incorporating behavioral factors into antenatal anemia prevention programs.

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