

Determinants of Adherence to Iron Supplementation in the Anemia Prevention Program Among Pregnant Woman at Lere Health Center, Palu City

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Access this article online
Quick Response Code :



DOI: 10.22487/hjt.v12i3.2148

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Page : 516-525

Article History:

Received: 2025-12-18

Revised: 2026-06-27

Accepted: 2026-07-31

Published by:

Tadulako University,
Managed by Faculty of
Medicine.

Website :

<https://jurnal.fk.untad.ac.id/index.php/hjt/index>



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Abstract

Background: Anemia in pregnancy remains a public health problem with serious consequences for both mothers and fetuses. Low adherence to iron supplementation persists at the Lere Community Health Center, which reports the highest anemia prevalence in Palu City. **Objective:** This study aimed to analyze the determinants of iron supplementation adherence among pregnant women, including knowledge, family support, frequency of antenatal care (ANC) visits, health worker education, and prenatal attachment. **Methods:** A cross sectional study was conducted using a purposive sampling technique among second and third trimester pregnant women. Data were collected through structured questionnaires and analyzed using logistic regression. **Results:** The frequency of ANC visits ($p = 0.013$; $\text{Exp}(B) = 4.938$) and health worker education ($p = 0.030$; $\text{Exp}(B) = 6.786$) significantly influenced iron supplementation adherence. Knowledge, family support, and prenatal attachment showed no significant association. The regression model demonstrated an accuracy of 86.7%. **Conclusion:** Optimizing ANC attendance and improving the quality of education provided by health workers are essential to enhance adherence to iron supplementation. Strengthening educational strategies and continuous monitoring should be prioritized in anemia management programs for pregnant women.

Keywords: Antenatal care visit; Family support; Health education; Iron tablet adherence; Prenatal attachment.

Introduction

Anemia in pregnancy is a global public health issue with a broad impact on maternal morbidity, obstetric complications, and fetal development. The WHO reports that approximately 36% of pregnant women worldwide suffer from anemia, with the highest prevalence in Southeast Asia and Sub-Saharan Africa. In Indonesia, the proportion of anemic pregnant women still exceeds a quarter of the population and contributes to an increased risk of premature birth, low birth weight, and maternal health problems. Although the Iron Folic Acid Supplement (IFAS)

supplementation program has been implemented nationally, low compliance with consumption hinders the achievement of anemia reduction targets. This underscores the need for an in-depth study of the factors IFAS^{1,2}. Various studies have identified knowledge, family support, the quality of health worker education, and access to antenatal care as potential determinants of iron tablet adherence. However, findings across studies are inconsistent and do not provide a comprehensive understanding, particularly in the context of primary care. Furthermore, psychological factors such as prenatal

attachment, which plays a role in motivating maternal health behaviors, are rarely analyzed alongside other determinants. The limited number of studies integrating cognitive, social, and psychological aspects, particularly in facilities with a high prevalence of anemia such as the Lere Community Health Center, indicates a research gap that needs to be addressed^{3,4,5}.

The urgency of this research lies in the need to strengthen the effectiveness of anemia prevention programs through more comprehensive and contextual identification of adherence determinants. The novelty of this research is reflected in the integration of prenatal attachment psychological variables with classic variables such as health worker education, family support, and frequency of antenatal visits. This multidimensional approach provides a holistic perspective that has not been widely applied in similar studies at the primary care level. The focus of the research on the Lere Community Health Center, with its high anemia prevalence, further strengthens its relevance and novelty⁵.

The main research question is: what factors influence pregnant women's adherence to iron supplementation? This study hypothesizes that knowledge, family support, frequency of ANC visits, health worker education, and prenatal attachment influence adherence. The objectives of this study include: (1) analyzing the influence of each variable on adherence to iron supplementation; (2) determining the variables with the dominant influence; and (3) developing evidence-based recommendations to strengthen anemia prevention strategies at the primary care level^{6,7}.

This research is expected to provide a substantive contribution to the development of public health science and maternal care practices by identifying key determinants of iron tablet adherence. The research findings

can inform the formulation of more effective policies and interventions, particularly in optimizing ANC visits, standardizing education, and increasing the capacity of health workers in counseling. Furthermore, the integration of behavioral and psychological aspects has the potential to improve the quality of anemia prevention programs and reduce the risk of pregnancy complications. This tangible impact is expected to contribute to improving maternal health and accelerating the achievement of the national target of reducing anemia in pregnancy^{8,9}.

Materials and Methods

Study Design

This study used a cross-sectional design to analyze the influence of knowledge, family support, antenatal care visits, health worker education, and prenatal attachment on pregnant women's adherence to iron supplementation. This design was chosen because it allows for simultaneous measurement of variables at a single point in time, effectively assessing the influence of these factors without intervention. This approach is appropriate for public health research in primary care and supports the identification of determinants of adherence in pregnant women.

Sampling

The population in this study was all pregnant women receiving maternal health services in the Lere Community Health Center (Puskesmas Lere) working area. The study sample was selected using a purposive sampling technique, taking into account participant characteristics that align with the research objectives. Inclusion criteria included pregnant women in their second and third trimesters, able to communicate well, and willing to participate as respondents. Exclusion criteria included pregnant women with certain medical conditions that could interfere with the

questionnaire completion process or being absent during data collection. The sample size was determined using the Slovin formula, resulting in 83 respondents in this study.

Data Collection Technique

Data in this study were collected through a structured questionnaire to measure knowledge, family support, health worker education, prenatal attachment, and adherence to iron supplement consumption. The questionnaire underwent validity and reliability testing before use. Furthermore, data on the frequency of antenatal care (ANC) visits was obtained from secondary data by directly recording them in each respondent's Maternal and Child Health (KIA) book. Data collection was conducted at the Lere Community Health Center during the specified research period. Respondents completed the questionnaire independently with the assistance of the researcher to ensure data accuracy and completeness.

Data Analysis Technique

The collected data were analyzed using descriptive statistics to describe the characteristics of the respondents and the distribution of each variable. Furthermore, logistic regression analysis was used to assess the influence of knowledge, family support, antenatal care visits, health worker education, and prenatal attachment on adherence to iron supplement consumption. The analysis process was conducted using SPSS software to ensure the accuracy of the statistical calculations. This study established a significance level of $p < 0.05$ as the basis for determining statistically significant effects.

Ethical Considerations

This study did not require formal ethics approval because it did not involve medical intervention, did not collect biological data, and did not pose any physical or psychological risks

to respondents. Primary data was collected through a non-invasive questionnaire, while secondary data was obtained from the KIA (Child Health and Child Health) book without identifying individuals. Nevertheless, all research procedures adhered to ethical principles of health research, including data confidentiality, respondent anonymity, and completely voluntary participation, with data use limited to academic purposes. The researchers ensured that the entire research process was carried out in accordance with the principle of benefit and did not cause any adverse impacts on respondents.

Results

Descriptive analysis showed that the majority of respondents attended antenatal care (ANC) visits as scheduled, namely 64 out of 83 respondents (77.1%), while 22.9% did not. Respondents' knowledge levels were predominantly in the high category (68.7%), while 31.3% were in the low category. Family support also showed a very positive distribution, with 91.6% of respondents reporting receiving good family support, and only 8.4% reporting inadequate support. In other aspects, 95.2% of respondents rated health workers' education as good, and most respondents reported good prenatal attachment (89.2%). The level of compliance with iron supplementation (TTD) was high, with 77.1% compliant and 22.9% non-compliant. Logistic regression analysis showed that the frequency of ANC visits ($p = 0.013$; $\text{Exp}(B) = 4.938$) and health worker education ($p = 0.03$; $\text{Exp}(B) = 6.786$) were significant determinants of adherence to iron supplement consumption. In contrast, knowledge ($p = 0.118$), family support ($p = 0.206$), and prenatal attachment ($p = 0.454$) did not have a statistically significant effect. The regression model has good feasibility, as indicated by the significant Omnibus test results ($p < 0.001$), good model

fit based on the Hosmer Lemeshow test ($p = 0.612$), and a Nagelkerke R^2 value of 0.564, which illustrates the model's ability to explain 56.4% of the variation in compliance. The model's classification accuracy reached 86.7%, indicating high predictive reliability.

Respondent Characteristics

Respondents in this study were predominantly pregnant women aged 20 - 35, representing the reproductive age group. Most were in their second and third trimesters, with the majority being multigravida. Educational attainment was primarily high school graduates, and most respondents were housewives. Medical histories indicated that the majority had no comorbidities. These characteristics provide a general overview of the respondents' demographic profile, potentially influencing their health behaviors during pregnancy, including adherence to iron supplementation.

Table 1. Characteristics of Respondents

Variable	Category	Frequency (n)	Percentage (%)
Age (year)	<20	11	13.3%
	20 – 35	66	79.5%
	>35	6	7.2%
Gestational age (week)	0 – 12	0	0%
	13 – 27	52	62.7%
	28 – 40	31	37.3%
Gravidity (G)	G1	26	31.3%
	G2 – G4	51	61.5%
	G5 +	6	7.2%
Education	SD	1	1.2%
	SMP	13	15.7%
	SMA	45	54.2%
	Perguruan Tinggi	24	28.9%
	Civil	4	4.8%
Occupation	Servants	11	13.3%
	Private	6	7.2%
	Employed	62	74.7%
	Housewives	72	86.7%
	Tidak ada	11	13.3%
Medical history	Ada	11	13.3%

Source : Data Primer 2025

Descriptive analysis of the main study variables showed that most respondents had a

high level of knowledge, with the distribution of scores reflecting a good understanding of the importance of consuming iron tablets during pregnancy. Family support was also in the good category for the majority of respondents, indicating a social environment that supports healthy behaviors for pregnant women. The frequency of antenatal care (ANC) visits was generally on schedule, indicating compliance with maternal health services. Furthermore, education provided by health workers was considered of good quality by most respondents, while the level of prenatal attachment was mostly in the high category. Overall, the distribution of scores on these variables shows a pattern consistent with positive health behaviors for pregnant women, which is also reflected in the high level of compliance with iron tablet consumption^{10,11}.

Table 2. Univariate Analysis of Research Variables

Variable	Category	n (%)
Knowledge	Low	26 (31.3%)
Healthy	High	57 (68.7%)
Family Support	Poor	7 (8.4%)
	Good	76 (91.6%)
ANC Visits	Not	19 (22.9%)
	Appropriate	64 (77.1%)
Health Worker	Poor	4 (4.8%)
Education	Good	79 (95.2%)
Prenatal	Poor	9 (10.8%)
Attachment	Good	74 (89.2%)

Source : Data Primer 2025

Hypothesis testing was conducted using logistic regression analysis to examine the relationships and effects among variables in accordance with the research questions. The results indicate that antenatal care (ANC) visit frequency and health worker education have a statistically significant effect on iron folic acid (IFA) compliance, with p-values of 0.013 and 0.030, respectively. In contrast, knowledge, family support, and prenatal attachment did not demonstrate significant effects, as reflected by

p-values greater than 0.05. These findings suggest that the regularity of ANC visits and the quality of health education provided to pregnant women serve as key determinants of

compliance with iron tablet consumption, while the other variables do not exhibit statistically meaningful relationships within the analytical model¹².

Table 3. Logistic Regression Analysis of Factors Associated with Iron Folic Acid Compliance

Variable	Odds Ratio (OR)	95% CI	p-value
Knowledge	2.207	0.813-5.995	0.001*
Family Support	2.994	0.556-16.132	
ANC Visits	4.938	1.401-17.406	
Health Worker Education	6.786	1.203-38.262	
Prenatal Attachment	1.748	0.395-7.732	

Note: $p < 0.05$ indicates a statistically significant effect

Health worker education emerged as the strongest predictor of IFA adherence (OR = 6.79), followed by ANC visit frequency (OR = 4.94). Other factors including family support, knowledge, and prenatal attachment showed weaker associations. These findings highlight the central role of provider delivered education in improving adherence among pregnant women.

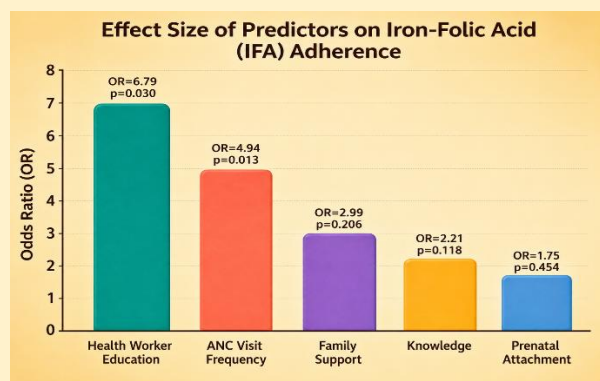


Figure 1. Logistic Regression Analysis

The study findings demonstrate that health worker provided education constitutes the most influential determinant of adherence to iron folic acid (IFA) supplementation, exhibiting a statistically significant association (OR = 6.79, $p = 0.030$). ANC visit frequency also contributes meaningfully to adherence outcomes (OR = 4.94, $p = 0.049$). Conversely, family support, maternal knowledge, and prenatal attachment show

comparatively weaker and statistically non significant relationships with adherence. Collectively, these results underscore the pivotal role of provider delivered educational interventions and consistent antenatal care engagement in enhancing compliance with IFA supplementation among pregnant women¹³.

Discussion

The discussion section aims to interpret the research results by linking them to theory, previous research, and their implications in the field of health and medicine. The structure of the discussion can be divided into several paragraphs as follows: The present study demonstrates that health worker provided education is the most influential factor associated with adherence to iron folic acid (IFA) supplementation among pregnant women, as reflected by its strong and statistically significant effect. This finding indicates that the provision of clear, structured, and accurate information by healthcare professionals plays a critical role in shaping maternal compliance behavior. ANC visit frequency also shows a meaningful association with adherence, suggesting that regular contact with healthcare providers increases opportunities for counseling, monitoring, and reinforcement of supplement intake. These

results collectively address the research question by confirming that provider driven educational exposure and adequate antenatal engagement are central determinants of IFA adherence. In contrast, family support, maternal knowledge, and prenatal attachment exhibit weaker and non-significant associations. These findings may not align fully with the initial expectations; however, several plausible explanations exist. It is possible that information from healthcare workers exerts a stronger and more immediate influence compared to support from the household environment. Additionally, knowledge alone may not translate into behavior change without adequate motivation, reinforcement, or follow-up from healthcare providers. The observed pattern is consistent with prior studies indicating that direct health professional counseling is often a more decisive factor in improving adherence to maternal supplementation programs^{14,15}.

These findings are consistent with the study by Michelle Kairupan, Injil Lina Enjelina Rei, and Mamahit (2025), which demonstrated that health education delivered by healthcare workers in Manado significantly improved adherence among pregnant women¹⁶. Similarly, Nur Caya, Yuly Peristiowati, and Ratna Wardani (2023) reported that anemia education through an e-booklet significantly increased knowledge and adherence to iron tablet consumption at the Sangurara Health Center in Palu¹⁷. However, the present study differs from the findings of Fitriawati et al. (2023) at the Pasir Jaya Health Center in Tangerang, which showed no significant effect of health worker support on adherence to iron tablet consumption ($p = 0.836$). The contribution of health worker education to pregnant women's adherence remains limited if it is not accompanied by family support, continuous monitoring, and effective two way

communication¹⁵. Another study by Rancakasari et al. (2022) also reinforces that ANC adherence has a significant influence on compliance with iron tablet consumption ($p = 0.024$), as well as on the detection of pregnancy risk. Mothers who were non compliant with ANC visits were also more likely to be non-compliant with IFA supplementation, resulting in a higher likelihood of experiencing high-risk pregnancies¹⁸. However, the findings of the present study differ from those of Lestari (2018), which reported no significant association between ANC visit frequency and adherence to iron supplementation. Although most respondents in Lestari's study attended ANC visits regularly, their adherence levels remained low. This was attributed to the fact that ANC visits were largely administrative in nature and were not accompanied by comprehensive education regarding the importance of IFA supplementation, indicating that a higher frequency of visits does not automatically translate into improved adherence among pregnant women¹⁹.

The findings of this study highlight the need to strengthen health worker led educational interventions as a core component of antenatal care services. Given the significant influence of provider delivered education and ANC engagement on IFA adherence, clinical practice should emphasize structured counseling, regular follow-up, and clear communication strategies to ensure pregnant women understand the importance of consistent supplementation. At the public health level, these results suggest that policies should support capacity building for healthcare workers, integration of standardized education modules, and the implementation of systematic monitoring during ANC visits. Community based strategies, including family involvement and targeted outreach for women with limited ANC attendance, may further enhance

adherence. Collectively, these implications underscore the importance of combining clinical guidance, family support, and community engagement to improve maternal nutrition outcomes and reduce anemia related risks during pregnancy^{20,21,22}.

This study possesses several strengths, including the use of a well defined analytical framework and the application of multivariable regression techniques that allow for a more precise examination of the factors influencing adherence to iron folic acid supplementation. The inclusion of multiple predictors provides a comprehensive understanding of the relative contribution of clinical, behavioral, and psychosocial variables. However, certain limitations should be acknowledged. The cross sectional design restricts the ability to infer causal relationships between the predictors and adherence outcomes. Additionally, the findings may have limited generalizability beyond the study setting, as local health system characteristics and community practices may differ across regions. Potential reporting bias may also arise from self-reported adherence, and unmeasured social or cultural determinants could have influenced the results but were not captured in this study. These limitations should be considered when interpreting the findings and in guiding future research^{23,24}.

Future research should consider employing longitudinal or cohort based designs to better assess changes in IFA adherence over time and to establish clearer causal pathways between educational interventions, ANC engagement, and supplementation behavior. Qualitative approaches are also recommended to explore in greater depth the social, cultural, and interpersonal dynamics that influence adherence, particularly the role of family support and communication patterns that were not captured comprehensively in this study.

Additionally, future studies may benefit from incorporating objective adherence measures and expanding the research setting to multiple health facilities or regions to enhance generalizability. Strengthening these methodological aspects will contribute to a more holistic understanding of the determinants of IFA adherence and support the development of more effective maternal health interventions^{25,26,27}.

Conclusion

This study identified health worker provided education and ANC visit frequency as the primary determinants of adherence to iron folic acid supplementation among pregnant women. These findings emphasize the importance of strengthening counseling and optimizing antenatal care services to improve maternal compliance and reduce anemia-related risks. While the cross-sectional design limits causal inference, the results offer important insights that can guide future longitudinal and qualitative studies aimed at further exploring the behavioral and contextual factors influencing supplementation adherence.

Acknowledgments

The authors would like to express their sincere gratitude to Universitas Tadulako for providing institutional support throughout the research process. Appreciation is also extended to all parties who contributed valuable guidance, constructive feedback, and continuous supervision during the completion of this study. The authors also thank the midwives and healthcare staff at Puskesmas Lere, Kota Palu, for their assistance in data collection and field coordination. Finally, the authors express their deepest gratitude to all pregnant women who participated and contributed to this research. This study received no external funding.

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Conflict of Interest Statement

The author(s) declare no commercial, financial, or personal conflicts of interest related to this research. All authors approved the final manuscript and consented to its publication in *Healthy Tadulako Journal*.

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