

# THE RELATIONSHIP BETWEEN COMPLIANCE WITH IRON TABLET CONSUMPTION AND NUTRITIONAL STATUS WITH ANEMIA AMONG PREGNANT WOMEN IN PUTRI AYU HEALTH CENTER, JAMBI CITY

Izmi Arisa Putri Lubis<sup>1\*</sup>, Ray Wagiu Basrowi<sup>2</sup>, Dessy Pratiwi<sup>2</sup>

<sup>1</sup>*Institute Kesehatan Helvetia, Medan, Indonesia*

<sup>2</sup>*Indonesian Health Development Center, Jakarta, Indonesia*

\* Corresponding Author: [izmiaris@gmail.com](mailto:izmiaris@gmail.com)

## Abstract

**Background:** Anemia during pregnancy remains a significant public health concern in Indonesia, with a high prevalence and adverse outcomes for both mothers and infants. Iron supplementation and maternal nutritional status are key factors in preventing anemia. This study aimed to examine the association between compliance with iron tablet consumption and nutritional status (chronic energy deficiency) with the incidence of anemia among pregnant women. **Methods:** A cross-sectional study was conducted at Putri Ayu Health Center, Jambi City, involving 100 pregnant women selected using accidental sampling. Data on hemoglobin levels, upper arm circumference (MUAC), and iron tablet intake were collected through interviews and direct measurement. Anemia was defined as Hb <11 g/dL. Nutritional status was categorized based on MUAC <23.5 cm as chronic energy deficiency (CED). Data were analyzed using descriptive and bivariate analysis. **Results:** While statistical associations between CED and iron tablet compliance with anemia were not significant, higher proportions of anemia were observed among women with CED and those who consumed fewer than 30 tablets. Additionally, descriptive trends showed that women who began supplementation early in pregnancy—particularly in the first trimester—were less likely to develop anemia compared to those who initiated later. **Conclusions:** Although not statistically significant, the findings suggest that poor nutritional status and low adherence to iron tablet supplementation may increase the likelihood of anemia in pregnancy. Early and consistent supplementation, particularly from the first trimester, should be emphasized in antenatal care programs to prevent iron deficiency-related complications.

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**Keywords:** Anemia in Pregnancy, Compliance of Iron Tablet Consumption, Chronic Energy Deficiency, Maternal Health

## Introduction

Anemia during pregnancy continues to be a significant global public health issue, particularly in developing countries. The World Health Organization (WHO) estimates that more than 40% of pregnant women worldwide suffer from anemia, which is associated with adverse maternal and neonatal outcomes including low birth weight, preterm delivery, and increased risk of maternal mortality.<sup>1</sup> In Indonesia, the 2018 Basic Health Research (RISKESDAS) reported a high prevalence of anemia among pregnant women at 48.9%, categorizing it as a severe public health problem.<sup>2</sup> Almost similar result was found among young women aged 15-24 years (39.93%).<sup>3</sup>

One of the key preventive strategies against anemia in pregnancy is iron supplementation in the form of iron-folic acid tablets. Despite government efforts to distribute iron tablets to pregnant women through primary healthcare centers, non-compliance remains a persistent barrier.<sup>4</sup> Inadequate consumption of iron tablets has been shown to significantly increase the risk of anemia. Moreover, nutritional status, particularly chronic energy deficiency (CED), further contributes to this condition. Pregnant women with CED often have insufficient nutrient reserves, which exacerbates their vulnerability to anemia.<sup>5</sup>

Although maternal anemia has been studied in various urban settings across Indonesia, there is limited published evidence focusing on the Jambi region. One of the primary health centers in the area, Putri Ayu Health Center, has reported a consistent increase in anemia cases among pregnant women over recent years. Given this trend and the center's role in providing antenatal care services to a large population, it presents a relevant setting for

investigating contributing factors to anemia in pregnancy. This study aims to examine the association between compliance with iron tablet consumption and nutritional status, particularly chronic energy deficiency, with the incidence of anemia among pregnant women at the Putri Ayu Health Center in Jambi City.

## **Method**

This study used a cross-sectional design to investigate the relationship between iron tablet compliance, nutritional status, and anemia in pregnant women. The research was conducted at the Putri Ayu Health Center, located in Jambi City, Indonesia, from May to June 2022. The study population included all pregnant women who visited the health center during the study period. A total of 100 participants were selected through accidental sampling, based on inclusion criteria: pregnant women aged  $\geq 18$  years, currently receiving antenatal care (ANC) services, and willing to provide informed consent. The sample size was determined based on a descriptive-analytic formula for cross-sectional studies, and it fulfilled the minimum requirement for statistical analysis. Data collection employed structured interviews using validated questionnaires, including a 24-hour food frequency questionnaire (FFQ) and records of iron tablet consumption provided by the health center. Anthropometric measurements such as mid-upper arm circumference (MUAC) were used to determine nutritional status. MUAC  $< 23.5$  cm was categorized as chronic energy deficiency (CED). Hemoglobin (Hb) levels were measured using the HemoCue method, with anemia defined as Hb  $< 11.0$  g/dL according to WHO standards. Data analysis was performed using univariate and bivariate analysis with the Chi-square test to assess the association between independent variables (iron tablet compliance, CED) and dependent variable (anemia status).

## Results

A total of 100 pregnant women participated in this study. A substantial number of the respondents were found to have hemoglobin levels below the WHO threshold for anemia (<11.0 g/dL), indicating the relevance of further analysis on contributing factors. based on hemoglobin levels below 11,0 g/dL. The participants' characteristics showed that 16.8% had chronic energy deficiency (MUAC <23.5 cm) and 69.3% reported consuming fewer than 30 iron tablets during their current pregnancy. A bivariate analysis was conducted to determine the association between maternal nutritional status, indicated by mid-upper arm circumference (MUAC), and anemia status. As shown in **Table 1**, pregnant women with chronic energy deficiency (MUAC <23.5 cm) showed a higher proportion of anemia cases (52.9%) compared to those with normal nutritional status (35.7%). Although the association did not reach statistical significance ( $p = 0.290$ ), the odds of anemia were approximately **2 times** higher in the CED group (**OR = 2.025; 95% CI: 0.707–5.797**).

**Table 1. Association between Nutritional Status (CED) and Anemia among Pregnant Women (n = 100)**

Nutritional Status	Anemic (%)	Not Anemic (%)	Total (%)	P – value	OR (95%CI)
<b>CED (&lt;23.5 cm)</b>	9 (52.9%)	8 (47.1%)	17 (100%)	0.290	2.025 (0.707 – 5.797)
<b>Normal (≥23.5 cm)</b>	30 (35.7%)	54 (64.3%)	84 (100%)		
<b>Total</b>	<b>39 (38.6%)</b>	<b>67 (61.4%)</b>	<b>100(100%)</b>		

\*Chi-square test

**Table 2** summarizes the association between iron tablet consumption and anemia. Women who consumed fewer than 30 tablets had anemia in 42.9% of cases, whereas those consuming 30 or more tablets showed anemia in 29.0%. This difference did not reach statistical

significance ( $p = 0.274$ ), but the odds ratio suggests an 83% higher likelihood of anemia among less compliant women (OR = 1.833; 95% CI: 0.739–4.548).

**Table 2. Association between Compliance with Iron Tablet Consumption and Anemia (n = 100)**

Iron Tablet Consumption	Anemia (n, %)	Not Anemic (n, %)	Total (n)	p-value	OR (95% CI)
< 30 tablets	30 (42.9%)	40 (57.1%)	70	0.274	1.833 (0.739–4.548)
≥ 30 tablets	9 (29.0%)	22 (71.0%)	31		

**\*Chi-square test**

In an additional A descriptive cross-tabulation was conducted to explore the pattern of anemia prevalence across different gestational ages in relation to iron tablet consumption. In the first trimester, none of the women who consumed 30 or more iron tablets were found to have anemia. In contrast, anemia was more commonly observed among women in the second and third trimesters, regardless of tablet intake. Among third-trimester participants, 51.6% of those who consumed fewer than 30 tablets were anemic, compared to 33.3% of those who consumed ≥30 tablets. Although no statistical analysis was performed for this subgroup comparison, the trend suggests a possible benefit of early and consistent supplementation in preventing anemia.

**Discussion**

This study explored the association between maternal nutritional status and iron tablet supplementation with the occurrence of anemia during pregnancy. Although the relationships did not reach statistical significance, the findings showed increased odds of anemia among pregnant women with chronic energy deficiency and among those who consumed fewer than

30 iron tablets. These trends align with previous studies, such as those by Bertheelin et al and Lina et al, which reported that poor nutritional reserves and inadequate iron intake are important contributors to maternal anemia.<sup>6,7</sup>

A study at Kuala Simpang City Health Center found a significant association between chronic energy deficiency (CED) and anemia in pregnant women ( $p < 0.001$ ), as well as between adherence to iron tablet consumption and anemia ( $p < 0.001$ ).<sup>7</sup> Similarly, Fitria Dwi Yanti et al showed that pregnant women with CED had a 94.5-fold increased risk of delivering low birth weight (LBW) infants, and non-compliance with iron tablet supplementation increased LBW risk by 12 times.<sup>5</sup> These findings reinforce that CED and poor adherence to iron supplementation not only affect maternal anemia but also have profound consequences on neonatal outcome.

Iron deficiency anemia is recognized as one of the most common nutritional problems globally, especially among women in their reproductive years. The condition often develops gradually, beginning with depleted iron reserves due to inadequate intake or ongoing blood loss. Initially, there may be no clinical signs, but as iron stores become exhausted, hemoglobin production declines, eventually leading to anemia characterized by small, pale red blood cells. During pregnancy, this process can accelerate, as iron demands increase significantly to support both maternal and fetal needs, reducing.<sup>8</sup> The body's ability to maintain normal iron balance without supplementation.

In addition to the main analysis, a descriptive cross-tabulation of gestational age and iron tablet consumption showed a noteworthy pattern. None of the women in their first trimester who had consumed 30 or more iron tablets were found to be anemic. Meanwhile,

anemia remained relatively common in the second and third trimesters, even among those with higher tablet intake.

This pattern aligns with findings from Obeagu et al, who emphasized that anemia risk increases progressively with gestational age due to physiological hemodilution, placental development, and growing fetal demands. During the first trimester, maternal blood volume expansion is still minimal, and iron requirements remain relatively low. However, in the second and especially the third trimester, plasma volume increases dramatically—up to 50%—causing dilutional decreases in hemoglobin levels and placing substantial strain on maternal iron stores.<sup>9</sup> If supplementation is delayed, the mother may not be able to catch up with the cumulative iron demand, thus increasing the likelihood of moderate to severe anemia

Although this study did not find statistically significant associations, similar studies with stronger statistical power have demonstrated significant relationships. Fathoni et al (2022) found that women with poor nutritional status had a 2.2 times higher risk of anemia ( $p = 0.028$ ), and those who did not comply with iron supplementation had a 5.0 times higher risk ( $p < 0.001$ ).<sup>10</sup> These findings emphasize that non-significant results in our study may be due to limited sample size, rather than absence of real effect.

Further findings from Galani et al in India support these trends, showing that anemia remained prevalent (83.6%) in the third trimester, despite most women having received iron-folic supplementation.<sup>11</sup> This highlights that timing, adherence, and bioavailability—not just distribution—are critical for effective prevention. Their findings emphasize that iron supplementation must be simultaneously integrated with other interventions<sup>12</sup> such as early antenatal counseling and monitoring, particularly in the first trimester, to achieve better

outcomes.

In the context of this study, health education and iron tablet distribution were part of standard antenatal care services at the health center. However, several reasons were identified for non-compliance with iron tablet consumption among pregnant women. Some participants reported that they had just made their first antenatal visit and had not yet received tablets in the prior month. Others cited forgetfulness, nausea, dizziness, or discomfort as barriers to regular intake. These findings indicate that distribution alone is not sufficient; effective communication and follow-up are essential.

To address these barriers, the use of the updated 2020 Maternal and Child Health (MCH) handbook, which includes a monitoring column for iron tablet intake, could enhance health workers' ability to track compliance. Health providers are also encouraged to deliver counseling about the benefits of iron supplementation, tips to reduce side effects (such as taking tablets after meals or before sleep), and to engage family members—particularly husbands—in providing reminders and emotional support. Simple messages about the importance of iron tablets, displayed in clinics or included in educational materials, may also improve knowledge and motivation. Strengthening these strategies may help transform knowledge into behavior, ultimately reducing the burden of anemia in pregnancy.

These findings reinforce the importance of integrating nutrition screening and counseling into routine antenatal care. Encouraging early compliance with iron supplementation, particularly from the first trimester, could potentially improve maternal outcomes. While this study did not establish statistical significance, the observed patterns support current recommendations and point toward practical improvements in program delivery. In addition to supplementation program, experts agreed that life course approach should be used as a

framework to develop holistic interventions in preventing iron deficiency anemia in each life stage.<sup>13</sup>

Although this study is limited by its cross-sectional design and reliance on self-reported compliance, it offers valuable insight into real-world antenatal care patterns in an urban Indonesian setting. The absence of statistical significance may reflect sample size limitations, not the absence of clinical relevance. These findings advocate for a preventive, trimester-specific strategy, integrating early screening, counseling, and nutritional support to reduce anemia-related maternal complications.

## **Conclusion**

This study indicates that maternal nutritional status and compliance with iron tablet supplementation are associated with the occurrence of anemia in pregnancy, although the relationships were not statistically significant. The findings suggest that consistent iron tablet intake, particularly when initiated early in pregnancy, may help reduce the risk of anemia. These results underscore the importance of strengthening antenatal care services by integrating early nutritional assessments and reinforcing adherence to iron supplementation protocols. Future research is encouraged to explore intervention models that target early pregnancy stages and evaluate the long-term impact of comprehensive maternal nutrition strategies.

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### Conflict of Interest

There are no conflict interest of this publication.

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