Original Research

Iron Intake and Socio-Economic Factors With The Incidence of Anemia in Pregnant Women

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Abstract
Maternal mortality is increased in pregnant women with anemia. The prevalence of anemia is linked to inadequate information, education, and iron intake. The purpose of this study was to examine the association between the occurrence of anemia in pregnant women and socioeconomic variables and iron consumption. It was a cross-sectional study. Using sequential sampling, 140 respondents made up the sample size. Anemia and iron intake were shown to be significantly correlated (p=0.03). Anemia did not substantially correlate with socioeconomic factors, such as mother work (p=0.40), maternal education (p=0.05), or family income (p=0.85). It is advised that midwives educate patients about the value of consuming iron.

1. Introduction

Pregnancy anemia is a national issue since it has a substantial effect on the caliber of human resources and is a reflection of a community's socioeconomic health. Since anemia during pregnancy is seen as a "potential danger to mother and child," all stakeholders in front-line health services must give it careful consideration. (Manuaba, 2015)

According to the 2018 Basic Health Research, 37.1% of pregnant women had anemia, which is defined as having hemoglobin levels below 11.0 grammes/dl. The percentages were about identical in urban (36.4%) and rural (37.8%) areas (Ministry of Health, 2018). The prevalence of anemia in pregnant women with hemoglobin levels below 11 grams/dl was 21.5% in Central Halmahera Regency (Dinas Kesehatan Halmahera Tengah, 2025)

Miscarriage, early birth, low birth weight, bleeding before and during delivery, and severe anemia can all result from iron deficiency in pregnant women. It can also cause maternal and newborn death. Additionally, anemia during pregnancy raises the chance of maternal death. An estimated 18,000 maternal fatalities per year from postpartum hemorrhage are predicted if the frequency of anemia stays over 40% between 2018 and 2020. Three to seven percent of moms will pass away from this illness's indirect causes, namely anemia (Prawiroharjo, 2020)

With regard to pregnancy, labor, and the postpartum phase, Indonesia's Maternal Mortality Rate (MMR) is 359 per 100,000 live births. Hemorrhage, infection, prolonged/obstructed labor, abortion, and hypertension in pregnancy (HDK) are Indonesia's five leading causes of maternal death. 5. In the meantime, the Central Halmahera Regency Health Profile states that there were three maternal fatalities recorded in 2019 and four in 2020. The causes of maternal death were eclampsia and hypovolemic shock due to hemorrhage.2 The high incidence of anemia is related to malnutrition in pregnant women, insufficient iron intake, and low iron malabsorption. Furthermore, low levels of education, information, and knowledge contribute to poor information reception. 5 Research in Parakou also reported that anemia in pregnant women is associated with grande multipara, low education, and socioeconomic status. 6 Furthermore, maternal iron intake also significantly determines anemia status. This is closely related to the consumption of iron tablets during pregnancy. (Fatimah, 2024)

The Central Halmahera Regency Health Office reported that the Lelilef Community Health Center (Puskesmas) with the highest number of pregnant women receiving iron tablets (FE 1 and FE 3) was 1,294 (185.65%) and 1,123 (161.12%) respectively. Meanwhile, the Kobe Community Health Center (Puskesmas) with the lowest number of pregnant women receiving iron tablets (FE 1 and FE 3) was 124 (44.93%) and 160 (57.97%). 2 Sagea Community Health Center is one of the Basic Emergency Obstetric Neonatal Services (PONED) health centers in Central Halmahera Regency. This community health center provides prenatal checkups, delivery assistance, and other maternal and child health services, as well as family planning services.

Given that anemia during pregnancy is an indirect cause of maternal mortality, and Sagea Community Health Center has the lowest number of mothers receiving iron tablets, the researchers were interested in conducting this study based on the above background.

The study aimed to analyze the relationship between iron intake and economic status with the incidence of anemia among pregnant women in the Sagea Community Health Center's work area.

2. Research Method

This research is an observational analytical study with a cross-sectional design. The population of this study was all pregnant mothers in the Sagea Community Health Center working area from January 1 to December 31, 2024, totaling 226 people. The sample in this study, 140 pregnant women, was calculated using a descriptive research sample formula with a small population. The sample was selected using consecutive sampling. Data collection techniques were carried out through interviews and HB examinations using an easy touch stick.

3. Results and Discussion

Table 1 shows that 36.4% of pregnant women in the Sageayang Community Health Center's work area experience anemia. 80.7% of pregnant women consume iron tablets less than 90 tablets. The highest educational level of pregnant women is low-level (49.3%). Meanwhile, the husband's educational level is almost evenly distributed between low-level (45.7%) and high-level (44.3%). Regarding occupation, the study shows that the majority of pregnant women are unemployed (90%). Meanwhile, the majority of husbands are employed (95.7%). The study also shows that the highest family income is below the minimum wage (UMR) at 83.6%. The results are shown in Table 1 below:

Table 1. Distribution of Respondent Characteristics (n=140)

Variabel	n	Persentase (%)
Anemia		
Yes	51	36,4
No	89	63,6
Iron Intake		
<90 Tablet	113	80,7
▢90 Tablet	27	19,3
Mother's Education		
Low Education	69	49,3
Middle Education	57	40,7
High education	14	10
Mother's job		
Not Work	126	90
Work	14	10
Family Income		
< UMR	117	83,6
▢ UMR	23	16,4

Chi-square test results showed a significant association with anemia (p=0.03). Pregnant women with anemia were most likely to consume less than 90 iron tablets (41.2%). The OR value was 3.0 (95% CI 1.1-8.6), meaning that respondents who consumed less than 90 iron tablets were three times more likely to develop anemia than pregnant women who consumed more than 90 iron tablets. The analysis results are shown in Table 2 below:

Table 2. The relationship between Fe intake and the incidence of anemia (n=140)

Variabel	Anemia		Not Anemia		P
	n	%	n	%	
Fe Intake					0,03*
90 Tablet	5	9,8	22	17,2	
<90 Tablet	46	41,2	67	71,8	

Socioeconomic Status and Anemia Incidence

Based on the chi-square test results, the socioeconomic variables (maternal education, maternal occupation, and family income) are shown in Table 3 below:

Tabel 3 Socioeconomic Relationship with the Incident of Anemia (n=140)

Variabel	Anemia		Tidak Anemia		P
	n	%	n	%	
Mother Education					0,05
Low Education	31	25,1	38	43,9	
Middle Education	14	20,8	43	36,2	
High Education	6	5,1	8	8,9	
Mother's WOrk					0,40
Work	4	5,5	11	9,5	
Not work	47	45,5	78	79,5	
Family Income					0,85
⬜ UMR	8	8,4	15	14,6	
< UMR	43	42,6	74	74,4	

The results of the study on mothers showed no significant association with the incidence of anemia (p=0.053). Pregnant women with low levels of education were the most likely to experience anemia, at 25.1%. Meanwhile, husbands' education levels showed no significant association with the incidence of anemia (p=0.812). The husbands' education levels most likely to experience anemia were low (23.3%) and high (22.6%).

Regarding the mother's occupation, chi-square tests showed no significant association with the incidence of anemia (p=0.406). Unemployed pregnant women were the most likely to experience anemia (45.5%), compared to those who were employed (5.5%). The husband's occupation showed no significant association with the incidence of anemia (p=0.668). The husbands' occupations were the most common causes of anemia, at 49.9%.

The chi-square test showed no significant association with the incidence of anemia for the family income variable (p=0.668). Most pregnant women with anemia had incomes below the minimum regional minimum wage (UMR) (<Rp 2,219,400).

The chi-square test results showed a significant relationship between iron intake and the incidence of anemia. These results indicate that pregnant women with an iron intake of <90 tablets are three times more likely to develop anemia than those consuming more than 90 tablets. Pregnant women have very high iron requirements and should be prepared as early as possible, from pregnancy to delivery. The iron requirement during pregnancy is 900 mg Fe. This amount includes 500 mg Fe used to develop maternal red blood cells, 300 mg Fe in the placenta, and 100 mg Fe in fetal blood. If iron reserves are minimal during delivery, each pregnancy will reduce the body's iron stores, ultimately leading to anemia in subsequent pregnancies. Each pregnant woman is given at least 90 iron tablets, with a dose of one tablet daily throughout pregnancy. It is recommended that iron supplements not be consumed with tea or coffee, and vitamin C is strongly recommended. Iron tablets contain 60 mg iron and 0.25 mg folic acid. One side effect of iron use is constipation. To overcome constipation, pregnant women are advised to consume plenty of fiber-rich foods, drink plenty of water, and exercise daily. 9 Anemia during pregnancy due to iron deficiency occurs because iron requirements double due to increased blood volume without expansion of plasma volume to meet the needs of the mother and the growing fetus.

A study reported that 48.5% of 479 pregnant women with anemia did not take iron tablets during pregnancy.8 Another study also reported that 39% of pregnant women in Senegal who developed

anemia were due to iron deficiency. Similarly, the study reported a relationship between iron intake and the incidence of anemia in pregnant women.(Binetou, 2021)

Socioeconomic factors were assessed through education, occupation, and family income. In this study, the chi-square test results showed no significant relationship between maternal education and the incidence of anemia in pregnant women. This indicates that there was no difference in the incidence of anemia among mothers with low, middle, or high levels of education. These results align with other studies that reported no difference in the incidence of anemia among mothers with low, middle, or high levels of education.5 Education significantly influences a person's ability to receive nutritional information. The higher a person's education level (years of schooling), the easier it is to adopt a healthy lifestyle that is independent, creative, and sustainable. Therefore, education level has an exponential relationship to nutritional status and health.(Jiji, 2024). However, in this study, the incidence of anemia in pregnant women did not differ by education level. This could be due to pregnant women not consuming the minimum of 90 iron tablets during pregnancy.

In 2009, Silvia Mandiang Perdani conducted a study titled "The Relationship Between Iron (Fe) Tablet Consumption and the Incident of Anemia" in the Pulo Brayan Community Health Center Work Area of Medan City. Of the 38 mothers surveyed in 2019, the majority (Liou, 2020) were non-anemic, and the minority (18) were anemic. This means that the better the mothers' Iron (Fe) tablet consumption, the lower their risk of developing anemia. The results of this study are supported by Proverawati's (2009) theory and previous research by Silvia Mandiang Perdani (2019), which found a relationship between Iron (Fe) tablet consumption in pregnant women and the incidence of anemia, although the time and location of the study differed. According to the researcher, respondents who did not take Iron (Fe) tablets were unaware of the benefits of Iron (Fe) tablets for themselves and their fetuses. During pregnancy, they rarely took the Iron (Fe) tablets given to them, due to their lack of knowledge of the benefits, side effects, and how and when to take them, which led to anemia.

Respondents assumed that the side effects of consuming iron tablets, such as constipation and nausea, meant that pregnant women tended to refuse the iron tablets given to them. Respondents who consumed iron tablets experienced anemia because pregnant women did not take iron tablets regularly, or even inconsistently.

The chi-square test results also showed no significant association between the employment and family income variables, indicating no significant association with the incidence of anemia. These results are similar to the education variable, where there was no difference in the incidence of anemia between working and housewives. This study showed that mothers with anemia were housewives or unemployed. One of the contextual factors influencing maternal mortality is the employment status of the mother. Mothers in the formal sector have greater access to health information as well as other types of information. One can gain experience and information from their workplace, both directly and indirectly. By increasing awareness and offering new concepts, habits, and possibilities through interactions with people and the community, employment can improve women's reproductive health and economic autonomy.

The family income variable also showed no difference between those with family incomes below the minimum regional minimum wage (UMR) and those above the minimum regional minimum wage (UMR) and the incidence of anemia. The results of this study indicate that pregnant women with family incomes below the minimum regional minimum wage (UMR) are most likely to experience anemia. Family income also determines the family's socioeconomic status. Low-income women are more likely to experience anemia (Campigoto, 2025).

Meanwhile, other studies report similar findings, indicating that anemia in pregnant women is more common in women with low family incomes. This suggests that poverty levels influence pregnancy, and one consequence is the increased likelihood of anemia during pregnancy due to iron deficiency. Higher family income will increase the family's food purchasing power to meet the family's nutritional needs, including the needs of pregnant women, who are among the most vulnerable family members (Salifou, 2025).

Socioeconomic factors in this study were assessed through maternal education, occupation, and family income. The chi-square test results indicated that none of these variables had a statistically significant association with the incidence of anemia among pregnant women. Specifically, there was no significant difference in anemia prevalence among women with low, middle, or high levels of education. These findings are consistent with several previous studies reporting that maternal education level does not always differentiate the risk of anemia during pregnancy (Fatimah, 2024).

Education is generally considered a key determinant of health behavior, including nutritional practices and health service utilization. Higher educational attainment is often associated with better access to health information, improved health literacy, and a greater ability to adopt healthy and sustainable lifestyles. According to Jiji (2024), education has an exponential relationship with nutritional status and overall health, as it enhances individuals' capacity to process information, make informed decisions, and practice preventive health behaviors. However, the absence of a significant association in this study suggests that education alone may not be sufficient to prevent anemia during pregnancy.

One possible explanation is the suboptimal consumption of iron (Fe) tablets among pregnant women, regardless of their education level. National guidelines recommend a minimum intake of 90 iron tablets during pregnancy; however, compliance remains low in many settings. Even well-educated women may fail to adhere to iron supplementation due to inadequate counseling, misconceptions about side effects, or lack of continuous monitoring by health providers. This finding highlights the gap between knowledge and practice, indicating that educational attainment does not always translate into appropriate health behavior.

Supporting this explanation, a study conducted by Silvia Mandiang Perdani (2019) at the Pulo Brayan Community Health Center in Medan City demonstrated a significant relationship between iron tablet consumption and anemia incidence among pregnant women. Among the 38 respondents studied, the majority were non-anemic, while 18 experienced anemia. The results showed that better adherence to iron tablet consumption was associated with a lower risk of anemia. These findings are consistent with Proverawati's (2009) theory, which emphasizes that adequate iron intake during pregnancy is essential for preventing anemia.

In this study, respondents who did not regularly consume iron tablets reported limited knowledge regarding the benefits of iron supplementation for both maternal and fetal health. Additionally, many pregnant women experienced or feared side effects such as nausea, vomiting, and constipation, leading to refusal or inconsistent consumption of iron tablets. This behavior persisted even among women who had received iron tablets from health facilities, indicating that insufficient counseling and follow-up may contribute to poor adherence. Consequently, anemia occurred not only due to lack of access to supplements but also due to behavioral and perceptual barriers.

Regarding occupational status, the chi-square analysis showed no significant association between maternal employment and anemia incidence. Anemia was observed more frequently among housewives or unemployed women, although this difference was not statistically significant. Employment is often linked to improved access to health information, social networks, and economic resources. Women working in the formal sector may gain health-related knowledge through workplace interactions and benefit from increased autonomy in decision-making. Employment can also enhance women's reproductive health by improving economic independence and exposure to broader social environments.

However, the absence of a significant relationship in this study suggests that employment status alone may not sufficiently protect pregnant women from anemia. Housewives may have more time to access antenatal care services, while employed women may face time constraints that limit their ability to attend regular health check-ups or adhere to supplementation schedules. This indicates that the quality of health education and service delivery may be more influential than employment status itself.

Similarly, family income did not show a statistically significant association with anemia incidence. There was no difference in anemia prevalence between women from families earning below and above the regional minimum wage (UMR). Nevertheless, descriptively, anemia was more common among pregnant women from low-income families. Family income reflects socioeconomic status and determines household purchasing power, particularly in relation to food quality and diversity. Low-income households may struggle to meet the increased nutritional demands of pregnancy, making women more vulnerable to iron deficiency anemia (Campigoto, 2025).

Previous studies have consistently reported a higher prevalence of anemia among pregnant women from low-income families. Poverty can limit access to iron-rich foods, animal protein, and micronutrient supplements, while also increasing exposure to infections that exacerbate anemia.[14] Conversely, higher family income enhances the ability to purchase nutritious foods and access health services, thereby improving maternal nutritional status. Salifou (2025) emphasized that increased household income strengthens food security and supports adequate nutrition for pregnant women, who are among the most nutritionally vulnerable family members.

Overall, the findings of this study suggest that socioeconomic indicators such as education, occupation, and income may not independently determine anemia incidence among pregnant women. Instead, behavioral factors—particularly adherence to iron supplementation—and the effectiveness of health education and counseling appear to play a more critical role. These results underscore the importance of strengthening antenatal nutrition education, improving counseling on iron tablet use, managing side effects, and ensuring continuous support from healthcare providers to reduce anemia during pregnancy, regardless of socioeconomic background.

4. Conclusion

Iron intake during pregnancy is significantly correlated with the prevalence of anemia in pregnant women. The frequency of anemia in pregnant women does not significantly correlate with socioeconomic characteristics such as maternal education, job, and family income.

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