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FACTORS AFFECTING THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN

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ABSTRACT
Iron deficiency anemia accounts for approximately 75% of all anemia cases and can lead to complications such as fatigue, decreased cognitive function, preeclampsia, low birth weight, and preterm birth. Although the government has provided iron (Fe) tablets, compliance and nutritional adequacy remain major challenges. This study aims to analyze the factors influencing the incidence of anemia among pregnant women at Baamang I Public Health Center in Sampit. This research employed a quantitative approach with a cross-sectional design involving 70 pregnant women selected through consecutive sampling. Data were collected using questionnaires and observations. Information on hemoglobin levels, anemia status, and Fe tablet consumption was obtained through interviews and medical records at a single point in time, consistent with the cross-sectional design. Data were analyzed using univariate, bivariate (Chi-square test), and multivariate (logistic regression) analyses. Among the 70 respondents, 42.9% of pregnant women were diagnosed with anemia. Factors influencing anemia included Fe tablet consumption with a p-value < 0.05. Multivariate analysis revealed that compliance with Fe tablet consumption was the most dominant factor, with an odds ratio (OR) value of 0.000. Maternal age, nutritional status, and compliance with Fe tablet consumption significantly affect the incidence of anemia among pregnant women.

Keywords: anemia; fe tablet consumption; hemoglobin level; pregnancy

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INTRODUCTION

Anemia remains one of the most serious global health problems, particularly among pregnant women. The World Health Organization (WHO, 2023) reported that around 37% of pregnant women worldwide suffer from anemia, making it the most common micronutrient deficiency disorder. This condition increases the risk of pregnancy and childbirth complications such as bleeding, preeclampsia, miscarriage, preterm birth, low birth weight (LBW), and even maternal and infant mortality. Anemia during pregnancy is also associated with reduced maternal quality of life, chronic fatigue, postpartum depression, and impaired cognitive and motor development in children. Therefore, anemia affects not only maternal health but also the well-being of the next generation (WHO, 2023).

In Indonesia, the prevalence of anemia among pregnant women has been increasing. Data from the Basic Health Research (Riskesdas) showed that the prevalence rose from 37.1% in 2013 to 48.9% in 2018. This means that nearly half of Indonesian pregnant women suffer from anemia. This condition contributes to the high Maternal Mortality Rate (MMR), which reached 305 deaths per 100,000 live births in 2023—still far above the Sustainable Development Goals (SDGs) target of fewer than 70 per 100,000 live births. Furthermore, neonatal mortality remains high, much of which is linked to maternal anemia during pregnancy. These facts indicate that anemia remains a pressing reproductive health issue that requires immediate attention (Indonesia Health Profile, 2023).

At the regional level, anemia among pregnant women also remains prevalent. For instance, in Central Kalimantan Province, the MMR in 2022 was 63 per 100,000 live births, partly influenced by anemia. A preliminary study conducted at Baamang I Public Health Center in Sampit in 2024

found 102 cases of anemia among 793 pregnant women, despite a 100% coverage of iron supplementation (Fe tablets). This indicates that compliance with Fe tablet consumption, dietary patterns, and nutritional knowledge among mothers are still lacking, leading to ineffective prevention programs (Baamang I Public Health Center, 2022).

The factors influencing anemia among pregnant women are multifaceted. Biological factors include maternal age (too young, <20 years, or too old, >35 years), high parity (>3 pregnancies), short interpregnancy intervals (<2 years), and poor nutritional status (chronic energy deficiency) (Dewi & Astuti, 2021; Purnama & Lestari, 2020). Behavioral factors include low compliance with Fe tablet consumption, unbalanced dietary habits, and lack of knowledge regarding nutritional needs during pregnancy (Kurniawan & Yuliana, 2022; Pratama & Rahmawati, 2021). Socioeconomic and educational factors also play a crucial role—mothers with low educational levels tend to have limited understanding of the importance of iron and ways to prevent anemia, while low-income families may struggle to access nutritious food (Sari & Handayani, 2021). Environmental and cultural factors, such as eating habits and pregnancy-related myths, may further exacerbate the problem (Rahayu & Wulandari, 2020).

To address anemia in pregnant women, comprehensive solutions are required across multiple dimensions. From a healthcare perspective, it is essential to improve the quality and coverage of antenatal care (ANC) services for early anemia detection, strengthen Fe tablet distribution and consumption monitoring, and integrate nutrition education into every ANC visit (Ministry of Health RI, 2023; WHO, 2023). From an educational and behavioral standpoint, efforts should focus on increasing awareness among pregnant women and their families about balanced nutrition, promoting the consumption of iron-rich foods (both animal and plant-based) and vitamin C to enhance iron absorption, while reducing intake of foods that inhibit iron absorption such as tea and coffee (PMC, 2023).

From a socioeconomic perspective, improving access to nutritious food, empowering families through social and economic support, and conducting reproductive health campaigns to prevent early marriage and short birth intervals are essential (Ministry of Health RI, 2023). In terms of policy, the government should strengthen regulations and anemia control programs, including nutritional interventions targeting adolescent girls as a preparatory measure before pregnancy (BKKBN, 2023). By understanding the contributing factors and implementing comprehensive solutions, it is expected that the prevalence of anemia among pregnant women can be reduced. Ultimately, this will improve maternal health, decrease pregnancy and childbirth complications, and contribute to reducing both maternal and infant mortality rates in Indonesia (Ministry of Health RI, 2023; WHO, 2023; BKKBN, 2023).

Based on the description above, this study aims to analyze the factors influencing the incidence of anemia among pregnant women at Baamang I Public Health Center in Sampit. Specifically, the research seeks to determine the extent to which maternal age, nutritional status, and compliance with Fe tablet consumption contribute to the occurrence of anemia. In addition, the study aims to identify the most dominant factor affecting anemia among pregnant women. By understanding these factors, the findings are expected to serve as a basis for the Public Health Center and healthcare workers in designing more effective intervention strategies to prevent anemia among pregnant women in the area.

METHOD

This study employed a quantitative approach with a cross-sectional design to analyze the factors influencing the incidence of anemia among 70 pregnant women selected through consecutive sampling. The research was conducted at Baamang I Public Health Center in Sampit. The variables examined in this study included maternal age, education, pregnancy interval, parity, nutritional

status, and compliance with Fe tablet consumption. The validity and reliability of the research instruments were tested and met the established criteria. Ethical considerations, such as ensuring benefits, respecting respondents' rights, and maintaining fairness, were observed, and the study received ethical approval under number 057/e-KEPK/FIKES/VI/2025.

The collected data were analyzed using univariate, bivariate, and multivariate analyses. Univariate analysis was used to describe the respondents' characteristics through frequency distribution and percentage for each variable. Bivariate analysis was conducted using the Chi-square test to determine the relationship between each factor and the incidence of anemia. Meanwhile, multivariate analysis using logistic regression was performed to identify the most dominant factor influencing anemia among pregnant women. The results of the analysis are presented in tables, along with interpretations of p-values and odds ratio (OR) scores.

RESULT

Univariate Analysis

Table 1.
Characteristics of Pregnant Women Respondents (n = 70)

Variable	Category	f	%
Age	Low risk	59	84.3
	High risk	11	15.7
Education	Basic	32	45.7
	Higher	38	54.3
Parity	Low	56	80.0
	High	14	20.0
Pregnancy Interval	Safe	49	70.0
	Risky	21	30.0
Nutritional Status	Normal	42	60.0
	At risk of CED (Chronic Energy Deficiency)	28	40.0
Compliance with Fe Tablet Consumption	Compliant	51	72.9
	Non-compliant	19	27.1
Anemia Incidence	Not anemic	40	57.1
	Anemic	30	42.9

The results presented in Table 1 show that among the 70 pregnant women at Baamang I Public Health Center in Sampit, most respondents were in the low-risk age group, had higher education levels, low parity, safe pregnancy intervals, and normal nutritional status. The majority of mothers were also compliant in consuming Fe tablets; however, 42.9% of pregnant women were still found to have anemia. This indicates that the occurrence of anemia is not influenced by a single factor but rather by a combination of factors such as nutritional status, compliance with Fe tablet consumption, and pregnancy conditions. Therefore, efforts are needed to enhance nutritional education, conduct regular hemoglobin level monitoring, and strengthen supervision of Fe tablet consumption to help reduce the incidence of anemia among pregnant women.

Bivariate Analysis

Table 2.
Relationship Between Maternal Age and the Incidence of Anemia

Material Agne	Anemia Incident						p-value
	Anemia		Non Anemia		Total		
	f	%	f	%	f	%	
High Risk	8	72,7	3	27,3	11	100	0,045
Low Risk	22	37,35	37	62,7	59	100	

The analysis results presented in Table 2 show a significant relationship between maternal age and the incidence of anemia. Pregnant women in the high-risk age group had a much higher proportion of anemia compared to those in the low-risk age group. The p-value of 0.045 ($p < 0.05$) confirms that maternal age serves as a risk factor for anemia during pregnancy. Therefore, the higher the

maternal age, the greater the likelihood of developing anemia, indicating the need for more intensive health monitoring for pregnant women in the high-risk age group.

Tabel 3.
Hubungan antara Pendidikan dengan Kejadian Anemia

Education	Anemia Incident						p-value
	Anemia		Non Anemia		Total		
	f	%	f	%	f	%	
Basic Education	15	46,9	17	53,1	32	100	0,703
Higher Education	15	37,5	23	60,5	38	100	

Based on table 3, among the 32 pregnant women with basic education, 15 (46.9%) experienced anemia, while 17 (53.1%) did not. Meanwhile, among the 38 women with higher education, 15 (39.5%) experienced anemia and 23 (60.5%) did not. The comparison of proportions shows that the prevalence of anemia is slightly higher in the group with basic education compared to those with higher education. However, the difference in proportions between the two groups is not substantial. The statistical test result shows a p-value of 0.703, indicating that there is no significant relationship between education level and the incidence of anemia ($p > 0.05$).

Table 4.
Relationship Between Pregnancy Interval and the Incidence of Anemia

Pregnancy Interval	Anemia Incident						p-value
	Anemia		Non Anemia		Total		
	f	%	f	%	f	%	
High Risk	11	53,4	10	47,6	21	100	0,429
Low Risk	19	38,8	30	61,2	49	100	

Based on table 4, among the 21 pregnant women with a high-risk pregnancy interval, 11 (52.4%) experienced anemia, while 10 (47.6%) did not. In the low-risk pregnancy interval group consisting of 49 women, 19 (38.8%) experienced anemia and 30 (61.2%) did not. In percentage terms, the proportion of anemia cases is higher among women with a high-risk pregnancy interval. However, the difference in proportions between the two groups is not substantial. The p-value of 0.429 indicates that the relationship between pregnancy interval and the incidence of anemia is not statistically significant ($p > 0.05$).

Table 5.
Relationship Between Parity and the Incidence of Anemia

Parity	Anemia Incident						p-value
	Anemia		Non Anemia		Total		
	f	%	f	%	f	%	
High Parity	9	64,3	5	35,7	14	100	0,131
Low Parity	21	37,5	35	62,5	56	100	

Based on Table 5, among the 14 pregnant women with high parity, 9 (64.3%) experienced anemia, while 5 (35.7%) did not. In contrast, among the 56 women with low parity, 21 (37.5%) experienced anemia and 35 (62.5%) did not. The proportion of anemia cases is higher among women with high parity compared to those with low parity. However, the statistical test result shows a p-value of 0.131, indicating that there is no statistically significant relationship between parity and the incidence of anemia ($p > 0.05$).

Table 6.
Relationship Between Nutritional Status and the Incidence of Anemia

Nutritional Statuse	Anemia Incident						p-value
	Anemia		Non Anemia		Total		
	f	%	f	%	f	%	
At risk of CED	14	73,7	5	36,3	19	100	0,001
Normal	16	31,4	35	68,6	51	100	

Based on Table 6, among the 19 pregnant women with nutritional status at risk of CED, 14 (73.7%) experienced anemia, while only 5 (26.3%) did not. Meanwhile, among the 51 pregnant women with normal nutritional status, only 16 (31.4%) experienced anemia and 35 (68.6%) did not. The proportion of anemia among women with poor nutritional status is nearly twice as high as that

among women with normal nutritional status. The obtained p-value of 0.001 indicates a highly significant relationship between nutritional status and anemia ($p < 0.05$).

Table 7.
Relationship Between Compliance with Fe Tablet Consumption and the Incidence of Anemia

Compliance	Anemia Incident						p-value
	Anemia		Non Anemia		Total		
	f	%	f	%	f	%	
Compliance	26	92,9	2	7,1	28	100	0,000
Non-Compliant	4	9,5	38	90,5	42	100	

Based on Table 7, among the 28 pregnant women who were non-compliant in consuming Fe tablets, 26 (92.9%) experienced anemia, while only 2 (7.1%) did not. In contrast, among the 42 pregnant women who were compliant, only 4 (9.5%) experienced anemia, and 38 (90.5%) did not. This stark difference indicates a significant impact of supplement compliance on the incidence of anemia. The statistical test result shows a p-value of 0.000, meaning that the relationship between compliance with Fe tablet consumption and anemia is highly significant ($p < 0.05$).

Multivariate Analysis

Table 8.
Incidence of Anemia in Pregnant Women and Management Through Kelakai Pudding

Z	B	S.E	Wald	df	P value	OR	95% C.I.for EXP(B)	
							Lower	Upper
Age	1.581	1.251	1.595	1	0.207	4.858	0.418	56.446
Nutritional Status	2.112	1.045	4.801	1	0.043	8.264	1.065	60.889
Compliance with Fe Tablet Consumption	4.974	1.034	23.132	1	0.000	144.559	19.046	1.097.214
Constant	-14.172	3.975	12.712	1	0.000	0.000		

Based on Table 8, compliance with Fe tablet consumption is the most dominant variable affecting the incidence of anemia. The p-value for this variable is 0.000, indicating it is highly statistically significant ($p < 0.05$), with an odds ratio (OR) of 144.559. This means that pregnant women who do not comply with Fe tablet consumption are 144 times more likely to experience anemia compared to those who are compliant. In addition, nutritional status also has a significant effect on anemia, with a p-value of 0.043 and an OR of 8.264. Pregnant women at risk of chronic energy deficiency (CED) are 8 times more likely to suffer from anemia than those with normal nutritional status. Age, however, does not have a significant effect on anemia ($p = 0.207 > 0.05$), although the OR of 4.858 suggests a tendency toward higher risk. These results emphasize that the most relevant interventions to prevent anemia are improving compliance with Fe tablet consumption and enhancing maternal nutritional status.

DISCUSSION

The distribution of characteristics among pregnant women at Baamang I Health Center shows that most respondents fall into the low-risk age category, have higher education, low parity, safe pregnancy intervals, normal nutritional status, and compliance with Fe tablet consumption. Theoretically, these conditions should reduce the risk of anemia. However, the study results indicate that the prevalence of anemia remains high at 42.9%, suggesting that other factors influence anemia incidence in pregnant women. Most anemia cases were found among women with poor nutritional status and non-compliance with Fe tablets, consistent with the theory that nutritional status and supplement compliance are primary determinants of anemia (Ministry of Health, 2021). Anemia in pregnancy is closely related to increased physiological needs, particularly iron and other essential nutrients (Proverawati & Asfuah, 2018). According to the World Health Organization (2021), iron deficiency is the most common cause of anemia, especially in developing countries. This condition can be worsened by short pregnancy intervals, poor nutrition, and poor compliance with iron supplementation (WHO, 2021; Ministry of Health RI, 2020). These factors increase the

physiological burden on pregnant women, potentially affecting hemoglobin levels. Therefore, understanding basic maternal characteristics is essential for risk screening (WHO, 2021).

Univariate analysis showed that most pregnant women were in the low-risk age group (20–35 years), had low parity, safe pregnancy intervals, normal nutritional status, and were compliant with Fe tablets. Despite this, anemia prevalence remained high at 42.9%. Most anemia cases were found in women with poor nutritional status and those non-compliant with Fe tablet consumption. This aligns with WHO (2021), which states that anemia during pregnancy is generally caused by iron deficiency and non-compliance with iron supplements. Lestari and Suhartini (2023) also confirmed that pregnant women with poor nutritional status are at higher risk of anemia compared to well-nourished women. These findings indicate that although most demographic characteristics are in safe categories, behavioral factors and nutritional status still play a crucial role in preventing anemia (Lestari & Suhartini, 2023).

This study discussed that regular Fe tablet consumption is essential in preventing anemia, particularly due to increased iron requirements during pregnancy (Septi Kurniawati & Novi Pasiriani, 2023). Anemia in the third trimester occurs when Hb < 11 g/dL. Routine supplementation of iron or blood supplements benefits iron reserves, red blood cell synthesis, and muscle blood synthesis (Urip et al., 2020). These findings are consistent with the theory discussed, which emphasizes that maternal nutritional status is important in preventing anemia, particularly through adequate intake of iron, protein, vitamin C, and other nutrients (Patimbano et al., 2021). Chronic energy deficiency (CED) in pregnant women can reduce iron reserves, increasing the risk of anemia. Previous studies also indicate that pregnant women with insufficient nutrition are more prone to anemia due to unmet increased iron requirements during pregnancy (Omasti et al., 2021).

Bivariate analysis showed that maternal age, nutritional status, and compliance with Fe tablet consumption were significantly associated with anemia. Women under 20 or over 35 years have a higher risk of anemia than those aged 20–35, due to metabolic imbalances and suboptimal or reduced iron reserves in these age groups (Muliani et al., 2020; Gusnidarsih, 2020). Poor nutritional status also increases anemia risk, consistent with Patimbano et al. (2021), which stated that CED in pregnant women is associated with low hemoglobin levels. Moreover, non-compliance with Fe tablet consumption is significantly correlated with high anemia rates. Kurniawati and Pasiriani (2023) emphasized that women who do not comply with Fe tablets are at higher risk of anemia, with non-compliance often influenced by side effects, limited education, or incorrect consumption habits, such as taking Fe tablets with tea or coffee that inhibit iron absorption (Kurniawati & Pasiriani, 2023).

However, a study by Astuti and Handayani (2022) showed that maternal education is significantly associated with anemia incidence. Conducted in urban areas with good access to information and health services, women with higher education were more consistent in taking Fe tablets and maintaining a healthy diet. This contrasts with the current study, which found no significant relationship between education and anemia. The difference may be due to socioeconomic and geographic contexts, where education has not fully influenced health behavior. Therefore, the effectiveness of education as protection against anemia remains contextual. Researchers conclude that interventions to prevent anemia should prioritize factors that are statistically and clinically significant. Improving Fe tablet compliance and maternal nutritional status is more effective than solely increasing educational literacy. Preventive programs at primary health care facilities should emphasize routine monitoring and nutritional support. Empowering pregnant women through personalized education and strengthened nutrition counseling is a more targeted strategy.

Multivariate analysis showed that compliance with Fe tablet consumption is the dominant factor influencing anemia, with the highest odds ratio (OR), while nutritional status is also significantly

influential, albeit with a lower OR. Maternal age was not significant after controlling for other variables. These findings align with Sari, Puspitasari, and Dewi (2022), showing that non-compliance with Fe tablets increases anemia risk more than 100-fold, while poor nutritional status increases risk 6–8 times. This supports WHO (2021), which emphasizes that anemia in pregnancy is closely related to adequate iron intake, achievable only through regular supplementation and nutritious diets. Therefore, interventions should focus on improving Fe tablet compliance and monitoring maternal nutritional status, using individual education and active guidance during antenatal visits.

Research by Sari, Puspitasari, and Dewi (2022) in South Kalimantan confirmed that Fe tablet compliance is a strong predictor of anemia with an OR of over 100, and poor nutritional status increases risk 6–8 times. This is consistent with the findings at Baamang I Health Center, which show these two factors most influence maternal hemoglobin levels. Community-based nutritional interventions are effective in improving pregnant women's nutritional status. However, some urban studies show that nutrition is not the only dominant factor; Yuliani and Harahap (2023) in Jakarta found that psychological stress and helminth infections also contribute significantly to hemoglobin reduction. These differences indicate that anemia risk factors are contextual and vary based on population characteristics. Therefore, interventions must be tailored to the social and environmental background of pregnant women. This study underscores the need for an individualized approach in antenatal care.

CONCLUSION

Based on the study at Baamang I Health Center, Sampit in 2025, out of 70 respondents, 42.9% of pregnant women experienced anemia, with the majority in the low-risk age category and compliant with Fe tablet consumption. Factors significantly associated with anemia were age, nutritional status, and compliance with Fe tablet consumption, with non-compliance being the most dominant factor.

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