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Original Research

Determinants of Anemia among Pregnant Women at UPTD Puskesmas Seba, Sabu Raijua Regency

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A R T I C L E I N F O

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A B S T R A C T

Anemia during pregnancy remains a major public health problem associated with adverse maternal and fetal outcomes. This study aimed to analyze the determinants of anemia among pregnant women at UPTD Puskesmas Seba. A cross-sectional study was conducted involving 59 pregnant women. Data were collected using structured questionnaires and medical records and analyzed using chi-square tests. The study was conducted from January to June 2025. The results showed that 45.8% of respondents experienced anemia. Significant associations were found between gestational age ($p = 0.049$), nutritional status ($p < 0.001$), and socio-cultural factors ($p < 0.001$) with anemia incidence. However, parity was not significantly associated with anemia ($p = 0.807$). The findings indicate that anemia is a multifactorial condition influenced by physiological, nutritional, and socio-cultural determinants. Strengthening antenatal care, improving maternal nutrition, and addressing socio-cultural barriers are essential to reduce anemia prevalence among pregnant women.

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INTRODUCTION

Anemia during pregnancy remains a major global public health problem, affecting approximately 37–40% of pregnant women worldwide and contributing to maternal and perinatal morbidity and mortality (WHO, 2025). Although its impact on adverse outcomes such as preterm birth, low birth weight, and maternal complications has been widely documented, the persistence of high prevalence indicates that existing prevention strategies remain insufficient, particularly in low- and middle-income countries.

In Indonesia, anemia in pregnancy continues to be a significant health burden. The 2023 Indonesia Health Survey reported a prevalence of 27.7%, showing improvement from 48.9% in 2018; however, the rate remains high compared to several Southeast Asian countries, indicating uneven progress in maternal nutrition programs (Ministry of Health, 2023; Zheng et al., 2025). This suggests that national interventions such as iron supplementation and antenatal care coverage have not fully addressed the underlying determinants of anemia.

Previous studies have identified multiple contributing factors to anemia in pregnancy. Gestational age has been consistently associated with increased iron demand due to physiological changes across trimesters (Fitri et al., 2023; Aballo et al., 2025). Similarly, nutritional status is widely recognized as a strong predictor of anemia; however, while several studies report a significant relationship between chronic energy deficiency and anemia (Utama, 2021; Agusmarinda et al., 2025), others suggest that the effect may be influenced by dietary diversity and supplementation adherence.

In contrast, evidence regarding parity remains inconsistent, with some studies reporting significant associations due to depletion of iron stores in multiparous women (Yuvita et al., 2024), while others find no independent effect after controlling for socioeconomic and nutritional factors (Viamita et al., 2022; Alem et al., 2023). Sociocultural determinants such as food taboos, family support, and health-seeking behavior have also been identified as important contextual factors influencing maternal nutrition; however, their role is often understudied or analyzed separately rather than within an integrated framework (Hairuddin et al., 2024; Qamariyah et al., 2025). This inconsistency across studies highlights the need for context-specific and multidimensional analysis.

At the local level, anemia prevalence among pregnant women in Sabu Raijua Regency remains high, reaching 48.7% at Seba Community Health Center in 2024, exceeding the national average. Despite this burden, limited studies have simultaneously examined biological, nutritional, and sociocultural determinants in this setting. Most existing research tends to focus on isolated factors, which limits understanding of their combined effects in rural populations.

Therefore, this study aimed to analyze the relationship between gestational age, parity, nutritional status, and sociocultural factors with anemia incidence among pregnant women at Seba Community Health Center, Sabu Raijua Regency. The findings are expected to contribute to strengthening evidence-based maternal health interventions in high-burden rural areas.

METHOD

This cross-sectional study used secondary data from Maternal and Child Health (MCH) registers, antenatal care (ANC) records, and cohort monitoring sheets at Seba Community Health Center (UPTD Puskesmas), Sabu Raijua Regency, from January to June 2025. The study population included 346 pregnant women, of whom 59 were selected through purposive sampling based on complete medical records.

A total of 287 records were excluded due to missing hemoglobin results (n = 214) and incomplete data on key variables (n = 73). Additional exclusions included pregnant women with conditions that could affect hemoglobin levels, such as HIV/AIDS, malaria, tuberculosis, chronic kidney disease, thalassemia, and malignancies.

The study included one dependent variable and six independent variables. The dependent variable was anemia status, defined as hemoglobin <11 g/dL (trimester I and III) and <10.5 g/dL (trimester II). Independent variables were gestational age, parity, nutritional status (MUAC; CED <23.5 cm), maternal age, education level, and sociocultural factors.

Sociocultural factors were derived from secondary records assessing food taboos, family support, ANC attendance, and iron supplementation adherence and were categorized as positive or negative conditions. All data were obtained from routine health records without primary data collection.

Data were analyzed using univariate analysis and chi-square tests, with a significance level of $p < 0.05$. Ethical approval was obtained from the relevant ethics committee, and permission to access data was granted by Seba Community Health Center. All data were anonymized to maintain confidentiality.

RESULT

Univariate Analysis

Table 1. Frequency Distribution of Pregnant Women's Ages at the Seba Community Health Center

Age of Pregnant Women	f	%
<20 years old (Risky)	1	1,7
20-35 years old (Not Risky)	45	76,3
>35 years old (High Risk)	13	22
Total	**59**	**100%**

Based on Table 1, the majority of pregnant women were aged 20–35 years (76.3%). This was followed by those aged >35 years (22%), while a small proportion were aged <20 years (1.7%). The findings indicate that most respondents were within the 20–35 years age group, which is generally considered the optimal reproductive age due to lower maternal risk. However, a notable proportion of pregnant women belonged to high-risk age groups (<20 and >35 years). These age groups are associated with increased maternal risks, including pregnancy complications and a higher likelihood of anemia, which may be related to impaired iron metabolism and physiological adaptation during pregnancy.

Table 2. Frequency Distribution of Pregnancy Age Among Pregnant Women at the Seba Community Health Center

Gestational Age	f	%
Trimester I (0-<13 mg) (Risky)	23	39
Trimester II (13-<28 mg) (Not Risky)	28	47,5
Trimester III (>28 mg) (High Risk)	8	13,6
Total	**59**	**100%**

Based on Table 2, most pregnant women at Seba Community Health Center were in the second trimester (47.5%), followed by the first trimester (39%) and the third trimester (13.6%). Gestational age is an important factor related to maternal health conditions, including anemia risk. The second trimester is generally considered a relatively stable period of pregnancy, during which antenatal care attendance tends to increase. However, the first trimester is a critical phase in which physiological adaptation begins, and iron requirements start to increase, making women susceptible to anemia if nutritional intake is inadequate. In contrast, although the proportion of women in the third trimester is lower, this stage is associated with a higher risk of anemia due to increased blood volume expansion and greater iron demand in preparation for delivery. These findings suggest that anemia prevention efforts should be implemented throughout pregnancy, with particular attention to early and late gestational stages through adequate nutrition, hemoglobin monitoring, and regular antenatal care

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Table 3. Frequency Distribution of Parity Among Pregnant Women at the Seba Community Health Center

Maternal Parity	f	%
Risky (≥3)	23	39
Not Risky (<3)	36	61
Total	**59**	**100%**

Based on Table 2, most pregnant women at Seba Community Health Center were in the second trimester (47.5%), followed by the first trimester (39%) and the third trimester (13.6%). Gestational age is an important factor related to maternal health conditions, including anemia risk. The second trimester is generally considered a relatively stable period of pregnancy, during which antenatal care attendance tends to increase. However, the first trimester is a critical phase in which physiological adaptation begins and iron requirements start to increase, making women more susceptible to anemia if nutritional intake is inadequate. In contrast, although the proportion of women in the third trimester is lower, this stage is associated with a higher risk of anemia due to increased blood volume expansion and greater iron demand in preparation for delivery. Overall, these findings suggest that anemia prevention efforts should be implemented throughout pregnancy, with particular attention to early and late gestational stages through adequate nutrition, hemoglobin monitoring, and regular antenatal care.

Table 4. Frequency Distribution of Nutritional Status of Pregnant Women at the Seba Community Health Center

Nutritional Status of Pregnant Women	f	%
Chronic Energy Deficiency (CED)	18	30,5
No CED	41	69,5
Total	**59**	**100%**

Based on Table 4, most pregnant women at Seba Community Health Center had good nutritional status (69.5%), while 30.5% experienced chronic energy deficiency (CED). Nutritional status is a key determinant of maternal and fetal health during pregnancy. Although most respondents were classified as having adequate nutritional status, a considerable proportion still experienced CED. This condition may adversely affect fetal growth and development and increase the risk of pregnancy complications, including low birth weight. Therefore, strengthening maternal nutrition through health education, regular nutritional monitoring, and continuous support from healthcare providers is essential to reduce the prevalence of CED and improve pregnancy outcomes.

Table 5. Distribution of Socio-Cultural Characteristics of Pregnant Women at the Seba Community Health Center

Anemia in Pregnant Women	f	%
Negative	32	54,2
Positive	27	45,8
Total	**59**	**100%**

Based on Table 5, most pregnant women at Seba Community Health Center were not anemic (54.2%), while 45.8% experienced anemia. The findings indicate that although more than half of the respondents had normal hemoglobin levels, the proportion of anemia remains relatively high. This condition may be influenced by socio-cultural factors, including dietary habits, food restrictions, level of nutritional knowledge, and family support. These factors can affect dietary intake and iron consumption during pregnancy, thereby contributing to the occurrence of anemia.

Table 6. Frequency Distribution of Anemia in Pregnant Women at the Seba Community Health Center

Anemia in Pregnant Women	f	%
Anemia	27	45,8
No Anemia	32	54,2
Total	**59**	**100%**

Based on Table 6, 54.2% of pregnant women at Seba Community Health Center were not anemic, while 45.8% had anemia, indicating a relatively high prevalence. The findings suggest that anemia remains a significant health problem among pregnant women. This condition may be associated with several contributing factors, including inadequate iron intake, poor nutritional status, closely spaced pregnancies, and low adherence to iron supplementation. These factors can negatively affect hemoglobin levels during pregnancy. The results of this study are consistent with Harahap (2021), who reported that anemia in pregnancy is a major nutritional problem that increases the risk of complications for both mothers and fetuses.

Bivariate Analysis

The results of the analysis of the relationship between gestational age and parity with the incidence of anemia in pregnant women at UPTD Puskesmas Seba, Sabu Raijua Regency, are as follows:

Table 7. Relationship between Gestational Age and Anemia Incidence in Pregnant Women at UPTD Puskesmas Seba, Sabu Raijua District

Gestational Age	No Anemia	Anemia (n/%)	Total (n/%)	*p-value*
Trimester I (0–<13 weeks)	3 (5.1%)	3 (5.1%)	3 (5.1%)	
Trimester II (13–<28 weeks)	2 (3,4%)	26 (44,1%)	28 (47,5%)	0,049
Trimester III (>28 weeks)	0 (0%)	8 (13,6%)	8 (13,6%)	
Total	**5 (8.5%)**	**5 (8.5%)**	**5 (8.5%)**	

Based on Table 7, most pregnant women with anemia were in the second trimester (44.1%), followed by the first trimester (33.9%) and the third trimester (13.6%). Meanwhile, women without anemia were predominantly in the first and second trimesters, while none were recorded in the third trimester. The Chi-square test showed a statistically significant association between gestational age and anemia incidence (p = 0.049), indicating that gestational age is significantly associated with the occurrence of anemia among pregnant women.

Table 8. Relationship between Parity and Anemia in Pregnant Women at UPTD Puskesmas Seba, Sabu Raijua District

Parity	No Anemia (n/%)	Anemia (n/%)	Total (n/%)	*p-value*
Risky (≥3)	1 (1,7%)	22 (37,3%)	23 (39%)	
Not Risky(<3)	4 (6,8%)	32 (54,2%)	36 (61%)	0,807
Total	5 (8,5%(	54 (91,5%)	59 (100%)	

Based on Table 8, anemia was more prevalent among pregnant women in the non-risk parity group (54.2%) compared to the risk parity group (37.3%). Meanwhile, the proportion of non-anemic women was relatively low in both groups. The Chi-square test showed no statistically significant association between parity and anemia incidence (p = 0.807), indicating that parity was not associated with anemia status in this study.

Table 9. Relationship between Nutritional Status and Anemia Incidence in Pregnant Women at UPTD Puskesmas Seba, Sabu Raijua District

Categories	Anemia (n/%)	No Anemia (n/%)	Total (n/%)	*p-value*
CED	16 (88,9%)	2 (11,1%)	18 (100%)	
No CED	12 (29,3%)	29 (70,7%)	41 (100%)	0,001
Total	28 (47,5%)	31 (52,5%)	59 (1005)	

Based on Table 9, anemia was more prevalent among pregnant women with chronic energy deficiency (CED) (88.9%) compared to those without CED (29.3%). Conversely, the majority of pregnant women without CED did not experience anemia (70.7%). The Chi-square test showed a statistically significant association between nutritional status and anemia incidence (p = 0.001), indicating that nutritional status is associated with anemia among pregnant women. Pregnant women with CED are more likely to experience anemia due to inadequate intake of essential nutrients, including iron, folic acid, and protein, which are required for hemoglobin synthesis. Poor nutritional status reduces the body's ability to meet increased physiological demands during pregnancy, thereby increasing the risk of anemia. These findings are consistent with previous studies reporting that maternal nutritional status is a major determinant of anemia during pregnancy.

Table 10. Relationship between Socio-Cultural Factors and Anemia in Pregnant Women at UPTD Puskesmas Seba, Sabu Raijua District

Categories	**Anemia (n/%)**	**No Anemia (n/%)**	**Total (n/%)**	***p-value***
Negative	28 (87,5%)	4 (12,5%)	32 (100%)	
Positive	0 (0%)	27 (100%)	27 (100%)	0,001
Total	28 (47,5%)	31 (52,5%)	59 (1005)	

Based on Table 10, most pregnant women with negative socio-cultural factors experienced anemia (87.5%), while all respondents with positive socio-cultural conditions were not anemic (100%). The Chi-square test indicated a statistically significant association between socio-cultural factors and anemia incidence (p = 0.001), suggesting that socio-cultural conditions are associated with anemia status among pregnant women. Negative socio-cultural factors, such as food taboos, low family support, and infrequent antenatal care visits, are associated with an increased risk of anemia in pregnancy. In contrast, positive socio-cultural environments encourage healthier behaviors, including regular antenatal care visits, adherence to iron supplementation, and adequate nutritional intake. These conditions play an important role in shaping maternal health behaviors and influencing anemia prevention during pregnancy.

DISCUSSION

Univariate Analysis

Maternal Age

Most respondents were aged 20–35 years (76.3%), followed by those aged >35 years (22.0%) and <20 years (1.7%). This indicates that pregnancy in the study area predominantly occurs within the reproductive age group.

This finding is consistent with studies reporting that 20–35 years is the optimal reproductive age due to mature reproductive function and better physiological adaptation. In contrast, pregnancy at <20 years is associated with biological immaturity, while age >35 years is linked to declining physiological reserves and an increased risk of anemia and obstetric complications (Obianeli, 2024; Rosita & Afrianti, 2021; Pitriani et al., 2023).

The relatively high proportion of women aged >35 years is noteworthy, as advanced maternal age has been associated with reduced iron reserves and a higher risk of comorbidities (Noli et al., 2021; Mardiah et al., 2021). These findings reinforce reproductive age as an important determinant of maternal health outcomes.

Gestational Age

Most respondents were in the second trimester (47.5%), followed by the first trimester (39.0%) and third trimester (13.6%). This distribution is consistent with antenatal care patterns, where the second trimester is considered a relatively stable phase that encourages increased utilization of health services. Previous studies indicate that anemia risk increases as pregnancy progresses, particularly in the second and third trimesters, due to rising iron requirements and plasma volume expansion (Aballo, 2025; De Freitas-Costa, 2025). These findings highlight the importance of early initiation of antenatal care and continuous monitoring throughout pregnancy, particularly from the first trimester.

Maternal Parity

Most respondents were in the non-risk parity group (<3 births) at 61.0%, while 39.0% were in the high-risk group (≥3 births). This finding aligns with studies suggesting that high parity may increase the risk of anemia due to repeated depletion of iron stores across successive pregnancies and lactation periods. However, literature also indicates that parity alone is not always an independent predictor of anemia, as its effect is influenced by nutritional status, birth spacing, and antenatal care utilization (Viamita, 2022; Alem, 2023). Thus, parity should be considered a contextual factor rather than a sole determinant of maternal anemia.

Nutritional Status (CED)

Most respondents had normal nutritional status (69.5%), while 30.5% experienced chronic energy deficiency (CED). This result is consistent with studies indicating that maternal nutritional status is a key determinant of anemia during pregnancy. CED reflects long-term inadequate intake of essential nutrients such as iron, folic acid, and protein, which are required for hemoglobin synthesis (Saputro, 2022; Yuristrianti et al., 2024). Previous studies consistently report that poor nutritional status increases the risk of anemia, whereas adequate nutrition acts as a protective factor (Fakhriza et al., 2024; Ermanto, 2025).

Socio-Cultural Factors

Most respondents had positive socio-cultural conditions (approximately 57.6%), while the rest were categorized as negative. Studies show that the socio-cultural environment plays a major role in shaping maternal dietary behavior and healthcare utilization. Similar research reports that cultural beliefs, food taboos, and family support significantly influence nutritional intake during pregnancy (Hairuddin, 2024; Qamariyah, 2025; Gustanela, 2022). Supportive environments promote better antenatal care attendance and supplementation adherence, whereas negative environments reduce iron intake and increase the risk of anemia.

Anemia Status

Most respondents were not anemic (54.2%), while 45.8% had anemia. This prevalence indicates that anemia remains a moderate public health problem among pregnant women in the study area. Similar findings have been reported in other developing settings, where anemia persists despite supplementation programs due to dietary insufficiency and limited adherence to iron supplementation guidelines (Harahap, 2021; WHO, 2021).

Bivariate Analysis

Gestational Age and Anemia

The analysis showed a significant association between gestational age and anemia ($p = 0.049$). Anemia cases were more frequently observed among women in the second trimester, followed by the first and third trimesters. This finding is consistent with studies reporting that anemia risk increases during pregnancy due to progressive physiological changes, particularly plasma volume expansion and increased fetal iron demand. The second trimester represents a transitional phase in which maternal iron requirements rise significantly, while the third trimester is associated with the highest physiological demand (Aballo, 2025; De Freitas-Costa, 2025). Compared to previous studies, this pattern confirms that gestational age is an important determinant of anemia, although it should not be interpreted as a causal factor. Other variables such as dietary intake, iron supplementation adherence, and infection status may also influence hemoglobin levels (Chen, 2024). These findings highlight the importance of early antenatal screening and continuous monitoring throughout all trimesters, particularly starting from the first trimester.

Parity and Anemia

No significant association was found between parity and anemia ($p = 0.807$), indicating that parity does not independently influence anemia status among the respondents. This result is consistent with several studies reporting that parity alone is not a strong predictor of anemia when confounding factors such as nutritional intake, birth spacing, and antenatal care utilization are considered (Viamita, 2022; Alem, 2023). However, other studies suggest that high parity may contribute to iron depletion due to repeated pregnancies and lactation, particularly in populations with poor nutritional status. The inconsistency between studies suggests that parity functions more as a contextual risk factor rather than an independent determinant of anemia. Therefore, maternal anemia should be understood as a multifactorial condition influenced by both biological and behavioral factors.

Nutritional Status (CED) and Anemia

A significant association was found between nutritional status and anemia ($p < 0.001$), indicating that chronic energy deficiency (CED) is associated with an increased risk of anemia. Pregnant women with CED had a markedly higher proportion of anemia compared to those without CED. This can be biologically explained by insufficient intake of essential nutrients such as iron, folic acid, and protein, which are required for hemoglobin synthesis and erythropoiesis (Utama, 2021). These findings are strongly supported by previous studies reporting that poor maternal nutritional status significantly increases the risk of anemia during pregnancy (Agusmarinda, 2025; Hidayah, 2025). Nutritional deficiencies not only affect maternal hemoglobin levels but also contribute to adverse fetal outcomes. Compared with prior research, this study reinforces nutritional status as a key determinant of anemia, emphasizing that iron supplementation alone is insufficient without adequate overall dietary intake.

Socio-Cultural Factors and Anemia

A highly significant association was found between socio-cultural factors and anemia ($p < 0.001$). Women with negative socio-cultural conditions had a much higher prevalence of anemia compared to those with positive conditions. This finding aligns with previous research showing that the socio-cultural environment strongly influences maternal health behaviors, including dietary practices, healthcare utilization, and adherence to iron supplementation (Satriani et al., 2025; Zein, 2025; Hairuddin et al., 2024). Negative socio-cultural influences such as food taboos, low family support, and infrequent antenatal care visits reduce nutritional intake and limit access to preventive services. In contrast, positive socio-cultural environments encourage healthy dietary habits, supplementation adherence, and regular antenatal care visits. Compared with other studies, this result highlights that anemia prevention cannot rely solely on medical interventions but must also address cultural beliefs and family-level support systems.

CONCLUSION

The study found a high prevalence of anemia among pregnant women (45.8%). Gestational age, nutritional status, and socio-cultural factors were significantly associated with anemia, while parity was not. Anemia was more common in early trimesters and among women with poor nutritional status or negative socio-cultural conditions. These findings highlight the need for early screening, nutritional improvement, iron supplementation, and attention to socio-cultural influences, supported by healthcare providers and families. Further large-scale longitudinal studies are recommended.

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