JPPIPA 11(4) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Community-Based Analysis of Anemia Risk Factors in Pregnant Women at Primary Healthcare

Anita Dahliana[1*], Adinda Rizkita N. H[1], Chentya Catheriane L [1], Geraldy Aziz S. H[1], Isro Rafidatus S[1], Ketut Ayu O. S[1], Rinandha Yusfahreza W[1], Dyan Eka Puspitasari[2], Farida Yan Pratiwi Kurnia[2]

[1]Kedokteran, Fakultas Kedokteran, Universitas Surabaya, Surabaya-Indonesia
[2]Puskesmas Kebomas, Gresik, Indonesia.

Received: December 08, 2024
Revised: March 13, 2025
Accepted: April 25, 2025
Published: April 30, 2025

Corresponding Author:
Anita Dahliana
anitadahliana@staff.ubaya.ac.id

DOI: 10.29303/jppipa.v11i4.10875

Abstract: Anemia during pregnancy remains a significant public health concern, particularly in developing countries, where it contributes to adverse maternal and fetal outcomes. Data from Puskesmas Kebomas, Gresik, indicates that between July 2022 and June 2023, there were 167 cases of anemia among pregnant women across 11 villages. Anemia in pregnant women is influenced by various factors, including gestational age, parity, dietary patterns, infections during pregnancy, education level, economic status, and adherence to iron tablet consumption. In Kebomas District, Kedanyang Village recorded the highest number of anemia cases among pregnant women. This study was a descriptive cross sectional study using questionnaire for determine the risk of anemia in pregnant woman in Desa Kedanyang, Kebomas through interview. The result will processed to find the cause of anemia. Incidence of anemia in pregnancy in Desa Kedanyang, Kebomas is disobedient of consuming iron tablets (21 people) and the pregnancy interval less than 2 years (16 people). **Conclusion:** The incidence of anemia in pregnancy Desa Kedanyang, Kebomas is mostly caused by non-compliance with the consumption of iron tablets and a pregnancy interval less than 2 years.

Keywords: Anemia; Iron tablets; Pregnancy; Risk factors.

Introduction

Anemia during pregnancy is a major global health issue, disproportionately affecting women in developing countries (Zulkifal et al., 2022). This condition occurs when there is a deficiency of red blood cells or hemoglobin, reducing the blood's ability to deliver oxygen to body tissues (Aji et al., 2020). The World Health Organization (WHO) classifies anemia in pregnancy as a hemoglobin level lower than 11 g/dL (Stephen et al., 2018).

Pregnancy triggers significant physiological changes, including a 20–30% increase in plasma volume to support fetal growth. This expansion necessitates a higher intake of iron and vitamins to sustain optimal hemoglobin (Hb) levels for both the mother and the fetus. Various factors contribute to anemia in pregnant women, such as the number of pregnancies, age, childbirth history, dietary habits, infections, educational background, economic conditions, and adherence to iron supplement consumption (Zulkifal et al., 2022). Anemia is more prevalent among pregnant women in developing nations compared to those in developed countries (Stephen et al., 2018).

The most prevalent form of anemia during pregnancy in Indonesia is iron deficiency anemia, accounting for 62.3% of cases. This condition can lead to complications such as miscarriage, premature birth, weak uterine contractions, prolonged labor, uterine atony, severe bleeding, and shock. The consequences of iron deficiency anemia extend beyond maternal health to fetal outcomes, with fetal mortality rates reported between 12% and 28%, perinatal mortality at 30%, and

How to Cite:
Dahliana, A., H, A. R. N., L, C. C., H, G. A. S., S, I. R., S, K. A. O., … Kurnia, F. Y. P. (2025). Community-Based Analysis of Anemia Risk Factors in Pregnant Women at Primary Healthcare. *Jurnal Penelitian Pendidikan IPA*, *11*(4), 862-871. https://doi.org/10.29303/jppipa.v11i4.10875

neonatal mortality ranging from 7% to 10%. Due to these significant risks, anemia in pregnancy is often considered a "serious threat to both mother and child," as it affects not only maternal well-being but also fetal development (Aji et al., 2020).

According to WHO data from 2019, anemia among pregnant women is the second most common health issue in Asian countries, with a prevalence rate of 36.5% (Dim & Onah, 2007). In Indonesia, it ranks as the fifth most prevalent disease among pregnant women. The Basic Health Research (RISKESDAS) conducted in Indonesia in 2013 found a 37.1% prevalence of anemia in pregnant women, which rose to 48.9% in 2018, indicating a continuous upward trend in cases (Afifah et al., 2020).

Data from the Kebomas Primary Health Center in Gresik Regency show that between July 2022 and June 2023, 167 pregnant women across 11 villages were diagnosed with anemia. Kedanyang Village reported the highest number of cases, with 40 pregnant women affected, followed by Kembangan Village with 32 cases and Randuagung Village with 26 cases.

Considering the high incidence of anemia during pregnancy, identifying its causes and risk factors is essential to prevent further cases. Implementing comprehensive strategies that address nutrition, education, and medical interventions is necessary to effectively lower the prevalence of anemia among pregnant women in Gresik Regency, particularly in Kedanyang Village, where cases are most concentrated.

Method

This research employs a descriptive approach with a cross-sectional method, utilizing a questionnaire as the primary instrument to identify risk factors associated with anemia in pregnant women. The study was conducted at Kebomas Public Health Center from September to October 2023. The sample was selected using a total sampling technique, encompassing all pregnant women diagnosed with anemia in Kedanyang Village, Kebomas, from July 2022 to June 2023.

The questionnaire included inquiries regarding respondents' demographic characteristics (such as marital status, religion, and education level) and various risk factors contributing to anemia in pregnancy . These factors included the age at last pregnancy, nutritional status, parity, pregnancy spacing, the number and frequency of Ante Natal Care (ANC) visits, frequency of iron supplement intake, history of previous illnesses, and adherence to iron tablet consumption. The data were gathered through in-depth interviews with pregnant women suffering from anemia in Kedanyang Village, Kebomas.

The collected data were analyzed using a theoretical-descriptive approach, focusing on categorical data processing through statistical methods. The analysis examined factors such as age at last pregnancy, nutritional status, parity, pregnancy spacing, number and frequency of ANC visits, iron supplement intake frequency, history of previous illnesses, and compliance with iron tablet consumption. The hypothesis was tested using descriptive analysis, involving sum and mean calculations with the Statistical Package for Social Sciences (SPSS). Descriptive statistics were used to determine the distribution and frequency of respondents' characteristics. Additionally, the correlation between variables such as age at last pregnancy, nutritional status, parity, pregnancy spacing, ANC visit frequency, iron supplement intake, history of previous illnesses, and compliance with iron tablet consumption was assessed using Spearman correlation analysis.

Result and Discussion

The characteristics of respondents show that the number of pregnant women in Kedanyang Village, Kebomas District, Gresik Regency, who are all married is 34 people (100%). Based on the religion they adhere to, all respondents are Muslim. Based on the level of education, it is known that the number of pregnant women who have education > SMP is 31 people (91.2%). This shows that the level of education is quite high as represented in Table 1.

Table 1. Frequency Distribution of Respondent Characteristics in Pregnant Women with Anemia

Characteristics	Frequency	Percentage %
Marital status:		
Married	34	100
Not married yet	0	0
Religion:		
Islam	34	100
Kristen	0	0
Hindu	0	0
Budha	0	0
Education:		
< Junior high school	3	8.8
> Junior high school	31	91.2

The relationship between marital status and anemia in pregnant women is complex. However, marital status is typically considered a demographic factor rather than a direct biomedical cause of anemia. Marital status can indirectly affect a pregnant woman's access to resources, social support, and healthcare. Married pregnant women are more likely to have financial and emotional support from their partners, which can improve their

ability to access nutritious food, prenatal care, and supplements (Al-Mutawtah et al., 2023). In this study, all participants who were pregnant were legally married.

A healthy diet for pregnant women means that the food consumed must meet the required calorie intake and essential nutrients, such as carbohydrates, fats, proteins, vitamins, minerals, and water, according to their needs. This dietary pattern is influenced by several factors, including habits, preferences, culture, religion, economic status, and the environment. As a result, these factors affecting the eating patterns of pregnant women have an impact on their nutritional status (Happiness et al., 2021). In this study, all pregnant women are Muslim.

Lower levels of education often correlate with limited knowledge about proper nutrition, prenatal care, and hygiene practices, all of which increase the risk of anemia during pregnancy. Occupation can also impact access to healthcare services and resources. Additionally, lower family incomes may restrict access to nutritious food and essential healthcare services, exacerbating the risk of anemia during pregnancy (Zulkifal et al., 2022). Furthermore, the lack of knowledge among young women about the importance of iron intake can also contribute to the high prevalence of anemia (Afifah et al., 2020).

The level of education influences the incidence of anemia, particularly in terms of the ability to receive nutritional information and how easily a person acquires knowledge. The higher the education level, the easier it is for someone to absorb nutritional information (Priyanto, 2018). Education level also affects how individuals act and seek causes and solutions in their lives. Educated individuals are more receptive to new ideas. Similarly, highly educated mothers are more likely to undergo regular prenatal check-ups to maintain their health and that of their unborn child (Panjaitan et al., 2019). Increasing knowledge through education and information is a crucial step in changing behaviour.

Table 2. Hemoglobin Levels in Mothers with Anemia in Kedanyang Village

HB (Hemoglobin)	Frequency	Percentage %
<11 g/dL	34	100
>11 g/dl	0	0
Total	34	100

The results showed that pregnant women in Kedanyang Village experienced anemia. Table 2 shows that there are 34 pregnant women with Hb levels below 11 in Kedanyang Village. Therefore, it can be stated that 34 respondents have anemia.

Anemia is a condition in which hemoglobin levels are below normal. At low Hb levels, several studies have suggested that the synthesis of corticotropin-releasing hormone induces maternal and fetal stress, increasing the risk of complications such as pregnancy-induced hypertension, eclampsia, and premature rupture of membranes. Hemoglobin levels below 10 g/dL in the third trimester also increase the risk of low birth weight (LBW) by 3.6 times (Jung et al., 2019).

Risk factors that can cause anemia include maternal age during pregnancy, nutritional status, parity, pregnancy spacing, ANC visits, the number of iron tablets consumed per trimester, adherence to iron tablet consumption, and a history of pre-existing diseases.

Anemia in pregnancy remains a significant public health concern, particularly in developing countries like Indonesia and Ghana (Aji et al., 2020). The prevalence of anemia among pregnant women in Indonesia is notably high, with recent data indicating that nearly half of all pregnant women in the country are affected (Afifah et al., 2020). This is consistent with global trends, where anemia affects a substantial proportion of pregnant women, contributing to maternal and prenatal deaths (Ramadhannanti et al., 2019). Factors such as inhibited fetal growth, bleeding during labor, and low infant weight have been linked to anemia during pregnancy (Nurdin et al., 2018).

Table 3. Risk Factors for Anemia Based on Last Gestational Age

Gestational age	Frequency	Percentage %
<20 years	4	11.8
20-30 years	29	85.3
>35 years	1	2.9
Total	34	100

Table 3 describes maternal age when pregnant. The majority of pregnant women are between 20-30 years old. Based on the table above, it is known that pregnant women aged 20-30 years are 29 people (85.3%), pregnant women aged 35 years are 1 person. Pregnant women <20 years are 4 people.

Age is closely related to the maturity of the female reproductive system. The ideal age range for pregnancy is between 20-35 years. Pregnancies in women under 20 years old are considered biologically and emotionally immature. This mental vulnerability often leads to instability, resulting in a lack of attention to fulfilling essential nutritional needs during pregnancy. Meanwhile, pregnancies in women over 35 years old are associated with a decline in immune function, making them more susceptible to various diseases, including infections, which can contribute to the occurrence of anemia (Wu et al., 2020). The high prevalence of anemia among pregnant women aged 15-24 years underscores the need for targeted interventions to address iron deficiency in this age group (Afifah et al., 2020).

Based on maternal age during pregnancy, women under 20 years old tend to experience mental

unpreparedness in facing pregnancy, making them more susceptible to complications. This lack of preparedness can lead to inadequate attention to nutritional fulfillment, including iron intake. Meanwhile, for women over 35 years old, maternal health begins to decline, and the birth canal becomes less flexible, affecting the nutritional needs required. Pregnancies in this age group are often classified as high-risk, with an increased likelihood of complications such as preeclampsia, miscarriage, and prolonged labor (Madoué et al., 2019).

Age is a significant demographic factor influencing various health outcomes, including the risk of anemia during pregnancy. Advanced maternal age, typically defined as 35 years or older, has been associated with increased risks of adverse pregnancy outcomes such as gestational diabetes, pre-eclampsia, and chromosomal abnormalities in the fetus (Aji et al., 2020). Teenage pregnancies also carry substantial risks, including a higher likelihood of preterm birth, low birth weight, and maternal mortality. The prevalence of anemia is highest among women aged 15-24 years. This is attributed to several factors, including inadequate nutritional intake, poor iron stores, and the physiological demands of growth and development in adolescent mothers (Merid et al., 2023).

Table 4. Risk Factors for Anemia Based on Nutritional Status

Nutritional Status	Frequency	Percentage %
Poor nutrition MUAC <23.5 cm	7	20.6
Normal nutrition MUAC >23.5 cm	27	79.4
Total	34	100

Based on table 4, most pregnant women have normal nutritional status. Based on the table above, 7 pregnant women have poor nutritional status (MUAC 23.5).

Mid-upper arm circumference (MUAC) has been recognized as a rapid assessment tool adopted to monitor nutritional status and is highly correlated with BMI. MUAC allows for the evaluation of protein intake and storage, which is associated with severe malnutrition. A study conducted showed a relationship between MUAC and the incidence of anemia, where a MUAC measurement of less than <23.5 cm indicates poor nutrient absorption in the body, including hemoglobin levels (Ghosh et al., 2019).

Good nutrition is essential for maintaining optimal health during pregnancy, as it directly impacts both the mother and the developing fetus (Nguyen et al., 2017). Poor nutritional status, characterized by low mid-upper arm circumference, is associated with low birth weight (Ghosh et al., 2019). The proportion of undernourished women of reproductive age with a body mass index of less than 18.5 kg/m2 is very high in South Asia, exceeding 20% (Nguyen et al., 2017).

Nutritional status, as indicated by measurements like mid-upper arm circumference, plays a crucial role in determining a pregnant woman's susceptibility to anemia. Poor nutritional status, characterized by inadequate intake of essential nutrients such as iron, folate, and vitamin B12, can lead to decreased hemoglobin production and subsequent anemia (Zulkifal et al., 2022).

Table 5. Risk Factors for Anemia Based on Parity

Parity	Frequency	Percentage %
Number of children <3	22	64.7
Number of children >3	6	17.6
No children yet	6	17.6
Total	34	100

Based on Table 5, the majority of participants had fewer than three children, totaling 22 individuals (64.7%). Meanwhile, six individuals (17.6%) had more than three children, and another six had no children.

Parity is an important factor to consider in preventing anemia in pregnant women. The more frequently a woman experiences pregnancy and childbirth, the more iron reserves her body utilizes, making her more susceptible to anemia. Nutritional issues linked to anemia include insufficient intake of protein, carbohydrates, and micronutrients (vitamins and minerals). Additionally, non-compliance with iron tablet consumption remains a significant cause of anemia in pregnant women, despite government programs that provide 90 iron tablets to support maternal health (Suryanarayana et al., 2017). From the parity Table 5, it is evident that most pregnant women have fewer than three children. Mothers with parity >3 face a higher risk of anemia due to the increased demands on their bodies from multiple pregnancies.

Parity refers to the number of pregnancies that have resulted in a fetus capable of surviving outside the womb. Women who experience multiple pregnancies are at a higher risk of developing anemia in subsequent pregnancies if their nutritional needs are not adequately met. This is because, during pregnancy, essential nutrients are distributed between the mother and the fetus. Having more than three pregnancies is a significant risk factor for anemia, as frequent pregnancies can deplete the mother’s nutrient reserves (Yuniarwati & Fitriasari, 2022).

Table 6. Risk Factors for Anemia Based on Pregnancy Spacing

Pregnancy Spacing	Frequency	Percentage %
Spacing <2 years	16	47.2
Spacing 2-5 years	9	26.4
Spacing >5 years	5	14.7
First child	4	11.7
Total	34	100

Table 6 shows that the most common pregnancy spacing is less than 2 years, with 16 women (47.2%). Pregnancy spacing of 2-5 years was found in 9 women (26.4%), spacing of more than 5 years in 5 women (14.7%), and first pregnancies in 4 women (11.7%).

In this study, a significant number of women experienced closely spaced pregnancies. Pregnancy spacing refers to the time interval between the current pregnancy and the previous one. The ideal pregnancy spacing is at least 2 years. A gap of less than 2 years is associated with a higher proportion of maternal mortality. Closely spaced pregnancies hinder the full recovery of the reproductive system and uterus. Additionally, short pregnancy intervals increase the risk of anemia due to the mother's iron stores not being fully replenished, leading to depletion for fetal development (Sanga et al., 2020). Short interpregnancy intervals, defined as less than 18 months between the end of one pregnancy and the beginning of the next, have been associated with adverse maternal and infant outcomes, including anemia, preterm birth, and low birth weight (Suryanarayana et al., 2017). Shorter birth intervals can lead to maternal depletion of essential nutrients such as iron and folate, increasing the risk of anemia in subsequent pregnancies (Ayele et al., 2023). Short interpregnancy intervals, defined as less than 24 months between the delivery of one child and the conception of the next, have been associated with adverse maternal and infant health outcomes (McKinney et al., 2017).

Table 7. Risk Factors for Anemia Based on ANC Visits

Number of ANC visits	Frequency	Percentage %
Trimester 1 and 2		
a. Number of visits <1	6	17.6
b. Number of visits 1	28	82.4
Total	34	100
Trimester 3		
a. Number of visits <2	4	11.8
b. Number of visits 2	30	88.2
Total	34	100

Based on table 7, it is known that most pregnant women visit ANC >1 in the 1st and 2nd trimesters and ANC >2 in the 3rd trimester. Antenatal care is a crucial component of prenatal care that involves regular check-ups and interventions to monitor the health of both the mother and the developing fetus (Suryanarayana et al., 2017). ANC (Antenatal Care) examinations during pregnancy can significantly impact the health status of both the mother and the fetus. Regular ANC visits help minimize potential pregnancy complications. A study conducted by Dolang (2020) found a correlation between irregular ANC visits and the incidence of anemia. ANC services play a crucial role in reducing the prevalence of anemia during pregnancy.

During ANC visits, healthcare providers assess various health indicators, provide essential supplements, and offer health education to pregnant women. The World Health Organization recommends that pregnant women initiate antenatal care in the first trimester to improve maternal health outcomes. Late initiation of antenatal care, particularly after the first trimester, can result in missed opportunities for early detection and management of risk factors associated with anemia (Kouanda et al., 2023).

The WHO emphasizes the importance of early and continuous antenatal care visits for positive pregnancy experiences (Khatri et al., 2022). The detection of high-risk pregnancies through the analysis of socioeconomic, medical, and obstetrical factors represents a key element of ANC. It is also often used as a platform for additional interventions that have been shown to positively influence the maternal (Kuhnt & Vollmer, 2017).

Table 8. Risk Factors for Anemia Based on the Number of Iron Tablets Consumed

Consumption of Iron Tablets	Frequency	Percentage %
Trimester 1		
a. <30 tablets	19	55.8
b. >30 tablets	15	44.2
Total	34	100
Trimester 2		
a. <60 tablets	14	41.2
b. >60 tablets	20	58.8
Total	34	100
Trimester 3		
a. <90 tablets	12	35.3
b. >90 tablets	22	64.7
Total	34	100

Based on table 8, it is known that more than half of pregnant women consume more than 30, 60, and 90 iron tablets. One of the primary drivers of anemia in pregnant women is iron deficiency, which can be exacerbated by factors such as poor nutritional intake and parasitic infections. Iron tablet consumption is essential for pregnant women, especially in areas with high anemia prevalence.

The use of iron supplements is an important method to prevent anemia during pregnancy. Iron supplementation is an effective strategy for preventing and treating iron deficiency anemia during pregnancy (Khatri et al., 2022).

The daily iron needs for pregnant women cannot be met by food intake alone. Iron deficiency is associated with decreased work capacity, impaired immune function, and adverse pregnancy outcomes. During pregnancy, the demand for iron increases, leading to a higher risk of anemia. Additionally, there is a disproportionate increase in plasma volume compared to red blood cell mass, resulting in a physiological decline in hemoglobin (Hb) levels during mid-trimester. Hemoglobin concentration plays a crucial role in nutrition, particularly in iron status, and can help identify neonatal adverse effects. Therefore, early intervention measures, such as iron supplementation, are essential to prevent complications (Lestari & Saputro, 2022).

Table 9. Risk Factors for Anemia Based on Medical History

Medical History	Frequency	Percentage %
Anemia	18	52.9
Blood Disorders	-	-
Diabetes Mellitus	1	2.9
Hipertention	3	8.8
None	12	35.3
Total	34	100

Based on Table 9, the majority of pregnant women had a history of anemia, with 18 individuals (52.9%). Additionally, 12 women (35.3%) had no comorbidities, 3 women (8.8%) had hypertension, and 1 woman (2.9%) had diabetes mellitus. Pregnant women with chronic diseases experience prolonged inflammation, which can affect the production of healthy red blood cells. As a result, pregnant women with chronic illnesses are at a higher risk of developing anemia due to inflammation and acute infections (Pinto, 2017). The presence of anemia during gestation can precipitate a cascade of complications, encompassing increased risks of maternal mortality, intrauterine growth restriction, and impaired neurodevelopment in offspring, thereby underscoring the imperative for proactive screening and management strategies. Several studies have shown a relationship between infections during pregnancy and the incidence of anemia in pregnant women. Additionally, other studies have indicated that infections such as malaria during pregnancy can lead to anemia. Factors such as age, parity, nutritional status, and adherence to iron tablet consumption also play a role in the incidence of anemia in pregnant women (Sifakis & Pharmakides, 2000). Socioeconomic status, encompassing income, education, and access to healthcare services, also plays a pivotal role in determining the nutritional status and overall health of pregnant women (Panjaitan et al., 2019).

Table 10. Risk Factors for Anemia Based on Compliance with Iron Tablet Consumption

Compliance with Iron Tablet Consumption	Frequency	Percentage %
Compliant	13	38.2
Non-compliant	21	61.8
Total	34	100

Based on table 10, it is known that the majority of pregnant women are not compliant in taking iron tablets, as many as 21 people. From interviews with pregnant women, the main reasons for non-compliance with iron supplement (TTD) consumption include forgetfulness due to laziness or fatigue from daily activities, side effects such as nausea and vomiting, a lack of awareness due to the absence of symptoms during pregnancy, insufficient knowledge about the benefits of TTD, and a lack of support from both themselves and their families. Compliance with TTD consumption plays a crucial role in preventing anemia, as higher adherence leads to increased hemoglobin levels in the blood (Atika Suri et al., 2022).

Iron tablets (Fe) are essential minerals needed during pregnancy for both the mother and the baby. Since the baby's body cannot store its own iron reserves, it must absorb iron from the mother. Irregular consumption of iron tablets can significantly impact fetal growth and the health of the newborn (Ramadhini & Dewi, 2021).

To address anemia in pregnant women, the government has implemented a program providing 90 iron tablets throughout pregnancy. However, some women still do not adhere to this supplementation. Previous studies have shown a strong correlation between anemia in pregnant women and compliance with iron tablet consumption, with 72.2% of anemic pregnant women not regularly taking their iron tablets (Maryanto, 2021).

The spatial distribution of anemia among pregnant women reveals critical insights into geographical disparities and localized risk factors (Ayele et al., 2023). Medication compliance during pregnancy has a substantial effect on maternal and fetal health outcomes. Non-compliance with iron supplementation during pregnancy poses a substantial risk, exacerbating the potential for iron deficiency anemia and its attendant adverse effects on both maternal and fetal well-being (Tegodan et al., 2021).

Table 11. Signs of Anemia

Weakness, Fatigue, Lethargy	Frequency	Percentage %
Yes	12	35.3
No	5	14.7
Sometimes	17	50.0
Total	34	100

Based on Table 11, it is known that most pregnant women sometimes experience fatigue, weakness, and lethargy, with as many as 17 people, while 12 people experience it, and 5 people do not.

Common symptoms of anemia include fatigue, shortness of breath, chest pain, headaches, pale skin, cold extremities, spoon-shaped nails (koilonychia), and a pale tongue, which can be observed during a physical examination (Weckmann et al., 2023).

The manifestation of symptoms such as fatigue, weakness, and lethargy in pregnant women underscores the physiological challenges encountered during gestation, wherein the heightened metabolic demands and hormonal fluctuations contribute to a propensity for exhaustion and diminished energy reserves.

Socioeconomic disparities and environmental determinants exert considerable influence on the prevalence and distribution of anemia among pregnant women. Populations residing in resource-constrained settings often encounter barriers to accessing nutritious food, sanitation facilities, and healthcare services, thereby amplifying their susceptibility to nutritional deficiencies and infectious diseases, which are established risk factors for anemia (Ayele et al., 2023).

Table 12. Analysis of the Relationship Between Risk Factors for Anemia

Risk factors	Signs of Anemia
Previous medical history	0.542
Compliance with Iron Supplement Consumption	0.358
Nutritional status	0.027*
Pregnancy spacing	0.213
Parity	0.169
Hemoglobin levels	0.677
ANC visits in the 1st and 2nd trimesters	0.884
ANC visit in the 3rd trimester	0.212
Iron supplement consumption in the 1st trimester	0.628
Iron supplement consumption in the 2nd trimester	0.638
Iron supplement consumption in the 3rd trimester	0.425

* Spearman's correlation ($p<0.05$; CI = 95%)

Table 12 shows that the risk factor of nutritional status and the incidence of anemia has a p-value <0.05 and a correlation coefficient (r) ranging from $0.3 < r \leq 0.7$, indicating a moderate relationship between nutritional status and anemia incidence. Meanwhile, previous disease history, compliance with iron supplement (TTD) consumption, pregnancy spacing, parity, ANC visits in the first, second, and third trimesters, as well as iron supplement consumption in the first, second, and third trimesters, have a p-value >0.05 and a correlation coefficient (r) ranging from $-0.3 \leq r < 0$ and $0 < r \leq 0.3$, indicating a weak relationship between these seven risk factors and anemia incidence.

The intricate interplay between nutritional status and anemia underscores the significance of holistic dietary interventions and nutritional support initiatives in mitigating the burden of anemia among pregnant women. Anemia is a prevalent nutritional deficiency disorder among pregnant women, particularly in developing countries, leading to adverse pregnancy outcomes and posing risks to both mother and fetus (Suryanarayana et al., 2017). The prevalence of anemia during pregnancy varies due to socioeconomic conditions, lifestyles, and health-seeking behaviors. Inadequate nutrition, characterized by deficiencies in iron, vitamin B12, and other essential nutrients, is a primary driver of anemia in pregnant women. Parasitic infections and chronic blood loss exacerbate the problem. Globally, anemia affects 1.62 billion people, with pregnant women accounting for approximately 38% of cases, with a disproportionate burden in Africa, especially Sub-Saharan Africa (Ayele et al., 2023). The impact of anemia on pregnancy outcomes is substantial, leading to inhibited fetal growth, bleeding during labor, low infant weight, and placental size abnormalities (Nurdin et al., 2018).

Poor nutrition during pregnancy affects the incidence of anemia. A proper dietary pattern includes eating three main meals a day accompanied by snacks. Food should contain carbohydrates, animal protein, plant-based protein, vegetables, and fruits. Fruits are essential for the body as they help neutralize the body's pH balance (Ilmiyati et al., 2021). Malnutrition during pregnancy exerts a profound and multifaceted influence on maternal and fetal well-being, predisposing pregnant women to heightened susceptibility to infections, impaired immune function, and adverse pregnancy outcomes, encompassing preterm birth and low birth weight (Suryanarayana et al., 2017).

Anemia during pregnancy remains a significant public health concern, particularly in developing countries, where it contributes to adverse maternal and fetal outcomes (Ayele et al., 2023).

Conclusion

Based on the research findings and discussion, it can be concluded that many pregnant women are still not compliant in consuming iron (Fe) tablets during pregnancy, as revealed through interviews. Additionally, the results of the Spearman correlation analysis indicate that maternal nutritional status plays a role in the occurrence of anemia in this study. It is imperative to implement comprehensive interventions

encompassing nutrition education, iron supplementation, and prevention to mitigate the risk of anemia during pregnancy and improve maternal and child health outcomes.

Acknowledgments
The researcher would like to thank Puskesmas Kebomas for granting permission and providing support in conducting research in Desa Kedanyang. The support and cooperation given are highly valuable for the smooth execution of this research.

Author Contributions
This paper was written by nine authors, all of whom contributed to its content.

Funding
This research received no external funding.

Conflicts of Interest
The authors declare no conflict of interest.

References

Afifah, T., Sugiharti, R., R., S., N., K., & Rizkianti, A. (2020). Knowledge Profile About Anemia and Disparity Among Adolescent 15–24 years in Indonesia - 2012 and 2017. *Proceedings of the 5th Universitas Ahmad Dahlan Public Health Conference (UPHEC)*. https://doi.org/10.2991/ahsr.k.200311.044

Aji, A. S., Yusrawati, Y., Malik, S. G., & Lipoeto, N. I. (2020). Prevalence of anemia and factors associated with pregnant women in West Sumatra, Indonesia: Findings from VDPM Cohort Study. *Jurnal Gizi Dan Dietetik Indonesia (Indonesian Journal of Nutrition and Dietetics)*, *7*(3), 97. https://doi.org/10.21927/ijnd.2019.7(3).97-106

Al-Mutawtah, M., Campbell, E., Kubis, H.-P., & Erjavec, M. (2023). Women's experiences of social support during pregnancy: a qualitative systematic review. *BMC Pregnancy and Childbirth*, *23*(1), 782. https://doi.org/10.1186/s12884-023-06089-0

Atika Suri, W. A., Puspitasari, D. R., Pradipta, N. R., Ismawati, I., Zainu, L. A., Darmawan, N. M. E. P., Namira, D. S., Jamil, F. F. S., Yudiaprijah, S., Rahayu, E., & Hermansyah, A. (2022). Gambaran Faktor Penyebab Ketidakpatuhan Ibu Hamil dalam Mengonsumsi Tablet Tambah Darah di Era Pandemi Covid-19. *Jurnal Farmasi Komunitas*, *9*(2), 110–116. https://doi.org/10.20473/jfk.v9i2.24149

Ayele, M. A., Fenta, H. M., Zike, D. T., & Tesfaw, L. M. (2023). Spatial distribution and trends of anemia among pregnant women in Ethiopia: EDHS 2005–2016. *Frontiers in Public Health*, 11. https://doi.org/10.3389/fpubh.2023.1089383

Dim, C. C., & Onah, H. E. (2007). *The prevalence of anemia among pregnant women at booking in Enugu*. PubMed.

Dolang, M. W. (2020). Hubungan Kepatuhan Mengonsumsi Tablet Fe Dan Keteraturan Kunjungan ANC Dengan Kejadian Anemia Pada Ibu Hamil. *Jurnal Keperawatan Muhammadiyah*, *5*(1). https://doi.org/10.30651/jkm.v5i1.4189

Ghosh, S., Spielman, K., Kershaw, M., Ayele, K., Kidane, Y., Zillmer, K., Wentworth, L., Pokharel, A., Griffiths, J. K., Belachew, T., & Kennedy, E. (2019). Nutrition-specific and nutrition-sensitive factors associated with mid-upper arm circumference as a measure of nutritional status in pregnant Ethiopian women: Implications for programming in the first 1000 days. *PLOS ONE*, *14*(3), 214358. https://doi.org/10.1371/journal.pone.0214358

Happiness, W.-C. I., Amukeru, A. G., & Janet, D. N. (2021). The Behavioural Pattern of Pregnant Mothers towards Antenatal Clinics and Its Implications on their Nutritional Knowledge in Obio-Akpor Local Government Area, Rivers State. *European Journal of Nutrition & Food Safety*, 12–23. https://doi.org/10.9734/ejnfs/2021/v13i430399

Ilmiyati, L., Indarto, D., & Wasita, B. (2021). Daily Consumption of Fruits and Vegetables Has Different Correlations With Haemoglobin Levels in Young Women at Karanganyar Regency. *Proceedings of the International Conference on Health and Medical Sciences (AHMS*. https://doi.org/10.2991/ahsr.k.210127.026

Jung, J., Rahman, M. M., Rahman, M. S., Swe, K. T., Islam, M. R., Rahman, M. O., & Akter, S. (2019). Effects of hemoglobin levels during pregnancy on adverse maternal and infant outcomes: a systematic review and meta-analysis. *Annals of the New York Academy of Sciences*, *1450*(1), 69–82. https://doi.org/10.1111/nyas.14112

Khatri, R. B., Assefa, Y., & Durham, J. (2022). Assessment of health system readiness for routine maternal and newborn health services in Nepal: Analysis of a nationally representative health facility survey, 2015. *PLOS Global Public Health*, *2*(11), 1298. https://doi.org/10.1371/journal.pgph.0001298

Kouanda, S., Ouedraogo, A. M., Sogo, A. E., Bagaya, O., Sorgho, T. E. V, Hien, Y. C., Gbenou, D. V, Sawadogo Windsouri, S. R., Zoungrana, W., Dadjoari, M., Zombré Sanou, V. M., Usmanova, G., Jain, Y., Chahar, R., Kumar, S., Kumar, S. V. V, Srivastava, A., Nair, T. S., Sarkar, A. H., & Lorencatto, F. (2023). New Antenatal Model in Africa and India (NAMAI) study: implementation research to improve antenatal care using WHO recommendations. *Health Research Policy and*

Systems, *21*(1), 82. https://doi.org/10.1186/s12961-023-01014-5

Kuhnt, J., & Vollmer, S. (2017). Antenatal care services and its implications for vital and health outcomes of children: evidence from 193 surveys in 69 low-income and middle-income countries. *BMJ Open*, *7*(11), 17122. https://doi.org/10.1136/bmjopen-2017-017122

Lestari, C. R., & Saputro, A. A. (2022). Hubungan Lingkar Lengan Atas (LILA) Dan Kadar Hemoglobin Dengan Kejadian Anemia Pada Ibu Hamil Trimester III. *Jurnal Kesehatan Tambusai*, *3*(3), 384–395. https://doi.org/10.31004/jkt.v3i3.6516

Madoué, G. B., Ihagadang, F., & Ngarmbaye, M. (2019). Pregnancy and delivery in advanced maternal age: epidemiologic aspects and prognosis. *The Journal of Medical Research*, *5*(6), 239–242. https://doi.org/10.31254/jmr.2019.5610

Maryanto, E. P. (2021). Kepatuhan Ibu Hamil Terhadap Konsumsi Tablet Besi. *Suatu Kajian Literature Review. Syifa' Medika: Jurnal Kedokteran Dan Kesehatan*, *12*(1), 1. https://doi.org/10.32502/sm.v12i1.2628

McKinney, D., House, M., Chen, A., Muglia, L., & DeFranco, E. (2017). The influence of interpregnancy interval on infant mortality. *American Journal of Obstetrics and Gynecology*, *216*(3), 316 1–316 9. https://doi.org/10.1016/j.ajog.2016.12.018

Merid, M. W., Chilot, D., Alem, A. Z., Aragaw, F. M., Asratie, M. H., Belay, D. G., & Kibret, A. A. (2023). An unacceptably high burden of anaemia and it's predictors among young women (15–24 years) in low and middle income countries; set back to SDG progress. *BMC Public Health*, *23*(1), 1292. https://doi.org/10.1186/s12889-023-16187-5

Nguyen, P. H., Sanghvi, T., Kim, S. S., Tran, L. M., Afsana, K., Mahmud, Z., Aktar, B., & Menon, P. (2017). Factors influencing maternal nutrition practices in a large scale maternal, newborn and child health program in Bangladesh. *PLOS ONE*, *12*(7), 179873. https://doi.org/10.1371/journal.pone.0179873

Nurdin, M. S., Hadju, V., Ansariadi, A., Zulkifli, A., & Arundhana, A. I. (2018). Determinants of anemia among pregnant women in jeneponto regency. *Asian Pacific Journal of Health Sciences*, *5*(1), 135–138. https://doi.org/10.21276/apjhs.2018.5.1.28

Panjaitan, P. R. M., Santosa, H., & Utama, S. (2019). Associations between Education, Knowledge, Attitude, and Maternal Intention on Antenatal Care Visit. *Journal of Maternal and Child Health*, *4*(6), 516–521. https://doi.org/10.26911/thejmch.2019.04.06.12

Pinto, I. C. (2017). The Impact of Chronic Diseases during Pregnancy on the Fetus and Mother Health: A Literature Review. *Women's Health Science Journal*, *1*(1). https://doi.org/10.23880/WHSJ-16000101

Priyanto, L. D. (2018). The Relationship of Age, Educational Background, and Physical Activity on Female Students with Anemia. *Jurnal Berkala Epidemiologi*, *6*(2), 139. https://doi.org/10.20473/jbe.V6I22018.139-146

Ramadhannanti, K. D., Puji Wahyuningsih, H., & Setiyawati, N. (2019). Factors Affecting Anaemia among Pregnant Women in Tegalrejo Public Health Center. *Proceedings of the 5th International Conference on Health Sciences (ICHS)*. https://doi.org/10.2991/ichs-18.2019.8

Ramadhini, D., & Dewi, S. S. S. (2021). Hubungan Umur, Paritas dan Kepatuhan Konsumsi Tablet Tambah Darah Dengan Kejadian Anemia pada Ibu Hamil di Puskesmas Batunadua Kota Padangsidimpuan Tahun 2021. *Jurnal Kesehatan Ilmiah Indonesia (Indonesian Health Scientific Journal)*, *6*(2), 148. https://doi.org/10.51933/health.v6i2.600

Sanga, L. A., Mtuy, T., Philemon, R. N., & Mahande, M. J. (2020). Inter-pregnancy interval and associated adverse maternal outcomes among women who delivered at Kilimanjaro Christian Medical Centre in Tanzania, 2000-2015. *PLOS ONE*, *15*(2), 228330. https://doi.org/10.1371/journal.pone.0228330

Sifakis, S., & Pharmakides, G. (2000). Anemia in Pregnancy. *Annals of the New York Academy of Sciences*, *900*(1), 125–136. https://doi.org/10.1111/j.1749-6632.2000.tb06223.x

Stephen, G., Mgongo, M., Hussein Hashim, T., Katanga, J., Stray-Pedersen, B., & Msuya, S. E. (2018). Anaemia in Pregnancy: Prevalence, Risk Factors, and Adverse Perinatal Outcomes in Northern Tanzania. *Anemia*. https://doi.org/10.1155/2018/1846280

Suryanarayana, R., Chandrappa, M., Santhuram, A., Prathima, S., & Sheela, S. (2017). Prospective study on prevalence of anemia of pregnant women and its outcome: A community based study. *Journal of Family Medicine and Primary Care*, *6*(4), 739. https://doi.org/10.4103/jfmpc.jfmpc_33_17

Tegodan, E., Tura, G., & Kebede, A. (2021). Adherence to Iron and Folic Acid Supplements and Associated Factors Among Pregnant Mothers Attending ANC at Gulele Sub-City Government Health Centers in Addis Ababa, Ethiopia. *Patient Preference and Adherence*, *15*, 1397–1405. https://doi.org/10.2147/PPA.S301630

Weckmann, G., Kiel, S., Chenot, J.-F., & Angelow, A.

(2023). Association of Anemia with Clinical Symptoms Commonly Attributed to Anemia—Analysis of Two Population-Based Cohorts. *Journal of Clinical Medicine*, *12*(3), 921. https://doi.org/10.3390/jcm12030921

Wu, Y., Ye, H., Liu, J., Ma, Q., Yuan, Y., Pang, Q., Liu, J., Kong, C., & Liu, M. (2020). Prevalence of anemia and sociodemographic characteristics among pregnant and non-pregnant women in southwest China: a longitudinal observational study. *BMC Pregnancy and Childbirth*, *20*(1), 535. https://doi.org/10.1186/s12884-020-03222-1

Yuniarwati, N. P., & Fitriasari, B. (2022). Analysis of Eating Patterns and Pregnancy Distance with the Incidence of Anemia in Pregnant Women in Macanan Village, Loceret Public Health Center, Nganjuk Regency. *Open Access Health Scientific Journal*, *3*(1), 27–33. https://doi.org/10.55700/oahsj.v3i1.26

Zulkifal, S., Sarwar, S., Saddique, M., Yaqoob, K., Muneer, A., Fatima, A., Kabir, A., Asad Mangat, M., Mateen, L., Javed, Z., & Manzoor, M. (2022). Anemia during Pregnancy and Its Prevalence. In *Primary Health Care. IntechOpen*. https://doi.org/10.5772/intechopen.99521