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Maternal Characteristics and Iron Intake as a Factors of Iron Deficiency Anemia among Pregnant Women

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ABSTRACT: Pregnancy is a critical period for fetal growth and development, nutritional issues can significantly affect both maternal and fetal health. This phase is marked by increased nutritional needs to support fetal development and maintain maternal well-being. This study investigates the prevalence and risk factors of iron deficiency anemia among pregnant women in Parung Panjang District Health Center, Indonesia. A cross-sectional study was conducted on 92 pregnant women, examining various maternal characteristics and nutrient adequacy levels. The prevalence of anemia was found to be 36%. Parity emerged as a significant factor, with primipara mothers showing a higher anemia rate (46%) compared to multipara mothers (23.8%). Iron intake adequacy was also significantly associated with anemia status (p = 0.050). Women with insufficient iron intake had a higher rate of anemia (45.7%) compared to those with sufficient intake (26.1%). Other factors such as maternal age, education, and vitamin C intake did not show significant associations with anemia. These findings highlight the importance of targeted interventions for primipara mothers and emphasize the crucial role of adequate iron intake during pregnancy. The study underscores the need for comprehensive anemia prevention strategies in prenatal care.

KEYWORDS: Anemia, Iron, Paritas, Protein

INTRODUCTION

Pregnancy represents a crucial phase for fetal growth and development, during which nutritional issues can have profound implications for both maternal and fetal health [1]. This period is characterized by increased nutritional demands to support the developing fetus and maintain maternal well-being. Among the various nutritional challenges encountered during pregnancy, iron deficiency anemia stands out as one of the most prevalent and concerning issues. Iron deficiency anemia has shown a worrying upward trend in recent years [2], [3]. The global prevalence of anemia in pregnancy is reported at 29.9% [4]. Despite efforts to reduce its incidence, particularly in developing countries, anemia remains widespread. Data in Indonesia, its prevalence among pregnant women has significantly increased from 37.1% in 2013 to 48.9% in 2018 [5]. This substantial rise underscores the growing importance of addressing this health concern in prenatal care.

Anemia during pregnancy is clinically defined as a hemoglobin level of <11 g/d [6], [7]. This reduction in hemoglobin can have far-reaching consequences for both the mother and the developing fetus. The etiology of anemia in pregnancy is multifactorial, influenced by a complex interplay of various determinants. The factors influencing anemia in pregnancy can be broadly categorized into three main groups: basic, indirect, and direct factors. Basic factors encompass fundamental socio-economic and cultural aspects, including socioeconomic conditions, knowledge about prenatal health, education level, and cultural practices. Indirect factors, while not directly causing anemia, can significantly impact its likelihood. These include the frequency of Antenatal Care visits, parity, maternal age, and spousal support. Direct factors are the immediate causes or contributors to anemia, such as dietary patterns, adherence to iron supplementation, presence of infectious diseases, and incidents of bleeding. Understanding these multifaceted factors is crucial for developing effective interventions and improving prenatal care strategies to prevent and manage anemia during pregnancy [8]–[11].

Extensive research in this field has consistently demonstrated a strong correlation between inadequate nutrient intake, especially insufficient iron consumption, and the occurrence of anemia in pregnant women [1], [9], [10], [12]. This underscores the critical importance of proper nutrition and iron supplementation during pregnancy as key strategies in preventing and managing anemia. Given the significant impact of anemia on maternal and fetal health outcomes, understanding these multifaceted factors is crucial for

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developing effective interventions and improving prenatal care strategies. It highlights the need for a comprehensive approach to anemia prevention and management, encompassing not only medical interventions but also addressing broader socio-economic and cultural factors that influence maternal health and nutrition during pregnancy. This research aims to comprehensively examine anemia in pregnant women, focusing on its prevalence and underlying causes. The study were investigate pregnancy characteristics and nutrient adequacy levels, determine the prevalence of anemia among pregnant women, and explore the relationships between these factors and the occurrence of anemia during pregnancy.

METHOD

Design of the study

This research was a quantitative study with a cross-sectional design conducted from July to August 2024 at the Parung Panjang District Health Center, Bogor Regency, Indonesia. This health center served as a primary healthcare facility for the local community, making it an ideal setting for collecting data on maternal health and anemia prevalence among pregnant women in the region.

Population and Subject

This study involved pregnant women who had undergone prenatal check-ups at the Parung Panjang Community Health Center, Bogor Regency. The sample consisted of pregnant women from early to late trimester, who were selected through accidental sampling. The inclusion criteria for this sample encompassed pregnant women who had check-ups at the Research Community Health Center, were in good health, aged 18 to 35 years, and were willing to sign informed consent after receiving an explanation. The number of subjects in this study was 92 pregnant women.

Research Variables

The variables in this study include maternal age, education, parity, nutrient intake, and anemia status. Maternal age was assessed using a questionnaire, with results categorized as high risk (mother's age < 20 years and > 35 years) or low risk (mother's age 20-35 years), measured on a nominal scale. Maternal education, also measured via questionnaire, was categorized as High or Low on an ordinal scale. Parity was determined through a questionnaire, with results classified as high risk (parity ≥ 4) or low risk (parity 2-3) on an ordinal scale. Anemia was measured using a Rapid Test Check to determine hemoglobin levels, categorized as Anemic (Hb < 11 g/dL) or Non-Anemic (Hb ≥ 11 g/dL) on an ordinal scale. Iron sufficiency levels were assessed using a Semi-Quantitative Food Frequency Questionnaire (FFQ), comparing average iron intake from food and beverages to the Recommended Dietary Allowance (RDA). Results were categorized as Sufficient (> 77% RDA) or Insufficient (≤ 77% RDA) on an ordinal scale.Protein adequacy was also measured using the Semi-FFQ, comparing average protein intake to the RDA. Results were categorized as Adequate (90-110% RDA) or Inadequate (<90% or >110% RDA) on an ordinal scale. Finally, Vitamin C sufficiency was assessed using the Semi-FFQ to determine the average intake of Vitamin C from food and beverages. Results were categorized as Sufficient (≥ 77% RDA) or Insufficient (≤ 77% RDA), also measured on an ordinal.

Sampling technique and data analysis

Data processing and analysis were conducted using SPSS version 23 and Nutrisurvey, through several structured stages. First, univariate analysis was performed to understand the distribution of research variables, including maternal age, maternal education, nutritional status, parity, anemia, and the adequacy of iron, protein, and vitamins. This analysis provided a detailed picture of the prevalence of these conditions in the research sample. The second stage was bivariate analysis, which focused on measuring the relationship between each variable and the occurrence of anemia. This analysis was essential in identifying which variables had the potential to be risk factors for anemia. The final stage was the chi-square test, used to verify the existence of significant relationships between these variables and the occurrence of anemia. With this test, we could determine which variables were statistically significant as risk factors for anemia. The statistical test used was the chi-square test.

RESULTS AND DISCUSSION

Characteristic of Respondent

Table 1 presents the characteristics of the 92 respondents in this study, focusing on four variables: gestational age, maternal age, maternal occupation, and maternal education. These variables provide important context for understanding the study population and potential factors that may influence anemia prevalence during pregnancy. Gestational age is crucial as it can affect the risk of anemia,

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with iron requirements increasing as pregnancy progresses. The majority of respondents (48.9%) were in their third trimester, potentially representing a higher-risk group for anemia. Maternal age is another significant factor, with 80.4% of mothers falling within the 20-35 year age range, generally considered the optimal childbearing years. The high proportion of unemployed mothers (93.5%) might indicate lower socioeconomic status, which could impact nutrition and healthcare access. Lastly, the predominance of low maternal education (64.1%) is noteworthy, as education level can influence health literacy and prenatal care practices. These demographic characteristics provide valuable insights into the study population and may help interpret the prevalence and risk factors of anemia in this group of pregnant women.

Table 1. Characteristics of respondent

Variables	Frequency	
	n (92)	%
Gestational Age		
First Trimester	14	15.2
Second Trimester	33	35.9
Third Trimester	45	48.9
Maternal Age		
<20 years	8	8.7
20-35 years	74	80.4
>35 years	10	10.9
Maternal Occupation		
Unemployed	86	93.5
Employed	6	6.5
Maternal Education		
Low	59	64.1
High	33	35.9
Family Income		
<4,500,000	66	71.7
≥4,500,000	26	28.3

Prevalence of Iron Deficiency Anemia among Pregnant Women

Figure 1 provides a clear visual representation of the anemia status among the study participants. The data shows a significant presence of anemia in this population, with 36% of the participants affected by the condition. This blue segment of the chart represents those diagnosed with anemia, while the larger red segment, comprising 64% of the circle, represents participants with normal hemoglobin levels. The high prevalence of anemia, affecting more than one-third of the study group, underscores the importance of this health issue among pregnant women in the study. This finding has potential implications for prenatal care strategies and nutritional interventions, highlighting the need for targeted approaches to address anemia in this population

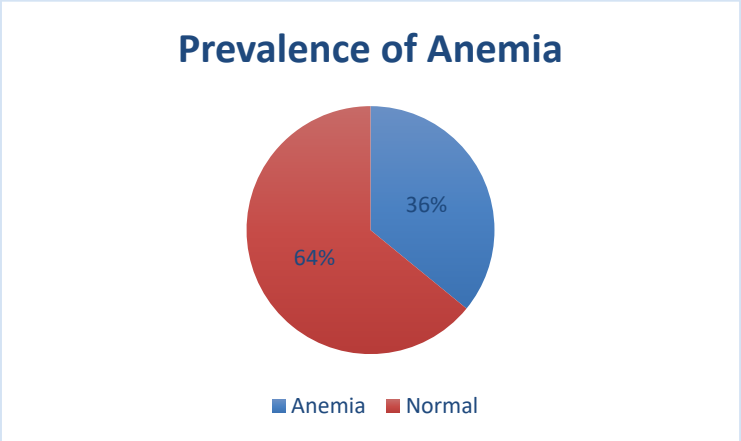

Figure 1. Prevalence of Iron Deficiency Anemia among Pregnant Women

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Risk Factors of Iron Deficiency Anemia among Pregnant Women

This study investigated multiple variables and their relationship to anemia during pregnancy. This study examined a range of factors including maternal age, household income, educational attainment, history of infections, and level of knowledge about anemia and nutrition. Interestingly, our statistical analysis revealed that these variables did not show significant differences in the prevalence of anemia among our study participants. This finding highlights the complex nature of anemia in pregnancy, suggesting that its occurrence may not be easily predicted by these commonly considered factors alone. However, our research uncovered a notable exception to this trend. Parity, which refers to the number of times a woman has given birth, emerged as the most statistically significant factor in our study ($p = 0.027$). This result provides valuable insights into the distribution of anemia among pregnant women. Specifically, we found that primipara mothers - those experiencing their first pregnancy - had a considerably higher rate of anemia (46%) compared to their multipara counterparts - women who have had previous pregnancies - (23.8%).

To further illustrate this point, our data showed that 54% of primipara mothers maintained normal hemoglobin levels, while a substantial 76.2% of multipara mothers fell within the normal range. This disparity underscores the potential protective effect that previous pregnancies might have against anemia, possibly due to increased awareness, better preparedness, or physiological adaptations from prior experiences. These findings emphasize the multifaceted nature of anemia in pregnancy and highlight the crucial role that parity plays among the various factors we studied. The results suggest that healthcare providers should special attention to first-time mothers when screening for and preventing anemia during pregnancy. Additionally, our research opens up new avenues for further investigation. It would be valuable to conduct more in-depth studies to understand why primipara mothers might be at a higher risk for anemia. Such research could explore various aspects including physiological changes, nutritional habits, and healthcare-seeking behaviors unique to first-time pregnancies. Moreover, our findings point to the need for developing targeted interventions specifically designed for primipara women. These interventions could include enhanced nutritional counseling, more frequent anemia screenings, and tailored educational programs that address the unique challenges faced by first-time mothers. By focusing on this higher-risk group, we may be able to significantly reduce the overall prevalence of anemia in pregnancy and improve maternal and fetal outcomes [13]–[15].

Table 2. Maternal Characteristic and anemia status

Variables	Anemia Status				p Value
	Normal		Anemia		
	n	%	n	%	
Age					
Not at Risk	48	64.9	26	35.1	0.650
At Risk	4	50.0	4	50.0	
Income					
< Minimum Wage	41	62.1	25	37.9	0.522
> Minimum Wage	18	69.2	8	30.8	
Parity					
Primipara	27	54.0	23	46.0	0.027*
Multipara	32	76.2	10	23.8	
Education					
Low	35	59.3	24	40.7	0.199
High	24	72.7	9	27.3	
Infection History					
None	1	33.3	2	66.7	0.258
Present	58	65.2	31	34.8	
Knowledge Level					
Poor	32	71.1	13	28.9	0.172
Adequate	27	57.4	20	42.6	

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Table 3 presents data on the relationship between nutrient adequacy levels and anemia status in pregnant women. The table is divided into three main categories: Protein Adequacy Level, Iron Adequacy Level, and Vitamin C Adequacy Level. For each nutrient, it shows the distribution of women with normal hemoglobin levels and those with anemia, along with the corresponding p-values for statistical significance. This study shows that there's no significant difference in anemia rates between those with adequate and inadequate protein intake (p = 0.613). This Table 3 shows the most significant relationship with anemia status (p = 0.050). Women with insufficient iron intake have a higher rate of anemia (45.7%) compared to those with sufficient intake (26.1%). Similar to protein, there's no significant difference in anemia rates based on vitamin C intake (p = 0.613). These results suggest that iron intake is the most crucial factor among these nutrients in relation to anemia status during pregnancy, highlighting the importance of adequate iron supplementation or dietary intake for pregnant women.

Iron is essential for the production of hemoglobin, the protein in red blood cells responsible for carrying oxygen throughout the body. During pregnancy, a woman's blood volume increases by about 50%, requiring a significant increase in iron to support this expansion and meet the growing needs of the fetus. When iron intake is insufficient, the body cannot produce enough hemoglobin, leading to anemia [16]–[18]. Our findings emphasize the importance of ensuring adequate iron intake during pregnancy, whether through diet or supplementation. Healthcare providers should pay particular attention to iron status in pregnant women, especially those at higher risk of deficiency. This may include recommending iron-rich foods, iron supplements, or in some cases, investigating and addressing underlying causes of iron deficiency. It's worth noting that while our study shows a clear relationship between iron intake and anemia, other factors can also contribute to anemia in pregnancy. These may include deficiencies in other nutrients (such as vitamin B12 or folate), chronic diseases, or genetic factors. Therefore, a comprehensive approach to anemia prevention and treatment in pregnancy is crucial.

Table 3. Nutrient intake and anemia status

Variables	Anemia Status				p Value
	Normal		Anemia		
	n	%	n	%	
Protein Adequacy Level					
Inadequate	10	58.8	7	41.2	0.613
Adequate	49	65.3	26	34.7	
Iron Adequacy Level					
Insufficient	25	54.3	21	45.7	0.050*
Sufficient	34	73.9	12	26.1	
Vitamin C Adequacy Level					
Insufficient	10	58.8	7	41.2	0.613
Sufficient	49	65.3	26	34.7	

CONCLUSION

Conclusion this study was a significant issue among pregnant women, affecting 36% of participants in this study. Parity emerged as a statistically significant factor, with primipara mothers showing a higher rate of anemia compared to multipara mothers. Iron intake was identified as the most crucial nutritional factor related to anemia status, with insufficient iron intake associated with a higher rate of anemia. Healthcare providers should focus on iron status monitoring, nutritional counseling, and potentially tailored supplementation strategies to reduce the prevalence of anemia in pregnancy.

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