Original Article

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Risk Factors for Anemia in Pregnant Women at Hj Ida Maternity Clinic, Bogor Regency, 2022

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Abstract:

Anemia in pregnant women is a maternal health problem influenced by various risk factors, making it an important focus in nursing and midwifery studies. Understanding these factors is necessary to support prevention efforts and improve health. This study aims to determine the risk factors for anemia in pregnant women. This is a descriptive analytical study using a cross-sectional approach. The sample consisted of 145 pregnant women. Data were collected using questionnaires, medical records or KIA books, and upper arm circumference measurements. Data analysis was performed using logistic regression. Knowledge, parity, chronic energy deficiency, dietary patterns, and iron supplement adherence were associated with anemia ($p < 0.05$), while education, age, and occupation were not ($p > 0.05$). Furthermore, parity, dietary patterns, and iron supplement adherence were simultaneously associated with anemia ($p < 0.05$), with dietary patterns being the dominant variable. There is a relationship between knowledge, parity, chronic energy deficiency, diet, and FE intake compliance with the incidence of anemia, while education, age, and occupation show no relationship. Furthermore, there is a simultaneous relationship between parity, diet, and FE intake compliance with the incidence of anemia, and diet is the dominant variable.

Keywords: Anemia, Diet, Fe Intake Compliance, Parity, Pregnant Women.

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Introduction

The success of maternal and child health efforts can be measured through the Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR) (Fasiha et al., 2022). According to the WHO, the global maternal mortality rate is 32.9 per 100,000 live births due to complications related to pregnancy and childbirth. ASEAN data for

2021 shows an MMR of 235 per 100,000 live births and an IMR of 28.2 per 1,000 live births, while in Indonesia in 2021, the MMR was recorded at 7,389 deaths and the IMR at 16.85 per 1,000 live births (Suci et al., 2025). The main causes of maternal mortality in Indonesia include hemorrhage, hypertension during pregnancy, metabolic disorders, and other factors such as anemia and chronic energy deficiency (Kemenkes RI, 2022).

Anemia is one of the main risk factors contributing to maternal mortality by around 20–40%, both directly and indirectly. Anemia in pregnancy is characterized by hemoglobin levels below 11 g/dL in the first and third trimesters, or less than 10.5 g/dL in the second trimester. This condition can trigger various serious complications such as heart failure, preeclampsia, antepartum and postpartum hemorrhage, and sepsis. In addition to affecting the mother, anemia also affects fetal growth and development, increases the risk of perinatal mortality, lowers the mother's and baby's resistance to infection, causes premature labor, and increases the incidence of low birth weight (LBW) (Amiruddin et al., 2022).

Knowledge among pregnant women is one of the factors that contribute to anemia during pregnancy. A good level of knowledge can increase mothers' awareness of healthy lifestyles and understanding of anemia prevention measures. Meanwhile, pregnant women with low knowledge tend to have a higher risk of anemia (Oktaviana et al., 2022). In addition to knowledge, anemia during pregnancy is also influenced by education. Education is closely related to a person's level of knowledge. If a person has a high level of education, they may still have poor knowledge about how to prevent anemia during pregnancy and lack knowledge about nutritional fulfillment during pregnancy (Salsabilah & Suryaalamsah, 2022).

Another factor that can cause anemia in pregnant women is age. The ideal age for pregnancy is between 20 and 35 years old, because pregnancy under the age of 20 carries a risk of anemia due to the reproductive system not being fully developed. Pregnancy over the age of 35 is also considered high-risk due to decreased endurance and bodily functions. In addition to age, chronic energy deficiency (CED) also plays a role in the occurrence of anemia. Pregnant women with insufficient energy and protein intake generally also experience vitamin and mineral deficiencies. This condition increases the risk of micronutrient deficiencies, especially iron and folic acid, which play an important role in hemoglobin formation (Sirait et al., 2023).

Work can also increase the risk of mothers developing anemia during pregnancy. The type and workload of a pregnant woman's job can affect her pregnancy and the delivery process. Heavy work activities can cause pregnant women to experience fatigue and lack of rest. This condition can hinder the optimal formation of red blood cells, thereby increasing the risk of anemia (Salsabilah & Suryaalamsah, 2022). Parity also contributes to the incidence of anemia in pregnant women. During pregnancy and childbirth, iron requirements increase along with blood loss. This can lower hemoglobin levels and reduce the mother's iron reserves, thereby increasing the risk of anemia in subsequent pregnancies (Oktaviana et al., 2022).

Diet is another factor that can affect anemia in pregnant women. Proper nutrition during pregnancy plays an important role in meeting the nutritional needs of mothers and supporting fetal health. Irregular, unbalanced diets and food restrictions can increase the risk of anemia. Pregnant women with food restrictions are known to have a higher risk of anemia compared to women without restrictions. In addition to diet, adherence to iron tablet consumption also affects the incidence of anemia. Pregnant

women who do not regularly consume iron tablets tend to experience iron deficiency, putting them at risk of anemia. Conversely, adherence to iron tablet consumption helps meet iron requirements and reduces the risk of anemia during pregnancy (Sari & Herdiani, 2022).

Based on medical records data from the Hj. Ida Maternity Clinic in Bogor Regency for the period March–May 2022, there were 380 pregnant women who underwent pregnancy check-ups, with 140 (36%) experiencing anemia and 240 (64%) not experiencing anemia. Furthermore, during the period of June to August 2022, the number of pregnant women with anemia increased to 182 (45%), while those without anemia numbered 228 (55%). These data indicate a 9% increase in the prevalence of anemia among pregnant women during the period of June to August 2022. The purpose of this study was to determine the risk factors for anemia in pregnant women at the Hj. Ida Maternity Clinic in Bogor Regency in 2022.

Methods

Study Design

This study utilised a descriptive analytical case study design with a cross-sectional approach, aiming to identify factors associated with anaemia in pregnant women at the Hj Ida Maternity Clinic.

Sample

The population consisted of all pregnant women who met the inclusion criteria, namely pregnant women of all gestational ages who were willing to be respondents and had complete status (including data on pregnancy, history of bleeding, prenatal visits, iron tablet administration, upper arm circumference, and hemoglobin) selected through accidental sampling. Based on the results of the Slovin test, the number of respondents was 145.

Data Collection Technique

Data was collected through interviews, measurements, and questionnaires. The data collection procedure was carried out at the Hj Ida Maternity Clinic on Jalan Babakan Ciomas Cibinong Rt 02/Rw 02, Sukaharja Village, Ciomas Subdistrict, Bogor, in July 2022.

Data Analysis Technique

According to the cross-sectional study, data on knowledge, education, age, KEK, occupation, parity, diet, and maternal compliance in consuming iron tablets with the incidence of anemia in pregnant women were collected simultaneously with the aim of finding the relationship between these variables. The data analysis used was univariate analysis, bivariate analysis using the Chi-Square test, and multivariate analysis using logistic regression. The analysis was performed using SPSS software.

Ethical Consideration

This study has obtained ethical approval from the Ethics Committee of th Respati Indonesia University to ensure that all research procedures comply with ethical principles in research. Written consent from patients or authorized parties was also obtained prior to data collection, ensuring that patient participation was voluntary and in accordance with ethical standards applicable in clinical research

Results

Table 1. Univariate Analysis

Anemia	Anemia	54	37.2
	No Anemia	91	62.8
Knowledge	Poor	104	71.7
	Good	41	28.3
Education	Low	23	15.9
	High	122	84.1
Age	At Risk	32	22.1
	Not at Risk	113	77.9
Parity	Grandmulti	84	57.9
	Primipara & Multipara	61	42.1
Occupation	Working	88	60.7
	Not Working	57	39.3
Chronic Energy Deficiency	Chronic Energy Deficiency	79	54.5
	No Chronic Energy Deficiency	66	45.5
Diet	Unbalanced	70	48.3
	Balanced	75	51.7
Fe Intake Compliance	No Compliant	60	41.4
	Compliant	85	58.6

Source : *Primary Data, 2022*

Table 1 shows that the majority of respondents did not experience anemia (91 or 62.8%), had insufficient knowledge (104 or 71.7%), were highly educated (122 or 84.1%), were not at risk due to age (113 or 77.9%), had grandemulti parity (84 or 57.9%), were employed (88 or 60.7%), experienced chronic energy deficiency (79 or 54.5%), practiced a balanced diet (75 or 51.7%), and were compliant with FE intake (85 or 58.6%).

Table 2. The Relationship Between Knowledge, Education, Age, Parity, Occupation, Chronic Energy Deficiency, Diet, and Fe Intake Compliance with Anemia (Chi-Square Test)

Variable	**Category**	**Anemia**				**Total**		**P Value**	**OR (95% CI)**
		Anemia		No Anemia					
		n	%	n	%	n	%		
Knowledge	Poor	33	31.7	71	68.3	104	100	0.046	0.443 (0.211-0.926)
	Good	21	51.2	20	48.8	41	100		
Education	Low	8	34.8	15	65.2	23	100	0.975	0.881 (0.347-
	High	46	37.7	76	62.3	122	100		

									2.240)
Age	At Risk	9	28.1	23	71.9	32	100		0.591
	Not at Risk	45	39.8	68	60.2	113	100	0.317	(0.251-1.394)
Parity	Grandmulti	41	48.8	43	51.2	84	100		0.284
	Primipara & Multipara	13	21.3	48	78.7	61	100	0.001	(0.135-0.600)
Occupation	Working	32	36.4	56	63.6	88	100		1.100
	Not Working	22	38.6	35	61.4	57	100	0.924	(0.553-2.188)
Chronic Energy Deficiency	Chronic Energy Deficiency	22	27.8	57	72.2	79	100		0.410
	No Chronic Energy Deficiency	32	48.5	34	51.5	66	100	0.017	(0.206-0.817)
Diet	Unbalanced	34	48.6	36	51.4	70	100		2.597
	Balanced	20	26.7	55	73.3	75	100	0.011	(1.298-5.199)
Fe Intake Compliance	No Compliant	16	26.7	44	73.3	60	100		0.450
	Compliant	38	44.7	47	55.3	85	100	0.041	(0.220-0.919)

Source : *Primary Data, 2022*

Table 2 shows the results of the chi-square test, which indicate a relationship between knowledge, parity, chronic energy deficiency, diet, and Fe intake compliance with anemia ($p < 0.05$). Meanwhile, the results of the chi-square test show no relationship between education, age, and occupation with anemia ($p > 0.05$).

Table 3. Bivariate Selection

Variable	P Value	Description
Knowledge	0.031	Candidate
Education	0.790	Not a Candidate
Age	0.230	Candidate
Parity	0.001	Candidate
Occupation	0.786	Not a Candidate
Chronic Energy Deficiency	0.007	Candidate
Diet	0.007	Candidate
Fe Intake Compliance	0.028	Candidate

Source : *Primary Data, 2022*

Table 3 shows the results of bivariate selection yielding $p < 0.25$, including knowledge, age, parity, chronic energy deficiency, diet, and Fe intake compliance. These variables were included in the multivariate modeling.

Table 4. Simultaneous Relationship between Knowledge, Education, Age, Parity, Occupation, Chronic Energy Deficiency, Diet, and Fe Intake Compliance with Anemia (Logistic Regression)

Variable	P Value	OR	95% CI		Change in OR
			Lower	Upper	

					(%)
Stage 1					
Knowledge	0.141	0.533	0.231	1.232	
Age	0.101	0.452	0.175	1.166	
Chronic Energy Deficiency	0.225	0.590	0.251	1.384	
Parity	0.018	0.376	0.168	0.844	
Diet	0.132	1.937	0.820	4.574	
Fe Intake Compliance	0.124	0.528	0.234	1.191	
Stage 2					
Knowledge	0.153	0.544	0.236	1.253	-2.0
Age	0.123	0.480	0.189	1.219	-6.1
Parity	0.011	0.356	0.160	0.793	0.5
Diet	0.021	2.464	1.147	5.295	5.2
Fe Intake Compliance	0.120	0.526	0.235	1.182	2.7
Stage 3					
Age	0.081	0.440	0.176	1.105	8.8
Parity	0.010	0.354	0.160	0.781	0.8
Diet	0.023	2.408	1.129	5.134	5.9
Fe Intake Compliance	0.040	0.445	0.205	0.965	2.9
Stage 4					
Parity	0.012	0.368	0.169	0.803	
Diet	0.031	2.266	1.079	4.762	
Fe Intake Compliance	0.049	0.464	0.217	0.996	

Source : *Primary Data, 2022*

Table 4 shows the results of multivariate analysis of variables significantly associated with anemia, namely parity, dietary patterns, and compliance with iron supplementation. The multivariate analysis concluded that the most dominant variable associated with anemia was dietary patterns, which contributed 17.4% to the incidence of anemia.

Discussion

The results of the chi-square test obtained a p-value of 0.046, which allows us to conclude that there is a significant relationship between knowledge and the occurrence of anemia in pregnant women. An OR value of 0.443 was obtained, meaning that knowledge serves as a preventive factor for pregnant women from experiencing anemia, and this statement is consistent with the research by Afriyani et al. (2025). A person's knowledge about health is one of the predisposing factors that influences their behavior (Arniati, 2024). With increasing knowledge of anemia among pregnant women, it is expected that behavioral changes will occur in a direction that supports health.

The chi-square test results showed a p-value of 0.975, so it can be concluded that there is no significant relationship between education level and the incidence of

anemia in pregnant women. This is in line with Putri et al. (2025) research, which found that education has no significant relationship with the incidence of anemia during pregnancy. This is reinforced by the study by Mardiah et al. (2021) at the Sei Bejangkar Health Center, Batubara Regency, which states that there is no significant relationship between education and the incidence of anemia in pregnant women. The level of education affects a person's experience and knowledge; the higher the education, the easier it is to accept new information, have broad insights, and apply better disease prevention behaviors (Dewi & Mardiana, 2021). According to the researchers' assumptions, higher education in pregnant women does not guarantee freedom from anemia. Although it facilitates the acceptance of health information, without proper application in daily life, health conditions will not change.

The chi-square test results showed a p-value of 0.352, so it can be concluded that there is no significant relationship between age and the incidence of anemia in pregnant women. This is in line with research conducted by Mulyani & Windayanti (2021), which stated that there is no relationship between the age of pregnant women and the incidence of anemia during pregnancy at the Bojong Health Center. This is supported by the results of a study by Acheampong et al. (2018) at the Maternity Hospital in Accra, Ghana, which found that maternal age had no significant relationship with the incidence of anemia. The researchers concluded that pregnant women under the age of 20 and over the age of 35 were at risk of anemia, which could lead to unsafe pregnancies for both the mother and the fetus.

The chi-square test results show that there is a relationship between chronic energy deficiency and anemia in pregnant women with a p-value of 0.017, which is in line with Farahdiba (2021);Sandhi & Wijayanti (2021) who revealed that there is a relationship between chronic energy deficiency and anemia in pregnant women. Pregnant women who experience chronic energy deficiency tend to experience anemia more often than pregnant women who do not experience chronic energy deficiency. This condition is related to insufficient intake and utilization of nutrients during pregnancy. The fulfillment of balanced nutrition, both macronutrients and micronutrients, greatly affects the nutritional status of mothers. If these nutritional needs are not adequately met, pregnant women are at risk of chronic energy deficiency, which can ultimately trigger anemia (Farahdiba, 2021).

The chi-square test results show that there is no relationship between employment and the risk of anemia in pregnant women with a p-value of 0.924. This is consistent with a study Isnaini et al. (2021) which states that there is no relationship between employment and the incidence of anemia in pregnant women. Pregnant women with moderate workloads have a lower risk of anemia than those who do not work, who generally perform household activities with light but continuous workloads. Balanced physical activity helps maintain physical fitness and supports oxygen and energy needs during pregnancy. In addition, pregnant women who have an income tend to be better able to meet their nutritional needs and obtain health information. However, excessive activity should still be avoided as it can affect the health of the mother and fetus (Isnaini et al., 2021).

The chi-square test results showed a p-value of 0.001, indicating a significant relationship between parity and the incidence of anemia in pregnant women. An OR value of 0.284 was obtained, meaning that parity acts as a preventive factor for pregnant women with anemia. This is in line with research conducted by Mardiah et al. (2021) in the working area of the Sei Bejangkar Community Health Center,

Batubara Regency, which states that there is a significant relationship between parity and the incidence of anemia in pregnant women. According to the researchers' assumption, pregnant women with a history of frequent childbirth have a higher risk of experiencing anemia in subsequent pregnancies. Lack of attention to nutritional intake and bleeding before or after childbirth can exacerbate anemia because pregnant women are unable to tolerate blood loss.

The chi-square test results showed a p-value of 0.011, indicating a significant relationship between diet and the incidence of anemia in pregnant women. The odds ratio (OR) of 2.597 shows that pregnant women with a balanced diet are more likely to not have anemia. These results are consistent with Mardiah et al. (2021) study, which found a significant relationship between nutritional status and the incidence of anemia in pregnant women. Diet plays an important role in the health of pregnant women, which can be evaluated from their nutritional status. A balanced diet consists of various types of food in the right amounts and proportions, namely carbohydrates, proteins, minerals, and vitamins to meet the needs during pregnancy. An unbalanced diet will cause nutritional imbalance in the body, which can lead to malnutrition that adversely affects fetal development and maternal health, one of which is anemia during pregnancy (Gustanela & Pratomo, 2021). This is supported by Utari & Ratnawati (2021) research, which states that inadequate food intake causes iron deficiency for hemoglobin synthesis due to iron deficiency in food. Iron deficiency slows down the rate of hemoglobin formation and reduces its concentration in the blood.

The results of the study show a significant relationship between iron intake compliance and the incidence of anemia in pregnant women at the Hj. Ida Bogor Obstetrics Clinic, with a p-value of 0.041 ($p < 0.05$). This finding is in line with Dewi & Mardiana (2021) study, which reported a relationship between the level of Fe consumption compliance and the incidence of anemia in pregnant women. This finding is also consistent with research conducted by Wijaya & Nur (2021). According to Dewi & Mardiana (2021), compliance in taking iron tablets means that pregnant women consistently follow the advice of health workers to take iron tablets. Iron tablets are highly recommended from the second trimester of pregnancy until the third trimester, with a minimum consumption target of 90 tablets. However, non-compliance among pregnant women is often caused by a lack of knowledge and awareness about the importance of consuming iron tablets. In addition, researchers believe that non-compliance among pregnant women in taking iron tablets is influenced by side effects such as nausea, vomiting, and headaches, which make some women reluctant to continue taking them. The more compliant pregnant women are in taking iron tablets during pregnancy, the lower the risk of anemia. Conversely, the lower the compliance, the higher the likelihood of anemia in pregnant women (Yunika, 2021).

The results of the analysis show that diet is a dominant factor associated with anemia in pregnant women, contributing 17.4% to its incidence. Iron deficiency often occurs during pregnancy, causing a decrease in hemoglobin levels due to hemodilution, poor diet, and low consumption of iron-rich foods. These findings are consistent with a study conducted by Pebrina et al. (2021), which showed through a chi-square test that diet is significantly associated with the incidence of anemia in pregnant women. Poor diet, especially low iron intake, is one of the factors that can increase the risk of anemia in pregnant women. An unbalanced diet prevents the

body from obtaining the necessary nutrients optimally, thereby disrupting the nutritional status of pregnant women and contributing to anemia. In addition, the nutritional needs of pregnant women increase in each trimester of pregnancy according to Gozali (2018), so proper nutrition is very important to prevent anemia.

Conclusion

There is a relationship between knowledge, parity, chronic energy deficiency, diet, and FE intake compliance with the incidence of anemia, while education, age, and occupation show no relationship. Furthermore, there is a simultaneous relationship between parity, diet, and FE intake compliance with the incidence of anemia, and diet is the dominant variable.

Suggestion

It is recommended that the Hj. Ida Bogor Clinic improve health services by providing consultation, information and education to pregnant women so that they can consume TTD regularly and have their serum iron levels checked, thereby reducing iron deficiency and potentially lowering the incidence of anaemia.

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