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The relationship between food type, nutritional status and iron intake with the incidence of anemia in pregnant women at the Sukamakmur health center

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ABSTRACT

Anemia in pregnant women is one of the most common public health problems, mainly caused by iron deficiency. This condition can cause serious complications for both mother and fetus. The purpose of this study was to determine the relationship between food type, nutritional status, and iron intake with the incidence of anemia in pregnant women at the Sukamakmur Health Center. This study used a quantitative approach with an analytical survey design and a cross-sectional method. The sample amounted to 56 pregnant women in the third trimester which were taken using the total sampling technique. This study uses a multivariate approach to understand how these three independent factors (food type, nutritional status, and iron intake) together influence the incidence of anemia in pregnant women in their third trimester. Data collection was carried out through questionnaires and analyzed with the Spearman test. There was a significant negative association between food types and the incidence of anemia ($r = -0.527$; $p < 0.05$). Iron intake was also significantly negatively associated with the incidence of anemia ($r = -0.311$; $p < 0.05$). However, there was no significant association between nutritional status and the incidence of anemia ($r = 0.130$; $p = 0.341$). Diversity of food types and iron intake contribute to a decrease in the incidence of anemia in pregnant women. However, general nutritional status such as BMI did not show a significant relationship. Continuous education is needed for pregnant women regarding the consumption of nutritious foods, especially foods high in iron.

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1. Introduction

Health is one of the fundamental aspects of human life that affects the quality of life and productivity of individuals. Good health not only contributes to individual happiness but also impacts the well-being of society as a whole. Various factors influence health, such as environment, lifestyle, access to healthcare, and the type of food consumed. The right type of food can help maintain a person's nutritional balance and play a role in preventing various diseases, including anemia (Wiyanto, 2023).

Anemia in pregnant women is a significant public health problem in many countries, including Indonesia. The prevalence of anemia among pregnant women in Indonesia remains relatively high, with various studies indicating that the incidence can threaten the health of both mother and fetus. According to data from the Indonesian Ministry of Health, approximately 37% of pregnant women experienced anemia in 2020 (Kesehatan & RI, 2022) . Anemia can impact fetal development, including abortion, intrauterine death, prematurity, low birth weight, congenital defects, and susceptibility to disease. In mothers, anemia can lead to abortion, premature labor, the risk of cord decompensation, and premature rupture of membranes. Furthermore, complications such as uterine atony, retained placenta, and postpartum hemorrhage can occur during labor(Pratiwi & Jubaedah, 2024).

Pregnancy increases the need for iron in pregnant women because blood volume increases by about 50% during pregnancy, which requires more iron. for production hemoglobin. Fetal growth And A fast growing placenta also requires iron which can be met through a healthy diet. and balanced. However, food intake is often insufficient, so additional iron tablets are needed (Erryca et al., 2022).

According to data from Ministry of Health of the Republic of Indonesia(Kesehatan & RI, 2022), prevalence anemia in pregnant women in Indonesia achieved 37%. Anemia can negatively impact both the mother and the fetus, including abortion, intrauterine death, premature delivery, low birth weight, and birth defects. In the mother, anemia also increases the risk of premature rupture of membranes, postpartum hemorrhage, and other complications (Pratiwi & Jubaedah, 2024) .

In 2023, the prevalence of anemia in pregnant women was recorded at 46.2 %. However, this figure remains a serious concern as nearly half of pregnant women in Indonesia still face this condition, which can impact the health of both mother and baby. Based on data from the Aceh Besar Health Service in 2023, data on anemia in pregnant women of 8-11 mg/dl was 547 pregnant women and anemia >8 mg/dl was 17 pregnant women.

Despite extensive research on anemia in pregnant women at the national level, several critical knowledge gaps remain unaddressed, particularly in the context of rural and semi-urban communities like Sukamakmur. Most existing studies on anemia in pregnant women focus on urban populations or provide generalized national statistics. There is insufficient evidence specifically examining the relationship between food types, nutritional status, and iron intake with anemia incidence in the Sukamakmur area of Aceh Besar, which has unique socio-economic and cultural characteristics that may influence dietary patterns and health outcomes. While previous studies have examined individual factors contributing to anemia, few have comprehensively analyzed the simultaneous relationships between food diversity, nutritional status, and iron intake in a single community setting. This integrated approach is crucial for developing targeted interventions. Limited research has been conducted that considers the specific cultural food preferences, economic constraints, and local food availability in Aceh communities, which significantly impact dietary choices and subsequently anemia prevalence among pregnant women.

At Sukamakmur Community Health Center, the incidence of anemia in pregnant women in the third trimester is quite high. Initial data shows that 58 pregnant women experienced it. anemia. Wrong one factor reason the main thing is low consumption of foods rich in iron. Therefore, this study aims to analyze the relationship between food types, nutritional status, and iron intake with the incidence of anemia in pregnant women at the Sukamakmur Community Health Center.

Based on the background description above, the aim of this study is to find out connection type food with incident anemia in pregnant women at the Sukamakmur Health Center, Aceh Besar, to find out the relationship between nutritional status and the incidence of anemia in pregnant women at the Sukamakmur Health Center, Aceh Besar, and to determine the relationship nutrient intake iron with the incidence of anemia in pregnant women at the Sukamakmur Health Center, Aceh Besar.

2. Method

This research is quantitative in nature using analytical survey methods and a *cross-sectional approach*. The purpose of this study is to identify the relationship between the observed independent and dependent variables at one time *Cross-sectional* research is a type of study that only collects data once, where samples and events are obtained over a specific time period (Sugiyono , 2022).

The research location was conducted at the Sukamakmur Aceh Besar Community Health Center. Population study This is all mother pregnant which do visit pregnancy check-ups in the Sukamakmur Community Health Center work area, Aceh Besar with a total of 129 people. A sample is a part of a population selected to represent the entire population in a study. Sample selection is carried out using appropriate methods to accurately represent population characteristics. The sampling method in this study is *purposive sampling*. In this study, the samples selected were pregnant women who experienced anemia during pregnancy and were registered as patients at the Sukamakmur Community Health Center, Aceh Besar District. Determination sample in study This counted with *Slovin* formula. Thus, the sample used in this study was 56 respondents.

The inclusion criteria used in this study included:

a. Pregnant women in their first to third trimesters.
b. Pregnant women who underwent prenatal checkups at the Sukamakmur Community Health Center in Aceh Besar.

In addition, this study also established exclusion criteria, namely:

a. Pregnant women with multiple pregnancies.
b. Pregnant women with chronic health conditions.
c. Pregnant women with Hyperemesis Gravidarum

The research instrument used in this study was a questionnaire. To measure the types of food consumed, the instrument used was the Food Frequency Questionnaire (FFQ) with a measurement method in the form of interviews with respondents regarding the frequency of consumption of foods rich in iron, protein, vitamins, and minerals. Maternal nutritional status was measured using the Body Mass Index (BMI) measurement instrument and a maternal health history questionnaire. Iron intake was measured using the Semi-Quantitative Food Freedom Questionnaire (SQ-FFQ), with the measurement method involving recording the food intake and iron supplements consumed by the respondents. The data analysis used in this study is univariate analysis of frequency distribution and bivariate *Spearman rank analysis.*

3. Results and Discussion

Results

a) Results Connection Type Food with Incident Anemia

Table 1
Connection Type Food with Incident Anemia

Anemia Level	Good (%)	Sufficient (%)	Less (%)
Mild Anemia	3 (5.36%)	14 (25%)	4 (7.14%)
Moderate Anemia	0 (0%)	17 (30.35%)	4 (7.14%)
Severe anemia	13 (23.21%)	1 (1.78%)	0 (0%)
Total	16 (28.57%)	32 (57.13%)	8 (14.28%)
Amount (n)		56 (100%)	
P		-0.527 (*p = 0,000)*	

Based on the results of Table 1, the majority of respondents who experienced severe anemia (23.21 %) actually had a relatively good diet. Meanwhile, mild and moderate anemia were more common among respondents with dietary habit sufficient is 25% and 30.35 % respectively. On the other hand, a poor diet also appears to contribute to mild and moderate anemia, each at 7.14 %, but was not found in severe anemia.

Spearman rank test, there is a significant negative relationship between the type of food and the incidence of anemia ($r = -0.527$, $p < 0.05$) , which shows that the better the variety and quality of the types of food consumed, the incidence of anemia tends to decrease.

b) Results Connection Status Nutrition with Incident Anemia

Table 2
Connection Status Nutrition with Incident Anemia

		Status Nutrition			*P*
		Thin (%)	Normal (%)	Fat (%)	
	Mild anemia	2 (3.57%)	19 (33.93%)	0 (0%)	
Anemia	Moderate anemia	17 (30.36%)	3 (5.36%)	1 (1.79%)	0.130 (p=0.341)
Total	Severe anemia	1 (1.79%)	6 (10.71%)	7 (12.5%)	56
		21 (37.5%)	21 (37.5%)	14 (25%)	100%

Based on the results of Table 2, moderate anemia was most commonly experienced by respondents with an underweight nutritional status (30.36%). Meanwhile, mild anemia was more common in respondents with a normal nutritional status (33.93 %). Meanwhile, severe anemia was most commonly found in respondents with an overweight nutritional status (12.5 %). Of the total 56 respondents, 37.5% were underweight, 37.5% were normal, and 25% were overweight. This indicates that anemia can occur in all nutritional status categories, but the distribution differs depending on the severity of the anemia.

Spearman rank test, nutritional status did not show a significant relationship with anemia (r = 0.130, p = 0.341), although a positive value was found which could indicate that nutritional status had a relationship. However No fulfil condition significant, It means status nutrition just Not yet strong enough to predict anemia in this sample.

c) Results Connection Intake Substance Iron with Incident Anemia

Table 3
Connection Nutrient Intake Iron with Incident Anemia

		Intake Substance Iron			*P*
		Good (%)	Enough (%)	Not enough (%)	
	Mild anemia	4 (47.14%)	14 (25%)	3 (5.36%)	
Anemia	Moderate anemia	4 (7.14%)	17 (30.355%)	0 (0%)	-0.311 (p=0.020)
Total	Severe anemia	7 (12.5%)	7 (12.5%)	0 (0%)	56
		15 (26.80%)	38 (67.86%)	3 (5.36%)	100%

Based on the data in Table 3, the majority of respondents with mild anemia had iron intake in the sufficient category (25%), and a small portion was in the good category (7.14 %) or insufficient (5.36%). Respondents with moderate anemia mostly had sufficient iron intake (30.36 %), while only a few were in the good category (7.14%), and none were in the insufficient category. Overall, of the 56 respondents, the majority had iron intake in the sufficient category (67.86 %), followed by the good category (26.80%), and only 5.36% were in the insufficient category.

Results test statistics using correlation Spearman showed mark r = - 0.311 with p = 0.020, which means there is a statistically significant relationship between iron intake and the incidence of anemia (p < 0.05). Negative correlation This show that the more low intake substance iron, so the risk of experiencing anemia tends to increase. In other words, adequate iron intake is very important in preventing anemia in pregnant women.

d) Connection Type food, Status Nutrition and Intake Substance Iron with Anemia Incident

Table 4
Connection Type food, Status Nutrition and Intake Substance Iron with Incident Anemia

Variables	Anemia (r)	Type Food (r)	Status Nutrition (r)	Intake Substance Iron (r)
Anemia	1	-0.527 (p=0.000)	0.130 (p=0.341)	-0.311 (p=0.020)
Type Food	-0.527 (p=0.000)	1,000	-0.364 (p=0.006)	-0.096 (p=0.482)
Status Nutrition	0.130 (p=0.341)	-0.364 (p=0.006)	1,000	-0.627 (p=0.000)

Intake Substance Iron	-0.311 (p=0.020)	-0.096 (p=0.482)	-0.627 (p=0.000)	1,000

Based on table 4, there is a significant relationship between several variables in this study. The relationship between anemia and food types showed a correlation value of r = -0.527 with p = 0.000, which means p < 0.05, indicating a fairly strong and statistically significant negative relationship. This indicates that the better the quality or diversity of food types, the lower the incidence of anemia.

The relationship between anemia and nutritional status has a correlation value of r = 0.130 with p = 0.341, which indicates a very weak positive relationship and is not statistically significant, so there is no sufficient relationship between status nutrition based on anthropometry with incident anemia. As for the relationship between anemia and intake iron show mark r = -0.311 with p = 0.020, Which means there is connection negative Which weak However statistically significant, so it can be interpreted that the higher the iron intake, the incidence of anemia tends to decrease.

The relationship between food type and nutritional status yielded r = -0.364 with p = 0.006, which indicates a weak negative relationship to moderate and significant, indicating that food quality may influence nutritional status. The relationship between nutritional status and iron intake shows a value of r = -0.627 with p = 0.000, which is a positive relationship. a strong and significant negative correlation, meaning that decreased iron intake is strongly associated with decreased nutritional status. Finally, the relationship between food type and iron intake shows a significant value. correlation r = -0.096 with p = 0.482, which is a very weak and statistically insignificant relationship, so that no significant relationship was found between the diversity of food types and the amount of iron intake.

Discussion

This study describes the characteristics of 56 pregnant women as respondents with various demographic variables and pregnancy conditions relevant to the incidence of anemia. These findings support the results of statistical tests showing a significant negative relationship between dietary diversity and the incidence of anemia. This means that the more diverse the diet, the lower the risk of anemia. This research is consistent with the findings of (Pratiwi & Jubaedah, 2024), who stated that the quality of a pregnant woman's diet significantly affects hemoglobin levels in the body. The low proportion of mothers with a healthy diet highlights the need for educational interventions regarding the importance of dietary diversification, particularly foods rich in iron and nutrients that support absorption, such as vitamin C.

The types of food consumed by pregnant women play a crucial role in the incidence of anemia (Abbaspour et al., 2014). Research shows that pregnant women with low iron intake, especially those who rarely consume animal protein, are 2.5 times more likely to experience anemia than those with a balanced diet (Gebre & Mulugeta, 2015). This is consistent with findings that low dietary diversity is positively associated with the incidence of iron deficiency anemia in pregnant women.

Based on the researchers' assumptions, the types of food consumed by respondents in the Aceh Besar region appear to be sufficient in terms of quantity, but their nutritional content may not be sufficient for daily needs, especially iron and other micronutrients. A diet that is considered "sufficient" may mean that pregnant women eat regularly, but their food choices are more dependent on cheap and easily available food ingredients.

Cultural factors in dietary patterns, economic constraints, and the availability of nutritious foods also influence the variety of foods consumed by pregnant women in the region.

Statistical tests show no significant association between nutritional status and the incidence of anemia (r = 0.130; p = 0.341).

This study aligns with research conducted by (Hasanah et al., 2023) that nutritional status is not the sole cause of anemia in pregnant women. One cause of anemia during pregnancy is the increase in blood volume during pregnancy, often referred to as hydremia or hypervolemia. However, the increase in red blood cells is slower than the increase in plasma, leading to blood dilution. This increase is

proportional to plasma by 30.00%, red blood cells by 18.00%, and hemoglobin by 19.00%. However, red blood cell production is too slow, causing a shortage of red blood cells or anemia.

Other studies have shown a statistical relationship between the nutritional status of pregnant women and the incidence of anemia. It is known that the risk of anemia in pregnant women with KEK is 39 times higher than in pregnant women with good nutritional status (Utama, 2021).

Malnutrition in pregnant women can lead to deficiencies in micronutrients, including iron, folic acid, and vitamin B12, which play a role in red blood cell formation. Research in Indonesia shows that pregnant women with poor nutritional status have an anemia prevalence of 68.3%, while those with normal nutritional status have a prevalence of only 32.1% (Riset Dinas Kesehatan, 2018).

Based on this study, it can be concluded that nutritional status measured through anthropometry (such as BMI) does not specifically reflect iron sufficiency. This means that pregnant women may have ideal weight and height but still experience iron deficiency due to improper dietary patterns or low bioavailability. Additionally, some respondents with underweight nutritional status were actually more disciplined in consuming iron supplements compared to those who appeared generally healthy. Therefore, physical assessment of nutritional status is insufficient to detect the risk of anemia without considering biochemical micronutrient status.

The relationship between iron intake and the incidence of anemia in pregnant women shows that the majority of respondents in this study (67.9%) had adequate iron intake (moderate risk), while only 26.8% were classified as having good iron intake (minimal risk), and the remaining 5.4% were classified as insufficient (high risk). Statistics show a significant association between iron intake and the incidence of anemia ($r = -0.311$; $p < 0.05$). These findings align with a study (Bangun, 2021), which showed that pregnant women with adequate iron intake tend to have a lower risk of anemia. This highlights the importance of meeting iron needs, both from food and supplements, to maintain hemoglobin levels during pregnancy. However, the high proportion of iron intake that is only sufficient (not optimal) indicates that additional nutritional interventions such as counseling and the routine provision of iron tablets are still very much needed.

According to research written by (PUTRI et al., 2023), this study found a relationship between compliance with iron tablet consumption and the likelihood of anemia in pregnant women. Pregnant women who did not comply with iron tablet consumption had an 11.4 times higher risk of anemia compared to pregnant women who complied with iron tablet consumption.

Several factors influence pregnant women's compliance with iron tablets (FE), including their knowledge about iron tablets (Fe) (L. T. Arlym et al., 2024). Additionally, mothers' attitudes toward pregnant women's adherence to iron tablet (Fe) consumption also have an impact; pregnant women with negative attitudes are nearly entirely (86.1%) non-compliant in consuming iron tablets (Fe). According to research by (Azzahroh, 2023), pregnant women's adherence to iron (Fe) supplements is related to their perceptions and family support(Aulianingrum et al., 2020).

Many factors can influence how well pregnant women take iron tablets regularly. For example, some women still do not fully understand how to take the tablets correctly. In addition, iron tablets can cause side effects such as nausea, vomiting, heartburn, and diarrhea, which may make women reluctant to take them. Another problem is anemia, which can be caused by not taking iron tablets, often causing mothers to refuse the tablets. Furthermore, inadequate antenatal care and lack of education about the importance of iron tablets can also contribute to women struggling to adhere to regular tablet intake. This is why compliance rates among pregnant women have not yet reached satisfactory standards (Fegita et al., 2023).

Another significant factor influencing pregnant women's compliance in taking iron (Fe) supplements is family support. Social support theory states that family support, especially from husbands, can increase pregnant women's motivation and provide significant emotional encouragement (L. T. Arlym et al., 2024). According to research by (Pohan, 2022), pregnant women who receive practical and emotional support from their families are more likely to take iron supplements (Fe) as recommended. This support can take the form of moral support, assistance in managing side effects, and regular reminders to take iron tablets (Fe).

Hamzah's 2021 study found a correlation between pregnant women's adherence to iron tablet use and the role of health workers (p-value 0.002). Communication techniques are the most basic example of the support needed from health workers to improve adherence. Effective communication is crucial for health workers, including doctors and nurses, to convey information to patients.

Inconsistency in taking iron tablets is another factor contributing to pregnant women's non-compliance with the recommended dosage. Lack of spousal support to encourage pregnant women to take iron tablets, forgetting to take them, or refusing to take them because they are difficult to swallow. Therefore, healthcare workers have a crucial role in educating pregnant women, their families, and the community about nutrition and health issues (Panghiyangani & Kania, 2021) (Dewi et al., 2020).

Midwives are one of the health workers who help treat anemia in pregnant women. By conducting research and providing health education and counseling, midwives can act as educators in obstetric care, managers of health care facilities, and providers of obstetric services. Health care professionals can act as consultants, motivators, facilitators, and communicators, while midwives can act as counselors and service providers (Ms & Madeni, 2021)(Purwati et al., 2014).

Based on field findings and data interpretation, the researcher assumes that the incidence of anemia in pregnant women in the Sukamakmur Prosperous Health Center work area is not only influenced by biological factors or iron intake but is also closely related to the economic, social, and cultural aspects of the local community.

Furthermore, based on the interview results, the education provided by health workers has not optimally reached all pregnant women in a personal and contextual manner. The researchers assume that an educational approach based on local culture and the socioeconomic conditions of the community will be more effective in improving pregnant women's understanding and compliance in consuming nutritious foods and iron supplements. Midwives are one of the healthcare workers who help manage anemia in pregnant women by conducting research and providing health education and counseling.

4. Conclusion

Type of Food Has a Significant Effect on Anemia, there is a correlation between food diversity and the incidence of anemia ($r = -0.527$, $p < 0.05$). The more diverse and high-quality the types of food consumed, the lower the risk of anemia. Food diversification is an important protective factor in preventing anemia. Nutritional Status Does Not Significantly Affect Anemia ($r = 0.130$, $p = 0.341$). Anemia can occur in all nutritional status categories (underweight, normal, overweight). Anthropometric nutritional status alone is insufficient to predict the risk of anemia. There is a significant negative association between iron intake and the occurrence of anemia ($r = -0.311$, $p < 0.05$). The lower the iron intake, the higher the risk of developing anemia. Adequate iron intake is crucial in preventing anemia in pregnant women

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