

The Relationship between Body Mass Index and Anemia An Pregnancy at The Muara Fajar Rumbai Community Health Center, Pekanbaru City

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Abstract

Introduction: Anemia during pregnancy is a health problem that can be detrimental to the mother and baby, such as premature birth, low birth weight, and even death in the mother. Inappropriate nutritional intake can cause health problems such as malnutrition which can increase risks in pregnancy such as low birth weight, premature birth, and anemia.

Method: This study is a cross-sectional study of pregnancy in the first and third trimesters recorded at the Muara Fajar Rumbai Community Health Center, Pekanbaru was conducted in February 2024.

Results: This study was conducted with a total research sample of 106 pregnant women. Bivariate analysis showed the relationship between the incidence of anemia and gestational age showed a p-value <0.05. The relationship between BMI and the incidence of anemia in pregnant women was found to be a p-value of 0.001, which indicates that there is a relationship between BMI and the incidence of anemia in pregnant women in the Muara Fajar Community Health Center working area, Pekanbaru City. The variables age, BMI, level of knowledge, and income are the dominant variables in causing the incidence of anemia in pregnancy.

Conclusion: Maternal nutritional status as assessed by BMI influences the incidence of anemia in pregnant women, especially in the third trimester.

Keywords: Pregnancy, Nutritional status, Body Mass Index, Anemia

Hubungan antara Indeks Massa Tubuh dan Anemia pada Kehamilan di Puskesmas Muara Fajar, Kota Pekanbaru

Abstrak

Pendahuluan: Anemia selama kehamilan merupakan masalah kesehatan yang dapat merugikan ibu dan bayi seperti kelahiran prematur, berat badan lahir rendah, hingga menyebabkan kematian pada ibu. Asupan gizi yang tidak sesuai dapat menyebabkan masalah kesehatan seperti *malnutrition* yang dapat meningkatkan risiko pada kehamilan seperti berat bayi lahir rendah kelahiran prematur dan anemia.

Metode: Penelitian ini merupakan penelitian *cross sectional* pada ibu hamil trimester I dan III yang terdata di Puskesmas Muara Fajar Rumbai Kota Pekanbaru yang dilakukan pada bulan Februari 2024.

Hasil: Penelitian ini dilakukan dengan total sampel penelitian berjumlah 106 orang ibu hamil. Analisis bivariate menunjukkan hubungan antara kejadian anemia dan usia kehamilan menunjukkan p-value < 0,05. Hubungan antara IMT dan kejadian anemia pada ibu hamil diperoleh p-value 0.001 yang menunjukkan bahwa terdapat hubungan IMT dengan kejadian anemia pada ibu hamil di wilayah Kerja Puskesmas Muara Fajar Kota Pekanbaru. Variabel usia, IMT, tingkat pengetahuan, dan penghasilan menjadi variabel yang dominan dalam mengakibatkan kejadian anemia pada kehamilan.

Kesimpulan: Status gizi ibu yang dinilai dari IMT memengaruhi kejadian anemia pada ibu hamil terutama pada trimester ke-III.

Kata kunci: Kehamilan, Status Gizi, Indeks Massa Tubuh, Anemia

Introduction

World Health Organization defined anemia as a lack of a person's hemoglobin level, namely <11 g/dL, and anemia is considered severe if the hemoglobin level is <7 g/dL. Anemia during pregnancy is a health problem that can be detrimental to the mother and baby, such as premature birth, low birth weight, and even death in the mother. Globally, the prevalence of anemia in pregnant women is estimated at around 37%, while in developing countries anemia occurs in 43% of pregnant women with the highest prevalence in South Asia, namely 52%.¹ Anemia in pregnancy, especially in developing countries, is associated with socioeconomic status, maternal age, parity, ethnicity, and number of children. Anemia can be caused by micronutrient deficiencies including iron, vitamin B12, and folic acid, parasitic infections (such as malaria, hookworm, and schistosomiasis), HIV/AIDS, chronic inflammation, and genetic hemoglobinopathies (eg thalassemia).^{1,2}

The prevalence of anemia in pregnant women according to basic health research data in 2018 was 48.9% with the highest number in rural areas, namely 49.5%. Meanwhile, in Riau Province, 13.21% of pregnant women suffer from anemia.³ Based on data from the Pekanbaru City Health Service in 2021, it was reported that there were 1332 pregnant women with anemia, that there were 3 health centers with high anemia coverage in Pekanbaru, namely the Muara Fajar Health Center with 168 people, the Melur Health Center with 136 people and the Sail Health Center with 116 people.⁴ The study at the Muara Fajar Pekanbaru Health Center showed that 89.4% of pregnant women experienced anemia with knowledge about anemia still lacking (44.7%).⁵

Assessing nutritional status is very important for pregnant women, especially assessing body mass index (BMI). Inappropriate nutritional intake can cause

health problems such as malnutrition which can increase risks in pregnancy such as low birth weight, premature birth, and anemia. Several studies reported that low and high body mass index (BMI) increases the risk of anemia in pregnancy. Research conducted by Fauzan in 2022 stated that there is a relationship between body mass index and the incidence of anemia in pregnant women. Pregnant women with less BMI experience anemia by around 13.3%.⁶

Method

This research used a cross-sectional study to identify the relationship between nutritional status (BMI), education, knowledge, employment, age, economic level, and nutritional intake on the incidence of anemia in pregnant women, which was carried out in February 2024 at the Muara Fajar Rumbai Community Health Center, Pekanbaru. The sample in this study was 106 pregnant women at Muara Fajar Rumbai Community Health Center, Pekanbaru using a consecutive sampling technique. The inclusion criteria for this research are all pregnant women who are willing to take part in this research by signing consent after explanation (PSP), being interviewed, filling out a questionnaire, and the results of Hb levels obtained from secondary data with the exclusion criteria being pregnant women who are not willing to be respondents, history of infections such as malaria or worm infections, and pregnant women who are experiencing bleeding. All research procedures have been reviewed and approved by the Health and Medical Research Ethics Committee, Faculty of Medicine, Riau University. All participants in this study have been confirmed to be willing to take part in all examinations according to the instructions and sign after receiving an explanation.

The data used in this research is primary and secondary data. Primary data is data taken directly from the source and

formulated through a questionnaire containing close-ended questions. Researchers provide questionnaires that will be filled in by respondents and give respondents 5-10 minutes to answer the questions. After all the questions have been filled in by the respondent and collected again, the researcher will carry out a check, and then continue with the Hb examination on each respondent. If the respondent has previously had an HB examination, or anthropometry during the control and treatment at the previous health center, then the researcher will use secondary data from patient medical records. Data analysis in this study used SPSS, with univariate analysis aimed at looking at the frequency and percentage distribution of each variable. The chi-square test to see the significance of statistical calculations uses a significance limit of 5%. Analyze the close relationship between these 2 variables, by looking at the Odd Ratio (OR) value.

Result

In this study, the entire sample was 106 pregnant women who met the inclusion criteria. Table 1 shows an overview of the frequency distribution of research respondents. Based on Table 1, the majority of respondents in the Trimester I group were aged 20-35 years, had high education, had a high income with a normal BMI, had a history of illness, were multigravida parity, and had a high level of knowledge. Then, if we look at the Trimester III group, the majority of patients aged 20-35 years, with low education, low-income level, underweight BMI, have a history of disease, primigravida parity with low level of knowledge.

Table 2 shows that the majority of pregnant women suffer from anemia with a gestational age in the third trimester of around 58.5%. The results of the chi-square statistical test with a p-value of 0.032 show that there

Table 1 Frequency Distribution of Research Respondents.

Characteristic		First Trimester	%	Third Trimester	%
Age (years)	20 - 35	27	50.9	30	56.6
	<20 dan >35	26	49.1	23	43.4
Education	Low	18	50.9	32	60.4
	High	26	49.1	21	39.6
Income	Low	22	41.5	33	62.3
	High	31	58.5	20	37.7
BMI	Underweight	21	39.7	28	52.8
	Normal	24	45.3	22	41.5
	Overweight	4	7.5	2	3.8
	Obesity	4	7.5	1	1.9
History of Illness	Yes	38	71.7	37	69.8
	No	15	28.3	16	30.2
Parity	Primigravida	25	47.2	33	62.3
	Multigravida	28	52.8	20	37.7
Knowledge level	Low	24	45.3	32	60.4
	High	29	54.7	21	39.6

Table 2 Frequency distribution of anemia

Anemia	First Trimester	%	Third Trimester	%	P value
Yes	19	35.8	31	58.5	0.032
No	34	64.2	22	41.5	
Total	53	100	53	100	OR 2.522

Table 3 Relationship Between the Nutritional Status of Pregnant Women and the Incidence of Anemia

Nutritional status	Anemia				P value
	Yes	%	No	%	
Underweight	28	56.0	12	21.1	0.008
Normal	22	44.0	30	52.6	
Overweight	0	0	9	15.8	
Obesity	0	0	6	10.5	

Table 4 The Relationship between Nutritional Intake Patterns of Pregnant Women and Anemia in Pregnant Women at the Muara Fajar Rumbai Community Health Center, Pekanbaru City

Food Ingredients	Anemia				P-value
	Yes (N)	%	No (N)	%	
Heme					
Often	4	8.0	23	41.1	0.001
Rarey	28	56.0	22	39.3	
Never	18	36.0	11	19.6	
Non-heme					
Often	11	22.0	27	48.2	0.002
Rarey	31	62.0	16	28.6	
Never	8	16.0	13	23.2	
Increase iron absorption					
Often	9	18.0	30	53.6	0.001
Rarey	30	60.0	18	32.1	
Never	11	22.0	8	14.3	
Iron absorption inhibitor					
Sering	23	46.0	8	14.3	0.001
Jarang	14	28.0	22	39.3	
Tidak Pernah	13	26.0	26	46.4	

Table 5 Analysis Bivariate of Risk Factors That Influence the Incidence of Anemia In Pregnant Women at the Muara Fajar Rumbai Community Health Center

Variable	Anemia				OR (95%CI, P value)
	Yes N	%	No N	%	
Age					
20-35	11	22.0	30	53.6	OR 4.091
<20 dan >35	39	78.0	26	46.4	CI 95% 1.747 – 9.577
Total	50	100	56	100	P value 0.001
Education Levels					
Low	34	68.0	25	44.6	OR 2.635
High	16	32.0	31	55.4	CI 95% 1.191-5.830
Total	50	100	56	100	P value 0.019
Income					
Low	32	64.0	23	41.1	OR 2.551
High	18	36.0	33	58.9	CI 95% 1.191-5.830
Total	50	100	56	100	P value 0.021
Parity					
Primigravida	17	34.0	31	55.4	OR 2.407
Multigravida	33	66.0	25	44.6	CI 95% 1.095-5.290
Total	50	100	56	100	P value 0.033
Knowledge level					
Low	33	66.0	20	35.7	OR 3.494
High	17	34.0	36	64.3	CI 95% 1.569 – 7.782
Total	50	100	56	100	P value 0.003

Table 6 Multivariate Analysis

Variable	Wald	Sig.	Exp(B)	CI
Parity	0.942	0.332	1.670	0.593 – 4.704
Age	9.648	0.002	4.271	1.709 – 10.676
Knowledge level	7.011	0.008	3.214	1.354 – 7.629
Education	0.083	0.773	1.170	0.402 – 3.404
Income	3.792	0.052	2.367	0.994 – 5.635
BMI	3.099	0.078	1.875	0.931 – 3.776

is a relationship between the incidence of anemia in pregnant women and gestational age. Then, if you look at the results of the Odds Ratio (OR) test, you get an OR value of 2,522 because $OR > 1$, so gestational age is a risk factor for the incidence of anemia in pregnant women in the Muara Fajar Health Center working area, Pekanbaru City, so gestational age in the third trimester is 2,522 times more likely to suffer from anemia in pregnancy. pregnancy than mothers with gestational age in the first trimester.

Table 3 shows that the majority of underweight BMI was 28 people (56.0%) while the incidence of anemia with normal BMI was 22 people (44.0%), if we look at overweight and obese BMI, there were no respondents who experienced anemia. The results of statistical tests with a P-value of 0.008 show that there is a relationship between BMI and the incidence of anemia.

Table 4 shows statistical analysis regarding the relationship between nutritional intake and proves that there is a relationship between nutritional intake and the incidence of anemia. So H_0 which states that there is no relationship between nutritional intake and the incidence of anemia is rejected and H_2 from this study is proven, namely that there is a relationship between nutritional intake and the incidence of anemia in pregnant women in the Muara Fajar Health Center Working Area, Pekanbaru City.

After carrying out bivariate analysis in Table 5, multivariate analysis was carried out on Table 5 shows statistical analysis regarding the relationship between nutritional intake and proves that there is a relationship between nutritional intake and the incidence of anemia. So H_0 which states that there is no relationship between nutritional intake and the incidence of anemia is rejected and H_2 from this study is proven, namely that there is a relationship between nutritional intake and the incidence of anemia in pregnant women in the Muara Fajar Health Center Working

Area, Pekanbaru City.

Discussion

Anemia in the first trimester can be caused by loss of appetite or morning sickness, and the start of hemodilution at 8 weeks of gestation. Meanwhile, in the third trimester, this can be caused by the need for high levels of nutrition to carry out the fetal growth process and share iron in the blood with the fetus, which can reduce the mother's iron reserves. The nutritional needs of pregnant women, especially iron, during pregnancy, will change and increase according to gestational age.⁷

The results of this study are in line with research by Fitri et al., 2023, that the majority of cases of anemia in pregnancy are higher in the third trimester of pregnancy, namely 43.5%, while in the first trimester, it is 10.9% and the second trimester is 42.7%, then based on statistical tests it is proven that there is a relationship between gestational age and the incidence of anemia in pregnancy.⁸ This research is also strengthened by the results of research by Taner et al (2015) where gestational age is proven to influence the occurrence of anemia where pregnant women in the third trimester have a risk of anemia 2.45 times greater than in the first trimester, while pregnant women in the second trimester have a risk of anemia 1, 6 times bigger compared to the first trimester.⁹

The incidence of anemia in pregnancy with the third trimester of pregnancy is related to increasing gestational age which causes the mother's nutritional needs to increase and the iron in the blood is divided for the growth of the fetus in the uterus, thereby reducing the iron binding capacity in the mother's blood. Pregnant women's need for Fe increases, especially during the second and third trimesters, because during pregnancy there is an increase in blood volume and plasma volume. This will cause hemodilution or dilution of blood cells and a

decrease in hemoglobin levels. In pregnancy, anemia occurs relatively often because the blood of pregnant women experiences hemodilution with an increase in volume of 30-40%, the peak of which occurs at 32-34 weeks of gestation.¹⁰ anemia of pregnancy is the health problems experienced by women throughout the world, especially in developing countries. 40% of maternal deaths in developing countries are associated with anemia in pregnancy and most of anemia in pregnancy is caused by iron deficiency and acute hemorrhage, even less so the two are interacting. Frequency of pregnant women with anemia in Indonesia is relatively high at 63.5%. The purpose of this study is known factors associated with the incidence of anemia in pregnant women in health centers in 2013 Palembang Sekip This study used a survey method with the Analytical cross-sectional approach. The population in this study were all pregnant women who come to the health center for checkups Sekip Palembang in May-June of 2013. Sampling in this study with non-random methods with accidental sampling technique. Data analysis was done using univariate and bivariate statistical Chi-Square test with significance level $\alpha = 0.05$. Univariate analysis of the results obtained from the respondents who experienced anemia 14 (41.2% In pregnancy, anemia is prone to occur because pregnant women experience hemodilution (dilution) with an increase in volume of 30% to 40% and the peak occurs at 32 to 34 weeks of pregnancy. The number of blood cells increases by 18% to 30% and hemoglobin by around 19%. The occurrence of hemodilution will physiologically result in anemia in pregnancy. Pregnant women must consume nutritious food balanced with blood supplementation tablets to compensate for the hemodilution that occurs.¹¹

Then a statistical analysis was carried out to see the relationship between the two variables, obtaining a p-value of 0.001, which shows that there is a relationship between

BMI and the incidence of anemia in pregnant women in the Muara Fajar Health Center work area, Pekanbaru City. The same thing was also seen in Leonora's research in 2019 which showed that 54.1% of respondents with poor nutritional status experienced anemia in pregnancy and a statistical test was carried out with a p-value <0.005 , thus showing a relationship between nutritional status and anemia in pregnant women.¹² Similar research conducted in Sri Lanka in 2022 found that underweight pregnant women were 1.6 times more likely to suffer from anemia in pregnancy than pregnant women with a normal BMI, overweight or obese. Being underweight or having a low BMI before pregnancy is associated with the risk of malnutrition during pregnancy.¹³

BMI and anemia are important indicators that can affect the health of the mother and fetus. The incidence of anemia in mothers due to malnutrition and infection is thought to be related to the mother's low BMI, especially before pregnancy. In the 2015 National Family and Health Survey in India, 23% of women had a BMI less than 18.5 kg/m² and 53% had anemia (hemoglobin (Hb) <11 gm/dL).¹⁴

Anemia is a common condition during pregnancy. In the world, the prevalence of pregnancy anemia is estimated at 38% with a CI of 33–43%, which means that 32 million pregnant women are affected by anemia. Anemia during pregnancy can cause serious complications, such as premature rupture of membranes, postpartum infections, fetal growth restriction, fetal hypoxia, and premature birth. Previous research has identified several potential risk factors for anemia in pregnancy, such as poor nutritional status, multiple pregnancies, poor socioeconomic status, age over 35 years, multigravida, and shorter birth spacing.¹⁵

Efforts to overcome anemia in pregnant women have been made by giving iron tablets during pregnancy. Apart from that, the

mother's food intake pattern also influences the incidence of anemia during pregnancy in the mother. Plant foods which generally contain non-heme iron, polyphenols, and phytates are inhibitory factors for iron absorption, while to increase iron absorption, vitamin C and consumption of animal protein which contain lots of heme iron are needed. In research conducted by Christianti in 2019, it was stated that anemia in pregnant women is influenced by food consumption patterns which, although high consumption of animal food (fish), is also high in consumption of plant food, especially legumes. The types of food from the legume group that are widely consumed by respondents are tofu and tempeh. Apart from that, the consumption of vegetables and fruit which are sources of vitamin C is quite low in the anemia group.¹⁶

There is a relationship between age, knowledge, income, education, parity, pregnancy spacing, adherence to consuming Fe, and the incidence of anemia in pregnant women. The most dominant factors in the occurrence of pregnancy anemia are age, knowledge, and income. It is hoped that intensive health education about pregnancy anemia will increase the knowledge of pregnant women.

Conflict of Interest

There are no potential conflicts of interest reported by the authors

Advice

In this study, we have not examined the relationship between the consumption of iron tablets and a history of more specific diseases and the incidence of anemia in pregnant women, so that in future research we can examine the relationship between the consumption of iron tablets and a history of more specific diseases and the incidence of anemia in pregnant women.

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