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Association between Food Consumption and Types of Anemia among Pregnant Women in Development Country

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ABSTRACT

Anemia was a serious problem for pregnancy. The incidence of anemia in pregnant women in Indonesia was 48.9%. Data from the Cikuesik Health Center in Pandeglang Regency shows that the number of pregnant women with anemia until June 2021 was 57.77%. This study aimed to determine the association between food consumption on the type of anemia in pregnant women in the Area of the Cikeusik Public Health Center, Pandeglang Regency. This was a cross-sectional study. This study occurred from April to August 2021 at Cikeusik Health Center. With purposive sampling, 17 respondents were obtained. The instrument was a hemoglobin test kit and observation sheet. Data analysis used univariate and bivariate. From 17 respondents with mild anemia, 64.7% had iron deficiency anemia and 35.3% had megaloblastic anemia. Most of the respondents consumed food with sufficient energy intake (52.9%), less protein intake (52.9%), sufficient fat intake (58.8%), sufficient carbohydrate intake (70.6%), less fiber intake (58.8%), adequate intake of vitamins (folate, B6, B12) (64.7%), and insufficient intake of iron (58.8%). The statistical results showed that there was no association between energy intake (p=0.178), protein (p=1.000), fat (p=0.976), carbohydrates (p=1.000), and fiber (p=0.976) on the type of anemia among pregnant women. There was an association between vitamin intake (folate, B6, B12) (p=0.011) and iron intake (p=0.036) on the type of anemia among pregnant women. In conclusion, there was an association between food consumption on the type of anemia among pregnant women. They were advised to consume Fe tablets, iron-rich foods, folate, B6, and B12 to avoid anemia.

1. INTRODUCTION

The World Health Organization (WHO) in 2019 reported that the Maternal Mortality Rate (MMR) in developing countries was related to anemia during pregnancy caused by iron deficiency of 40.3% [1]. MMR in Indonesia nationally until 2020 was still high at 305 per 100,000 live births, while the National Mid-Term Development Plan 2024 MMR target was 183 per 100,000 per live birth. The highest causes of maternal death

in Indonesia include bleeding 30.3%, hypertension 27.1%, infection 7.3%, and prolonged labor 1.8% [2].

The number of MMR cases in Banten Province in the last three years has fluctuated, in 2017 was 226 cases, in 2018 was 135 cases, and in 2019 was 215 cases. The regency/city with the highest MMR in 2019 was Serang Regency with 66 cases, followed by Lebak 38 cases and Pandeglang 34 cases. The direct cause of maternal death in the Banten area is around 37% due to bleeding, 22% infection, and 14% hypertension; the rest is due to other reasons such as the family's lack of responsiveness to mothers who are about to give birth [3]. This becomes very ironic when considering the various causes of maternal death that should be prevented if handled properly.

One of the causes of bleeding is anemia during pregnancy. Anemia is a condition in which the number of erythrocytes (red blood cells) is reduced in the blood circulation or the mass of hemoglobin so that it is unable to fulfill its function as a carrier of oxygen to all body tissues [4].

According to the WHO, anemia during pregnancy is a condition while the mother's hemoglobin (Hb) level is less than 11 g/dl. In 2019, WHO reported that anemia in pregnant women in developing countries was 45% higher than in developed countries, which was 13%. The prevalence of anemia during pregnancy in developed countries such as America is was 17% and Turkey was 28%, while in developing countries such as countries in Asia, Laos was 57.1%, the Philippines was 56.2%, India was 54% and the highest prevalence is in the African region of 60% [1].

Based on data from the Indonesian Basic Health Research (Riskesdas) in 2018, it was reported that the incidence of anemia in pregnant women in Indonesia nationally was 48.9%. This figure increased when compared to 2013, which was 37.1%. Pregnant women with anemia mostly occur in the age group 15-24 years by 84.6%. This certainly needs special attention, because it means that almost half of pregnant women in Indonesia are anaemic [5].

Anemia during pregnancy is reported to harm maternal and child health and increases the risk of maternal and perinatal mortality. Negative health impacts for mothers include fatigue, poor work capacity or performance, impaired immune function, increased risk of heart disease, and maternal death. Several studies have shown that anemia during pregnancy contributes to 23% of indirect causes of maternal death in developing countries [6].

The high incidence of anemia among pregnant women is mostly caused by iron deficiency, but the prevalence of megaloblastic anemia is not considered light. According to Fatmawati's research (2019), the incidence of iron deficiency anemia was 60% and megaloblastic anemia was 29%. This shows that the incidence of megaloblastic anemia is quite large [7].

Megaloblastic anemia is an anemic condition due to ineffective red blood cell production and intramedullary hemolysis. The most common causes of megaloblastic anemia are folate (vitamin B9) deficiency and cobalamin or vitamin B12 deficiency [8]. Another cause of megaloblastic anemia is DNA synthesis disorder [9].

Due to the incidence of anemia in pregnant women being mostly caused by iron deficiency, the government's attention has been focused on handling iron deficiency anemia. The Indonesian Ministry of Health has implemented a program of giving iron tablets to pregnant women at the Health Centre and Integrated Health Centre for free by distributing 300 mg iron tablets and 0.5 folic acids to all pregnant women as much as 1

tablet per day for 90 days [2].

The government implements a program for the prevention and treatment of anemia in pregnancy with the assumption that iron deficiency anemia is high. But this will of course be different if there is a shift in the focus of handling the cause or type of anemia experienced by the mother, which is megaloblastic anemia. Megaloblastic anemia caused by deficiency of vitamins B9 (folic acid) and B12 (cobalamin) can be caused by changes in maternal consumption patterns [10].

Data from the Cikuesik Health Center in Pandeglang Regency shows that the number of pregnant women with anemia in 2019 was 278 people (61.5%) out of 452 pregnant women in 2020, 283 people (63.02%) out of 449 pregnant women, and in 2021 until June 260 people (57.77%) out of 450 pregnant women. The purpose of this study was to determine the association between food consumption on the type of anemia in pregnant women in the Area of the Cikeusik Public Health Center, Pandeglang Regency.

2. Methods

The research design used in this study is a comparative descriptive type with a cross-sectional approach. The population in this study was all third-trimester pregnant women who had their blood hemoglobin levels checked at the Cikeusik Health Center, Pandeglang Regency, Indonesia, which consisted of 30 people, and who had mild anemia, which consisted of 17 people. The sampling technique in this study was purposive sampling. The study was conducted in the Cikeusik Health Center Work Area from April to August 2021.

The research instrument was to measure hemoglobin levels in pregnant women using the easy touch for Glucose, Cholesterol, and Hemoglobin (GCHB) measuring instrument and to determine the type of anemia, the researchers brought blood samples from respondents with mild anemia to the clinical laboratory of the Malingping Hospital, while to measure food consumption patterns in pregnant women the researchers used an observation sheet measuring instrument. This study used univariate and bivariate analysis. The chi-square test was used in this study, where the P-value was significant if smaller than < 0.05.

3. Results

Based on the results of measuring Hb levels among 30 third-trimester pregnant women at the Work Area of the Cikeusik Pandeglang Health Center, it was found that 17 respondents had mild anemia. From this number, the researchers brought samples of the respondent's blood for examination of the type of anemia in the Malingping Hospital laboratory. The results of the examination showed that of the 17 respondents with mild anemia, 11 people (64.7%) had iron deficiency anemia and 6 people (35.3%) had megaloblastic anemia.

3.1 Univariate Analysis

Table 1: Frequency Distribution of Anemia Type and Food Consumption

Variable	Frequency (f)	Percentage (%)
		Type of Anemia
Iron Deficiency	11	64,7
Megaloblastic	6	35,3
		Energy Consumption
Poor	8	47,1
Adequate	9	52,9
		Protein Intake
Poor	9	52,9
Adequate	8	47,1
		Fat Intake

Poor	7	41,2
Adequate	10	58,8
		Carbohydrate Intake
Poor	5	29,4
Adequate	12	70,6
		Fiber Intake
Poor	10	58,8
Adequate	7	41,2
		Vitamin (Folat, B6, B12) Intake
Poor	6	35,3
Adequate	11	64,7
		Iron Intake
Poor	10	58,8
Adequate	7	41,2

Based on Table 1, it can be concluded that, out of 17 respondents with mild anemia, 11 people (64.7%) had iron deficiency anemia and 6 people (35.3%) had megaloblastic anemia, 9 people (52.9%) had an adequate energy intake, 9 people (52.9%) lack protein intake, 10 people (58.8%) had an adequate fat intake, 12 people (70.6%) had an adequate carbohydrate intake, 10 people (58.8%) lack fiber intake, 11 people (folate, B6, B12) have adequate intake (64.7%), and 10 people (58.8%) lack iron intake.

3.2 Bivariate Analysis

Table 2: Frequency Distribution of Food Consumption to The Anemia Type

Variable	Type of Anemia				Total		P-Value
	Iron Deficiency		Megaloblastic				
	f	%	f	%	n	%	
							Energy intake
Poor	7	87.5	1	12.5	8	100	0.178
Adequate	4	44.4	5	55.6	9	100	
							Protein intake
Poor	6	66.7	3	33.3	9	100	1.000
Adequate	5	62.5	3	37.5	8	100	
							Fat intake
Poor	4	57,1	3	42.9	7	100	0.976
Adequate	7	70	3	30	10	100	
							Carbohydrate intake
Poor	3	60.0	2	40.0	5	100	1.000
Adequate	8	66.7	4	33.3	12	100	
							Fiber intake
Poor	7	70.0	3	30.0	10	100	0.976
Adequate	4	57.1	3	42.9	7	100	
							Vitamin (Folat, B6, B12) Intake
Poor	1	16.7	5	83.3	6	100	0.011
Adequate	10	90.9	1	9.1	11	100	
							Iron intake
Poor	9	90.0	1	10	10	100	0.036
Adequate	2	28.6	5	71.4	7	100	

Based on Table 2, we know that 11 respondents who had iron deficiency anemia, 7 people (87.5%) lacked energy intake, 6 people (66.7%) lacked protein intake, 7 people (70%) had adequate fat intake, 8 people (66.7%) had adequate carbohydrate intake, 7 people (70%) lacked fiber intake, 10 people (90.9%) had sufficient vitamin intake, and 9 people (90%) lacked iron intake.

Out of the 6 respondents who had megaloblastic anemia, 5 people (55.6%) had adequate energy intake, 3 people (37.5%) had sufficient protein intake, 3 people (42.9%) had poor fat intake, 4 people (33.3%) had sufficient carbohydrate intake, 3 people (42.9%) had adequate fiber intake, 5 people (83.3%) had insufficient intake of vitamins, and 5 people (71.4%) had sufficient iron intake.

From the results of the bivariate analysis, that there was no association between energy intake (0.178 < 0.05), protein intake (1,000 < 0.05), fat intake (0.976 < 0.05), carbohydrate intake (1,000 < 0.05), and fiber intake (0.976 < 0.05) on the type of anemia in pregnant women. There was an association between vitamin/folate, B6, B12 intake (0.011 < 0.05) and iron intake (0.036 < 0.05) on the type of anemia in pregnant women.

4. Discussion

Univariate Analysis

4.1 Types of Anemia

Iron deficiency anemia is the most common anemia among pregnant women. Iron deficiency can cause the body to experience anemia because the bone marrow needs iron to make blood cells. Megaloblastic anemia is an anemic condition due to ineffective red blood cell production and intramedullary hemolysis. The most common causes of megaloblastic anemia are folate (vitamin B9) deficiency and cobalamin or vitamin B12 deficiency. This is similar to research in 2019 which showed that the incidence of iron deficiency anemia was 60% and megaloblastic anemia was 29% [7].

4.2 Food Consumption

Based on the results of research on the food consumption patterns of respondents, of the 17 respondents with mild anemia, most of the respondents consumed adequate energy intake (52.9%), less protein intake (52.9%), sufficient fat intake (58.8%), adequate intake of carbohydrates (70.6%), lack of fiber intake (58.8%), adequate intake of vitamins (folate, B6, B12) (64.7%) and lack of iron intake (58.8%).

Consumption of food in pregnant women must meet the needs of the mother and the needs of the growth or the development of the fetus. Mothers need more nutrients than before pregnancy. Therefore, it is necessary to consume a diverse and balanced diet both in terms of nutrition, quantity, and proportion [11].

Diversity of food in appropriate amounts and proportions can be seen from the composition of a balanced diet, to meet a person's nutritional needs for growth, development, and life processes. The main nutritional sources that complement each other are carbohydrates, proteins, and fats. The need for food intake in pregnant women, especially energy and micronutrients, will increase during pregnancy to support changes in maternal tissues and fetal growth so that lack of food intake will cause problems for maternal health and fetal growth [12].

The results of the measurement of the respondent's food consumption patterns on the food recall show that the level of intake of protein, fiber, and iron is in the less category, while the level of energy, vitamin (B6, B12, folate), fat, carbohydrate, and iron intake is in the sufficient category. On average, respondents preferred to consume food that is in the environment around them. In the morning, on average, respondents consume foods that are high in carbohydrates, such as village fried rice, uduk rice, and fried bananas.

During the day, on average, respondents often consume rice, fish, tofu/tempeh, and fresh vegetables. In the afternoon, the average respondent immediately eats heavy food such as rice, fish, tofu/tempeh, vegetables, and fresh vegetables, most of which have the same menu as the lunch menu, meaning that the dinner culture

in the Cikeusik area is changed to late in the afternoon around 16:30-18:00. At night, the respondents prefer to eat snacks such as fried bananas, boiled sweet potatoes, boiled cassava, and other snacks. This habit has become a hereditary culture for most families in the Cikeusik Pandeglang area.

The provision of health education regarding the intake of foods rich in nutrients such as carbohydrates, protein, fat, iron, folic acid, vitamins, and minerals were significantly associated with improved hemoglobin levels of pregnant women [13].

Bivariate Analysis

Association Between Food Consumption on Types of Anemia among Pregnant Women

The results of statistical tests show that there was an association between vitamin intake (folate, B6, B12) and iron intake on the type of anemia in pregnant women. Iron and folic acid are needed by pregnant women to prevent anemia and maintain optimal fetal growth. Iron deficiency anemia generally occurs in pregnant women and is more dominantly caused by a lack of intake of foods containing iron, while megaloblastic anemia in pregnant women is more dominantly influenced by a lack of vitamin intakes such as folate, B6, and B12 [14]. Lack of two nutritional elements such as folic acid and B12 can cause the body to not produce enough healthy red blood cells, resulting in megaloblastic anemia [15].

The results of this study are in line with the research in Bali, Indonesia which shows that there is a significant relationship between diet in pregnant women and the incidence of anemia [16]. Research in 2019 shows results that there was a relationship between food consumption patterns and the incidence of anemia. In this research, it was explained that the incidence of anemia in third trimester pregnant women was caused by vitamin B12 deficiency which is often called megaloblastic anemia [17]. This is supported by the research in 2019 which showed that there was a relationship between intake of folic acid and B12 with hemoglobin levels [18]. Similar results were also shown by the research in 2018, that there was a relationship between vitamin B12 intake in vegetarian food and megaloblastic anemia [19].

Researchers assumed that the more intake of iron, folate, and B12, the higher the hemoglobin level, and vice versa. Cases of anemia both iron deficiency and megaloblastic that occurred in respondents in the Work Area of the Cikeusik Health Center were caused by the lack of respondents in consuming iron-sourced foods such as red meat, liver/offal, spinach, and beans and the lack of intake of food sources of vitamin B6, folic acid, and B12 such as shellfish, meat, shrimp, salmon, milk, green vegetables, and folic acid fortified foods such as bread, cereals, and pasta. Anemia is not only caused by inadequate intake of nutrients, even though the intake of nutrients is sufficient but in the production process there is interference with red blood cells due to malfunctioning of the digestive process or gastric abnormalities that result in important nutrients cannot being absorbed and wasted together with feces, then this situation will over time make the body.

5. Conclusion

In conclusion, there was an association between food consumption on the type of anemia of pregnant women in the Work Area of the Cikeusik Health Center, Pandeglang Regency in 2021. Pregnant women were advised to consume Fe tablets and iron-rich foods to avoid iron deficiency anemia and to increase vitamin intake (folate, B6, B12) to avoid megaloblastic anemia.

Limitations

The limitation of this study is the number of respondents in this study is small due to the limited number of pregnant women in the area.

List of Abbreviations
WHO: World Health Organization
MMR: Maternal Mortality Rate
Hb: Haemoglobin
GCHB: Glucose, Cholesterol, and Hemoglobin

Competing of interest
The authors declare that they have no competing interests.

Authors' contributions
R, PA, and FUF contributed to the conception and design of the study, performed the data collection, drafted the manuscript, critically for important intellectual content, performed the statistical analysis. R critically reviewed the manuscript, and supervised the whole study process. All authors read and approved the final manuscript.

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6. References

[1] WHO. Maternal mortality. 2019. Available from: https://www.who.int/en/news-room/fact-sheets/detail/maternal-mortality.

[2] Kemenkes RI. Data info and information. Jakarta: Kementerian Kesehatan Republik Indonesia;2019.

[3] Dinkes Banten. Profil kesehatan Provinsi Banten 2019. Banten: Dinas Kesehatan Provinsi Banten;2020.

[4] Chaparro CM, Suchdev PS. Anemia epidemiology, pathophysiology, and etiology in low- and middle-income countries. Ann N Y Acad Sci. 2019 Aug;1450(1):15-31.

[5] Riskesdas. Basic health research 2018. Jakarta: Badan Penelitian dan Pengembangan Kesehatan Kementerian RI;2018.

[6] Stephen G, Mgongo M, Hashim TH, Katanga J, Stray-Pedersen B, Msuya SE. Anemia in pregnancy: prevalence, risk factors, and adverse perinatal outcomes in Northern Tanzania. Anemia. 2018;9(1):177-89.

[7] Fadli, Fatmawati. Analysis of factors causing anemia in pregnant women. Jurnal Kebidanan dan Keperawatan 'Aisyiyah. 2019;15(2):137-46.

[8] Socha DS, DeSouza SI, Flagg A, Sekeres M, Rogers HJ. Severe megaloblastic anemia: Vitamin deficiency and other causes. Cleveland Clinic Journal of Medicine. 2020;87(3):149-53.

[9] Hariz A, Bhattacharya PT. Megaloblastic Anemia. Treasure Island (FL): StatPearls Publishing;2021.

[10] Mahajan A, Sapehia D, Thakur S, Mohanraj PS, Bagga R, Kaur J. Effect of imbalance in folate and

vitamin B12 in maternal/parental diet on global methylation and regulatory miRNAs. Scientific Reports. 2019;9.

[11] Ernawati A. Nutritional issues among pregnant mothers. Jurnal Litbang. 2017;13(1):60-9.

[12] Mousa A, Naqash A, Lim S. Macronutrient and micronutrient intake during pregnancy: An overview of recent evidence. Nutrients. 2019;11(2).

[13] Sunuwar DR, Sangroula RK, Shakya NS, Yadav R, Chaudhary NK, PradhanI PMS. Effect of nutrition education on hemoglobin level in pregnant women: A quasi-experimental study. PLoS One. 2019;14(3).

[14] Simuyemba MC, Bwembya PA, Chola M, Michelo C. A root cause analysis of sub-optimal uptake and compliance to iron and folic acid supplementation in pregnancy in 7 districts of Zambia. BMC Pregnancy and Childbirth. 2020;20(20).

[15] Irianto K. Balanced nutrition in reproductive health. Bandung: Alfabeta;2014.

[16] Gozali W. The relationship between diet and the incidence of anemia in pregnant women in the working area of the Buleleng III Public Health Center. International Journal of Natural Sciences and Engineering. 2018;2(3):117-22.

[17] Imran M, Helmy Y, Hafez MA. Anemia with pergnancy. Sohag Medical Journal. 2019;21.

[18] Septyasih ARN, Widajanti L, Nugraheni SA. The relationship between intake of iron, folic acid, vitamin B12 and vitamin C with hemoglobin levels of students at SMP Negeri 2 Tawangharjo, Grobogan Regency. Jurnal Kesehatan Masyarakat. 2016;4(4):521-8.

[19] Nugroho MR, Sartika RAD. Vitamin B12 intake against megaloblastic anemia in vegetarians at Meitriya Khirti Vihara Palembang. Jurnal Kesehatan Komunitas. 2018;4(2):152-61.