An Exploration of Determinants of Anemia in Pregnant Women at Buakayu Community Health Center Tana Toraja Regency

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ABSTRACT

Introduction: Anemia on pregnant women is a global health problem that has serious impacts on the mother and fetus. The objective of the study was to explore the determinants of anemia on pregnant women at Buakayu Community Health Center, Tana Toraja Regency.

Methods: The study used an observational study with a cross-sectional design. The sample was pregnant women who visited the Buakayu Community Health Center for antenatal examination using an accidental sampling technique for 11 days. The data was collected through structured interviews and laboratory examinations. Data analysis was carried out using descriptive statistical methods (univariate), bivariate, and regression analysis to determine the variables most related to independent variables and anemia in pregnant women.

Results: The results of the study showed that diet (p=0.001), dietary restrictions (p=0.005), consumption of Fe tablets (p=0.000), and provision of additional food (p=0.000) were related to anemia incidence on pregnant women.

Conclusion: It can be concluded that diet, dietary restrictions, consumption of Fe tablets, and provision of additional food are factors that contribute to anemia incidence on pregnant women at the Buakayu Community Health Center area. It is hoped that the implications of the study can be used as a basis for designing appropriate interventions in dealing with anemia on pregnant women at the Health Center level.

INTRODUCTION

Anemia on pregnant women is an important public health problem because it can cause various negative impacts such as increasing the risk of complications during pregnancy, childbirth, and the baby being born (1). According to the World Health Organization (WHO), anemia is a major global health problem affecting nearly two billion people worldwide (2). The population groups most vulnerable to this condition are women of childbearing age and pregnant women (3). Given these serious health consequences, WHO has indicated that one of its Global Nutrition Targets is to reduce the frequency of anemia on women of childbearing age by 50% by 2025 (4). Based on

data from the World Health Organization (WHO), around 38% or around 32 million pregnant women experience anemia worldwide. Of this number, 46.3% or around 9.2 million women are in Africa (4). The rate of anemia during pregnancy is also quite significant in developed countries such as the United States (18%), Australia (20%), Singapore (67.8%), and China (70%), with rates tending to increase during the trimesters of pregnancy. However, the prevalence rate of anemia is much higher in developing countries, such as Ethiopia (50.1%) (5), Sudan (53%), Guinea (71%), and Pakistan (76,7%) (5–7).

Based on the Basic Health Research in 2018 report, the prevalence of anemia on pregnant women was 48.9%. According to the Director of Public Nutrition at the Ministry of Health, in 2019 there were four to five pregnant women who experienced anemia out of every 10 pregnant women. Data from the South Sulawesi Provincial Health Service in 2020 showed that there were 98.49% with hemoglobin levels of 8-11 mg/dl and 1.15% of pregnant women with hemoglobin levels of <8 mg/dl. The prevalence of anemia in South Sulawesi was 13.4% (8). According to the 2021 South Sulawesi Provincial Health Service Report, anemia was an important factor that caused direct maternal deaths (9). Data from the Tana Toraja Health Service stated that cases of anemia in Tana Toraja were 695 cases (47%) in 2021 (10), while the number of pregnant women who experienced anemia at the Makale health center in 2022 was 55 people (43.6%) (11). The findings from several studies conducted on this issue indicate that anemia in pregnancy has been associated with adverse pregnancy outcomes and fetal growth (12). This includes reducing work productivity, causing low birth weight babies (13), giving birth to premature babies, increasing the risk of preeclamptic abortion, complicating childbirth, and even causing perinatal death and maternal death during childbirth (11). It is caused by a decrease in the body's resistance to disease attacks, especially infections, which are caused by anemia (14). Therefore, excessive iron intake during the first or subsequent trimesters of pregnancy is strongly associated with a reduced risk of anemia. This may lead to adverse birth outcomes, premature birth, and low birth weight of the baby (15).

Numerous studies have investigated various factors that cause anemia during pregnancy. Independent factors that have been identified include maternal age, location of residence, level of education, antenatal visits, pregnancy interval, iron intake from food, diet (16), micronutrient intake, dietary diversity, use of iron supplements, parasite infections, and number of pregnancies, have been noted as factors associated with the risk of anemia during pregnancy (17,18). Meanwhile, data obtained from the Buakayu Health Center, Tana Toraja Regency in 2023 showed that 10% of 98 pregnant women suffer from anemia. Antenatal care is a service provided routinely to pregnant women to ensure the health of the mother and fetus. It includes a series of pregnancy checks, handling any irregularities that may be found, providing basic interventions such as tetanus toxoid (TT) immunization and iron tablet supplements, as well as providing education and motivation to mothers to care for themselves and prepare for the birthing process. The objective of the study was to explore the determinants of anemia on pregnant women at Buakayu Health Center Tana Toraja Regency.

METHOD

The study used observational with a cross-sectional design. It was carried out at the Buakayu Health Center, Tana Toraja Regency, starting from January 13 to January 24, 2024. The population was all pregnant women who came to have their pregnancies checked at the Buakayu Health Center, Tana Toraja Regency in 2024, totaling 60 pregnant women. The samples in this study were pregnant women who came to have their pregnancies checked at the Buakayu Community Health Center, Tana Toraja Regency by using an accidental sampling technique for 11 days. Primary data was taken through direct interviews with pregnant women using questionnaires and laboratory examinations. Electronic data processing used a computer program and data analysis used the chi-square test and logistic regression to determine the independent variables that were most closely or most related to anemia incidence and presented the data in table form with explanations.

RESULTS

The study was carried out at the Buakayu Community Health Center, Tana Toraja Regency for 11 days starting from January 13 to January 24, 2024, by taking a sample of 60 pregnant women. The data was processed

and analyzed according to research objectives. The results of data analysis were presented in table form which is equipped with the following explanation:

Table 1. Distribution of Characteristics of Pregnant Women at Buakayu Community Health Center Tana Toraja Regency

Characteristics of Pregnant Women	n	Percentage
Age Group of Mothers		
(Years)	2	3,3
15 – 18	15	25,0
19 – 22	25	41,7
23 – 26	13	21,7
27 – 30	1	1,7
31 – 34	4	6,7
35 – 38		
Total	**60**	**100,0**
Education of Mothers	7	11,7
No School	17	28,3
Elementary School	17	28,3
Junior High School	16	26,7
Senior High School	3	5,0
Undergraduate Degree		
Total	**60**	**100,0**
Occupation of Mothers		
Unemployment	54	90,0
Self- employed	2	3,3
Civil servant	4	6,7
Total	**60**	**100,0**

Table 1 showed that of the 60 pregnant women, the highest was 41.7%, in the 23 – 26-year age group and the lowest was 1.7% in the 31–34-year age group, the highest had elementary and junior high school education levels respectively 28.3% and the lowest was an undergraduate degree at 5.0%, the highest was 90.0% unemployment, and the lowest was self-employed at 3.3%.

Table 2. Relationship between Determinant Variables of Anemia Incidence in Pregnant Women at the Buakayu Community Health Center Tana Toraja Regency

Variable	Status of Pregnant Women				Total	X^2 (p)
	Anemia		Not Anemia			
	n	Percentage	n	Percentage		
Dietary Habit						
Insufficient	30	78,9	8	21,1	38	10,880
Sufficient	8	36,4	14	63,6	22	(0,001)
Total	38	63,3	22	36,7	60	
Food Restrictions						
Unconsumed	32	74,4	11	25,6	43	8,031
Consumed	6	35,3	11	64,7	17	(0,005)
Total	38	63,3	22	36,7	60	
Consumption of Fe Tablets						

Irregular	33	80,5	8	19,5	41	16, 407
Regular	5	26,3	14	73,7	19	(0,000)
Total	38	63,3	22	36,7	60	
Providing Supplementary						
Food	32	80,0	8	27,1	40	
Unconsumed	6	30,0	14	75,0	20	14,354
Consumed						(0,000)
Total	38	63,3	22	36,7	60	

Table 2 showed that of the 38 pregnant women who had poor or insufficient dietary habits, 78.9% suffered from anemia. Meanwhile, of the 22 pregnant women who had sufficient dietary habits, 36.4% suffered from anemia. The results of statistical analysis obtained a calculated X^2 value (10.880) > X^2 table (3.841) and a p-value (0.001) < 0.05. It indicated that dietary habit was related to anemia incidence on pregnant women. Of the 43 pregnant women who stated that they had no food restrictions, 74.4% suffered from anemia. Meanwhile, of the 17 pregnant women who stated that they were abstaining from consuming food, 35.3% suffered from anemia. The results of statistical analysis obtained a calculated X^2 value (8.031) > X^2 table (3.841) and a p-value (0.005) < 0.05. It showed that dietary restriction was related to anemia incidence on pregnant women. Of the 41 pregnant women who did not regularly consume Fe tablets, 80.5% suffered from anemia. Meanwhile, of the 19 pregnant women who regularly consumed Fe tablets, 26.3% suffered from anemia. The results of statistical analysis obtained a calculated X^2 value (16.407) > X^2 table (3.841) p-value value (0.000) < 0.05. It indicated that the consumption of Fe tablets was related to anemia incidence on pregnant women. Of the 40 pregnant women who stated that they did not consume supplementary food, 80.0% suffered from anemia. Meanwhile, of the 20 pregnant women who stated that they consumed sufficient supplementary food, 30.0% suffered from anemia. The results of statistical analysis obtained a calculated X^2 value (14.354) > X^2 table (3.841) and a p-value (0.000) < 0.05. It showed that supplementary food was related to anemia incidence on pregnant women.

Multivariate analysis was carried out to determine the variables most associated with anemia incidence on pregnant women, after being analyzed with other variables. The variables included in the model are those that are statistically significant (p-value <0.05). Based on the final logistic regression model, the variables related to anemia incidence on pregnant women at the Buakayu Health Center Tana Toraja Regency. The variables were diet, dietary restrictions, consumption of Fe tablets, and providing supplementary food. Multivariate analysis can be seen in the following table:

Table 3. Multivariate Analysis of Anemia Incidence on Pregnant Women at Buakayu Health Center Tana Toraja Regency

Variable	B	Sig	Exp (B)	Wald	95% C for Exp (B)	
					Lower	Upper
Diet	1,362	0,044	3,904	4,049	1,036	14,708
Food Restrictions	0,425	0,601	1,530	0,274	0,311	7,525
Consumption of Fe Tablet	1,300	0,161	3,670	1,969	0,597	22,565
Providing Supplementary Food	0,934	0,299	2,545	1,076	0,436	14,868
Constant	-6,063	0,000	0,002	16,450		

Table 3 showed that there was a relationship between diet, dietary restrictions, consumption of Fe tablets, and the providing supplementary food with anemia incidence on pregnant women, as shown by a significant p-value (p=0.001 for diet, p=0.005 for restrictions food, p=0.000 for consumption of Fe tablets, and p=0.000 for

providing supplementary food). Of these four variables, the variable that was most strongly related to anemia incidence on pregnant women was diet. It was indicated by a high exp (B) value (exp (B) = 3.904). Thus, it showed that diet has a big influence in determining the risk of anemia on pregnant women.

DISCUSSION
Determinants of Dietary Habits and Anemia Incidence on Pregnant Women

Diet refers to various information that describes the type and amount of food consumed by pregnant women in one day (19). In this study, the analysis showed a significant relationship between diet and anemia incidence on pregnant women. These findings highlight the important role of a balanced and nutritious diet in reducing the risk of anemia on pregnant women. The study showed that a good diet can be a very important factor in preventing anemia on pregnant women. Significant results with a low p-value (p=0.001) confirm that there was a strong correlation between diet and anemia incidence. The dietary habits variable also showed a high expected value (exp. (B)=3.904), confirming that adherence to a good dietary habit can significantly reduce the risk of anemia on pregnant women. Factors that need to be considered in the cultural influence of eating patterns include attitudes towards food, perceptions of the causes of disease, childbirth traditions, and food production patterns(20). In terms of attitudes towards food, there are still many beliefs, taboos, and prohibitions in society that can influence the level of food consumption (21).

Research conducted by Pebrina (2021) explained that the dietary factors of pregnant women were very important to meet the nutritional needs of pregnant women and their fetuses. There were pregnant women with good consumption levels who still suffered from anemia because the protein consumed by pregnant women was of poor quality. Good-quality protein comes from animal sources (22). It was supported by the research of Dina (2018) which stated that eating patterns were related to anemia incidence on pregnant women (p=0.035<0.05 at Jalan Gedang Health Center Bengkulu City. Bad dietary habits on pregnant women had an impact on nutritional disorders, including anemia, poor weight gain on pregnant women, and impaired fetal growth (23). Therefore, emphasis on comprehensive nutritional education and promotion of healthy dietary habits is very important in efforts to prevent and control anemia in pregnant women. Providing information and adequate support regarding the importance of a balanced nutritional intake(24), as well as promoting a diet rich in iron and other important nutrients, can help reduce the prevalence of anemia and improve the health of pregnant women and the development of their unborn babies (14).

Determinants of Food Restriction and the Incidence of Anemia in Pregnant Women

Food restriction can play a role in anemia incidence on pregnant women because they can limit their access to important nutritional sources, especially iron. In some cultures, or traditions, there are prohibitions or taboos against consuming certain foods during pregnancy, which can result in iron deficiency and cause anemia. Examples of dietary restrictions such as a ban on eating red meat, eggs, or other types of food rich in iron can reduce the nutritional intake needed to prevent anemia in pregnant women (3,6,7). The study found that food restriction was associated with anemia incidence on pregnant women (p-value = 0.005) < 0.05. It was supported by research by Rifatolistia et.al (2021) which stated that food restriction was associated with anemia incidence on pregnant women (p=0.000) in Amahai District Central Maluku Regency (25). The findings of this study are in line with the results of research by Martini and Haryanti (2017) regarding the impact of food taboos on anemia incidence in second-trimester pregnant women. Based on these data, the majority of pregnant women (74.4%) were influenced by food restrictions, influenced by knowledge and culture in society, which could increase the risk of morbidity and pregnancy complications, including anemia (26). These findings support the view expressed by Ariyani (2016), that cultural factors, including beliefs, such as superstition and prohibitions on certain foods, played a role in the risk of anemia in pregnancy (27).

Some people still believe that fish consumption by pregnant women is prohibited, and culture has a fundamental role in influencing the incidence of anemia in pregnancy. Sociocultural influences in this study include myths, taboos, and practices for treating and preventing anemia during pregnancy believed by families and local communities in the working area of the Buakayu Health Center Tana Toraja Regency. Myths or prohibitions

regarding food consumption were also revealed in the study, where most pregnant women expressed fear of foods that tasted too salty, bitter, or fishy, such as fish or eggs because they believed that it could cause the amniotic fluid to smell bad, nausea and undesirable body odor during pregnancy (28). Some also expressed their concerns about durian and pineapple, due to the belief that these two fruits could cause miscarriage. In addition, certain habits that are thought to cause anemia also include the prohibition of bathing at night and the prohibition of circling a pregnant woman's neck with a towel because it is feared that this could cause the fetus to become entangled in the umbilical cord (29).

The food given has a direct impact on the baby's health. Every society has norms that regulate the type, quantity, and quality of food according to individual characteristics, such as age, gender, and certain situations (3). For example, there are prohibitions or recommendations for pregnant women regarding the consumption of certain foods; fathers who are breadwinners usually get larger portions of food and better portions than other family members; or the order of feeding may be different for boys and girls. Even though this dietary habit is part of tradition or habit, the mother has a central role in determining the daily menu and distribution of food within the family (30). Therefore, pregnant women and health care providers need to understand the dietary restrictions applied in their culture and seek alternative sources of adequate nutrition to ensure pregnant women continue to receive adequate iron intake for their health and fetal development.

Determinants of Fe Tablet Consumption and Anemia Incidence on Pregnant Women

The risk of anemia is one of the health consequences for pregnant women. In young pregnant women, the need for nutritional intake increases, especially because of pregnancy. It means that necessary nutrients must be shared between the mother and fetus, which can lead to nutritional deficiencies in the mother. On the other hand, pregnant women over 35 years old face other challenges because their body organs experience decreased function or degeneration. During pregnancy, this can cause a decrease in hemoglobin in red blood cells because the body's ability to absorb nutrients, including iron, decreases. As a result, the risk of anemia may increase in this group (31).

The study found that regular consumption of Fe tablets can help prevent or treat anemia on pregnant women. Anemia on pregnant women is often caused by iron deficiency because pregnancy increases the need for iron to support fetal and placental growth. When iron intake from food is insufficient, consuming iron tablets can be an effective solution. The results of this study showed that pregnant women who regularly consumed iron tablets had a lower risk of experiencing anemia. In some cases, research also showed that the use of Fe tablets could increase hemoglobin levels in the blood, reduce symptoms of anemia, and improve the well-being of pregnant women. The results of the study were supported by research by Ana Samiatul (2018) in Baregbeg Village, Baregbeg Health Center Working Area Ciamis Regency. She stated that the majority were in the regular category (54.8%), most pregnant women did not experience anemia (61.3%) and the statistical test results showed that there was a relationship between consumption of Fe tablets with anemia incidence on pregnant women with a p-value of 0.002 (32).

Consuming Fe tablets is one effort to prevent and control anemia. Iron (Fe) is an essential microelement for the body that is needed in the synthesis of hemoglobin. Consumption of Fe tablets is closely related to hemoglobin levels in pregnant women. Iron deficiency anemia which is experienced by many pregnant women caused by poor adherence to Fe tablets or the wrong way of consuming them, which causes a lack of iron absorption in the mother's body. Mother's non-adherence to Fe tablets results in low Iron absorption. The form of iron contained in Fe tablets and low levels of iron in food affect the absorption of iron by the body. However, it is important to note that the effectiveness of iron tablets may be influenced by other factors such as the recommended dosage, user adherence in consuming the tablets, as well as the individual's health condition. Additionally, consultation with a healthcare provider before consuming iron supplementation is highly recommended, as the appropriate dose and type of supplement may vary depending on individual needs and health conditions (19,31,33).

Determinants of Providing Supplementary Food and Anemia Incidence on Pregnant Women

Providing supplementary food rich in iron and other nutrients can help prevent or reduce the risk of anemia on pregnant women (34). In this study, it was found that providing supplementary food was related to anemia

incidence on pregnant women with a p-value = 0.000 <0.05. The study showed that appropriate supplementary food during pregnancy can increase the intake of necessary nutrients, including iron, folate, and other vitamins important for maternal health and fetal development. Iron is a key nutrient in preventing anemia and providing supplementary food rich in iron such as meat, fish, green vegetables, and whole grains can help increase hemoglobin levels in the blood of pregnant women. Meanwhile, the study was supported by research by Kartini et.al (2019) which stated that consumption of Fe tablets (p-value = 0.000) was associated with anemia incidence on pregnant women at the Sanrobone Health Center Takalar Regency (35). Furthermore, research by Susilawati et.al (2023) in Menganti Village Kesugihan District Cilacap Regency found that there was an increase with an average score of 35.1. It showed an increase in knowledge regarding consuming supplementary foods and anemia incidence (36).

According to pregnant women at Buakayu Health Center working area Tana Toraja Regency, foods that should be avoided have certain beliefs regarding their impact on the baby's development. For example, drinking ice water is thought to affect the size of a baby's head at birth, while consuming squid is believed to influence the placenta, and consuming shrimp is believed to affect the birthing process. The recommended supplementary food does not have to be a complete meal such as rice and side dishes, but can be a snack, paying attention to its quality (37). The supplementary food provided should use local ingredients from local farms, not industrial products imported from the city, such as powdered milk, canned milk, instant noodles, or bread (38). These supplementary foods must have adequate nutritional content, at least 300 calories and 5 grams of protein per day, or at least cover 15% of daily calorie and protein requirements. This amount is equivalent to the calorie and protein value that pregnant women usually get from their morning meal (if they eat breakfast) (39,40).

Furthermore, it is also important to pay attention to variety and balance in providing supplementary food, so that pregnant women get sufficient nutrition from various sources (41). It can help to ensure that pregnant women get all the nutrients they need to prevent anemia and maintain their health and optimal fetal development (40). However, it is important to consult with a healthcare provider before starting a supplementary food program during pregnancy, to ensure that the choice of supplementary food is appropriate to the individual nutritional needs and health condition of the pregnant woman.

CONCLUSION

The study concluded that there are several factors such as diet, dietary restrictions, consumption of Fe tablets, and providing supplementary food, which are factors that have the potential to influence anemia incidence on pregnant women. Therefore, it is necessary to expand nutritional education and health promotion programs for pregnant women and the community in general, increase accessibility to iron and folic acid supplements, strengthen antenatal care services, and empower the community in increasing awareness of the importance of nutrition and health care during pregnancy.

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