Relationship Analysis of Protein Intake with The Amount of Erythrocite in Pregnant Women in Coastal Area of Brebes District (Study in Grinting Village, Bulukamba District, Brebes Regency)

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Abstract: The nutrients used by the human body to build cells are acted on by proteins. Among the cells formed by these proteins are erythrocytes. Therefore, if the intake of protein from foodstuffs is reduced, of course it will disrupt the erythrocyte formation process. As a result, there will be a decrease in the number of erythrocytes which will also have an effect on anemia. Therefore, this study aimed to analyze the relationship between protein intake and the number of erythrocytes in pregnant women in the coastal area of Brebes Regency. This study will use an analytic survey methods with a cross-sectional approach. The population used was all pregnant women who were present at the time of the research process using a purposive sampling model. The results showed that of the 49 respondents who were present at the time of the study, there were 14.3% respondents who experienced low protein intake and 85.7% respondents who had good protein intake. From the protein intake data, when analyzed through chi-square analysis, the results of the relationship between low protein intake and low erythrocyte count in pregnant women were obtained, namely (P = 0.013 <0.05) with POR = 3,000; CI = 1.704-5,283.
Keywords: Protein, Pregnant Women, Erythrocytes, Anemia.

Introduction

Humans need food to live. The human need for food is used to produce a source of energy to maintain its survival. This energy is obtained by humans from various foods that contain certain substances called nutrients. Nutrition is a chemical bond that is needed by the body to carry out its duties and functions to produce energy, build and maintain tissues and regulate tissue processes (Achmadi, 2014). Therefore, the nutrients contained in food ingredients are very useful as a source of energy besides being useful for maintaining human health (Cakrawati and Mustika, 2014). Among the nutrients that are needed by the human body to support its life activities is protein. Proteins are substances formed from the building blocks called amino acids. The function of protein is very important for the body to form new tissue during the growth and development of the body and to maintain body tissues and repair and replace damaged tissue (Achmadi, 2014).

Especially for pregnant women, protein substances play a very important role in the growth and development of the fetus, as well as forming the placenta and amniotic fluid, uterine tissue growth and increasing blood volume (Proverawati, 2009). The nutritional intake of pregnant women continues to increase from their usual needs. This happens because during pregnancy, these nutrients are also needed by the fetus, resulting in additional food intake for pregnant women. Protein intake in pregnancy requires an additional 30 grams per day (KEMENKES, 2019). If the need for food intake is reduced, it is feared that complications will occur in pregnant women, including anemia.

Anemia is a serious public health problem, especially in pregnant women and children, where the prevalence of anemia in pregnant women worldwide reaches 42.8%. In that case, anemia

in pregnancy cases is closely related to the increase in pain and death in pregnant women, where about 40% of maternal deaths in developing countries, such as Indonesia, are related to anemia (Pratiwi and Fatimah, 2019). Brebes Regency is one of the districts with the highest maternal mortality rate in Central Java Province. This can be seen from data throughout 2016 in the second quarter, where 36 cases of maternal death were recorded. (Dinas Kesehatan Provinsi Jawa Tengah, 2016). In relation to cases of anemia in pregnancy, it was found that out of 269 pregnant women, around 34.5% of pregnant women experienced anemia in the working area of the Kluwud Health Center in 2016 (Laporan Kerja Puskesmas Kluwud, 2016).

Pregnancy causes physiological changes in the body system, one of which is an increase in normal body fluids during pregnancy which can cause a relative decrease in the number of erythrocytes (Kiswari, 2014). A decrease in the number of erythrocytes is usually accompanied by a decrease in hemoglobin and hematocrit levels. This is because hemoglobin is a special protein found in red blood cells, where each red blood cell contains about 640 million hemoglobin molecules. However, these two parameters (hemoglobin and hematocrit) may be normal in some cases with hemoglobin levels less or below normal. (Hoffbrand and Moss, 2013).

Anemia in pregnancy is a condition of the mother with a hemoglobin (Hb) level of <11gr% in the first and third trimesters, while in the second semester the hemoglobin level is <10.5 g% (Pratiwi & Fatimah, 2019). In addition, Bakta (2006) explains the definition of anemia that anemia is a condition in which the mass of erythrocytes and/or mass of circulating hemoglobin cannot fulfill its function to provide oxygen to body tissues. In order for hemoglobin to be able to carry out its function properly in terms of oxygen exchange, red blood cells (erythrocytes) must be able to maintain hemoglobin from a state of destruction (ferols) and maintain osmotic balance in cells (Hoffbrand and Moss, 2013).

According to Kiswari (2014), anemia occurs due to one or more combinations of three basic mechanisms, namely blood loss, decreased erythrocyte production, or increased erythrocyte destruction (hemolysis). To prevent erythrocytes from being destroyed, erythrocytes must be produced continuously. In this regard, Parakkasi (1992) stated that normal erythrocyte production occurs in the bone marrow, this process requires iron for the metabolism of hemoglobin, miglobin and cytochromes. The reduced intake of nutrients needed for erythrocyte formation causes disruption of the erythrocyte formation process, causing a decrease in the number of erythrocytes. The disruption of erythrocyte formation is caused by the intake of food that is consumed lacking nutrients, especially erythrocyte-forming nutrients such as iron, folic acid, vitamin B12, protein, vitamin C and other important nutrients (Wirakusuma, 1999). Not only that, protein also functions as a carrier for iron in the body. If protein intake in the body decreases, of course iron delivery will be hampered. As a result, there will be an effect of iron deficiency (Gallagher ML in Mahan LK, Escott-Stumps, 2008).

Based on the previous description, this research focuses on the context of protein intake. The main problem being studied is whether the reduced intake of protein substances can disrupt the erythrocyte formation process so that it can cause a decrease in the number of erythrocytes or vice versa? This is the focus of this study because we want to know whether there is a relationship between protein intake and the number of erythrocytes. The object of the research was taken only on pregnant women on the grounds that the need for protein greatly affects the condition of the pregnant woman's body.

Methods

This study used an analytic survey method with a cross-sectional approach. This research was conducted in coastal areas, precisely in Grinting Village, Bulakamba District, Brebes Regency. The population used was all pregnant women who were present at the time of the research process using a purposive sampling model. The results obtained a sample of 49 respondents. Then the research variables were protein intake as the independent variable and the number of erythrocytes as the dependent variable.

This study uses data on the measurement of protein intake using the Foot Frequency Questionare (FFQ) form. Meanwhile, to measure the number of erythrocytes using a hematology analyzer. Then the protein intake data analysis used Nutrisurvey 2007. After the data was collected, the data would be processed using the SPSS for windows version 16.0 application. Furthermore, to determine the relationship between the two variables will use the chis-square statistical test.

Result

Table 1. Results of Distribution of Pregnant Women Based on Age Characteristics, Education and Work

Characteristics of Pregnant Women	**n**	**%**	**Mean**	**Median (min-max)**
Age			28,95	28 (19-47)
at rist (<20 dan >35)	6	12,2		
not at risk(20-35)	43	87,8		
Total	**49**	**100**		
Education				
Low	34	69,4		
Medium	12	24,5		
Higher	3	6,1		
Total	**49**	**100**		
Work				
yes	24	49		
No	25	51		
Total	49	100		

Referring to table 1, it can be seen that the characteristics of respondents based on age show that the average age of the subject is 28 years and most of the subjects are in the non-risk age group (20-25 years) of 87.8%. Judging from the level of education of the subject, most of the subjects had low education, namely 34 (69.4%). Furthermore, most of the subject's work status was not working 25 (51%).

Table 2. Distribution of Protein Intake and Erythrocyte quantity

Variable	**x±SD**	**n (%)**
Protein Intake	117,8 **±35,8**	
inadequate		7 (14,3)
adequate		42 (85,7)
Erythrocyte quantity	4,43 ± **0,651**	
Low		18 (36,7)
Not low		31 (63,3)

Based on the results listed in table 2, it is known that the average protein intake in the subjects was 117.8 ± 35.8 grams. Less protein intake was 14.3% and adequate protein intake was 85.7%. Meanwhile, the results of the hematological analysis showed that the average erythrocyte level in pregnant women was 4.42x106µL. The low erythrocyte quantity was 36.7% and the erythrocyte quantity was not low at 63.3%

Table 3. Results of Analysis of Protein Intake and Number of Erythrocytes in Pregnant Women

Variable	**Erythrocyte Quantity**				**Total**		**p**	***POR (CI)**
	Low		not low					
	n	%	n	%	n	%		
Inadequate protein intake	6	85,7	1	14,3	7	100	0,013	3,000 (1,704-5,283)
Adequate protein intake	12	28,6	30	71,4	42	100		
Total	18	36,7	31	63,3	49	100		

Based on the results of the bivariate analysis between protein intake and the number of erythrocytes in pregnant women in table 3, it is known that the proportion of subjects with low erythrocyte quantity is greater in less protein intake, namely 85.7% compared to adequate protein intake, namely 28.6%. From the results of the Chi-Square test analysis, it was found that the value of p = 0.013. This means that statistically there is a significant relationship between low protein intake and low erythrocyte quantity in pregnant women in Grinting Village, Bulakamba District, Brebes Regency. POR value = 3.0000; 95% CI = 1.704-5.283, so it can be concluded that pregnant women who have protein intake have less effect on reducing the number of erythrocytes compared to the amount of sufficient protein intake.

Discussion

The average age of the subjects was 28 years with the age range of the subjects between 19-47 years and most of the subjects were in the no-risk age group (20-25 years) of 87.8%. According to Pratiwi and Fatimah (2019), the most important risk factor for anemia is age. The age of pregnant women is closely related to the female reproductive organs. The ideal reproductive age is 20-35 years. Pregnant women who are less than 20 years old and more than 35 years old can be at risk of developing anemia. This is because at the age of less than 20 years, pregnant women are biologically unstable, so they do not pay attention to fulfilling their nutritional needs during pregnancy. In addition, pregnant women who are more than 35 years old, their immune system decreases and is susceptible to disease. This theory is confirmed by the results of research conducted by Anfiksyar *et al*. (2019), in which the age of the mother in pregnant women with anemia is mostly at the age of 20-35 years, namely 73%. Furthermore, in the process of assessing the nutritional status, age is a very important parameter to determine the extent to which human organs function optimally and accordingly. From age too, we can find out how long and to what extent the various nutritional intakes that enter the body affect the human body and life (Paramshanti, 2019).

Subject education was mostly low (69.4%). A person's education greatly influences the level of knowledge, where someone's knowledge can form certain beliefs so that people who already have knowledge can behave in accordance with these beliefs. In this regard, the higher a person's nutritional knowledge, the more he will take into account the type and

amount of food chosen for consumption so that it can affect nutritional status (Kemenkes RI, 2012).

Based on the analysis of different proportions, it was found that the proportion of subjects with low erythrocyte quantity was greater at less protein intake, namely 85.7% compared to adequate protein intake, namely 28.6% and statistically stated that there was a significant relationship between insufficient protein intake and low erythrocyte quantity. This study is in line with research conducted by Mantika & Mulyati which states that there is a relationship between protein intake (r = 0.611) and hemoglobin levels in female workers. In addition, Thomson also conducted the same study in 2011 on 963,676 people, the results showed that the lower the protein intake, the lower the hemoglobin level.

This has been proven by Sood *et al.* (1965) in their experimental research using rheus monkeys as research subjects, in which it induces rhesus monkeys with a syndrome very similar to humans experiencing Kwashiorkor, by giving them a protein deficient but sufficient diet. in all other nutrients and calories for 8 and 10 weeks. As a result, all the animals lacked protein and experienced severe anemia for 8 and 10 weeks, besides that, the hemoglobin concentration and erythrocyte quantity also decreased significantly.

The results of this study are also in accordance with the theory put forward by Gallagher (2008), that protein functions as a formation of blood grains as well as the formation of erythrocytes and hemoglobin. In addition, protein also plays a role in the transportation of iron in the body. So, if a person is deficient in protein, then iron transfer will be inhibited directly so it will result in iron deficiency. Transfering itself is a glyco-protein that plays a central role in the body's iron metabolism because the function of transferrin is to transport iron in the circulation to places where iron is needed, such as bone marrow as a place to form new hemoglobin. On the other hand, there is ferritin which is another protein that is important in the metabolism of nutrients.

With regard to the function of protein in the body, Murray *et al.* (2009) stated that among the many roles of protein in the body, one of them is to play a role in helping non-heme iron to be more easily absorbed in the body, where the sulfur groups contained in proteins have an effect. as a booster to bind non-heme iron and help its absorption in the body. Inadequate protein intake can cause disturbances in iron metabolism, thus affecting the formation of hemoglobin and resulting in anemia. However, the results of this study are different from the research conducted by Kusudaryati and Parananingrum in 2018 with different research subjects, namely adolescents. The results showed that there was no relationship between protein intake and hemoglobin levels (p = 0.515) in adolescent girls.

Conclusion

Of the 49 pregnant women, most of them had no risk age characteristics (20-35) of 87.8%, with low educational status (69.4%) and unemployed (51%). Meanwhile, seen from the total protein intake, it is known that the average protein intake of pregnant women is 117.8 grams, including protein intake in the low category of 14.3% and adequate protein intake of 85.7%. Meanwhile, if viewed from the average erythrocyte level in pregnant women is 4.42x106 µL, including low erythrocyte quantity of 36.7% and not low erythrocyte quantity of 63.3%.

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