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Relationship between Protein Intake and Serum Albumin Levels in First Trimester Chronic Energy Deficient Pregnant Women in Padang City

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ABSTRACT

Albumin is a specific indicator to assess chronic energy deficiency (KEK) in pregnant women. Albumin functions as a protein that transports micronutrients in the blood. Low albumin levels can indicate KEK has occurred. This study aims to determine the relationship between protein intake and serum albumin levels for pregnant women in the first trimester of KEK in the city of Padang. This study was an observational correlative analytic study with a cross sectional approach. The sample in this study was 34 pregnant women in the first trimester of KEK with a proportional stratified random sampling technique. Interviews for protein intake using a modified semi quantitative food frequency questionnaire designed by Lipoeto were conducted at Pauh Puskesmas and Puskesmas Lubuk Kilangan while sample examinations were carried out at the Technical Implementation Unit of the West Sumatra Health Laboratory Service from June 2019 to November 2020. Data analysis used the Pearson correlation test. The results showed that the mean protein intake was 56.40 ± 14.612 g / day and the serum albumin level was 3.8 ± 0.604 g / dl. There is a significant relationship between protein intake (r = 0.467) and serum albumin levels. The conclusion is that there is a relationship between protein intake and serum albumin levels in pregnant women in the first trimester of SEZ in the city of Padang.

1. Introduction

Albumin is one of the parameters for determining KEK in pregnant women because serum albumin is a specific indicator of the adequacy of protein intake and an assessment of long-term nutritional status. KEK is a condition where there is a continuous and long-lasting lack of energy and protein intake so that it can reduce levels of branched chain essential amino acids in plasma and serum albumin levels in the blood. Lack of nutritional intake in the first trimester is associated with a high incidence of preterm birth, fetal death and central nervous system abnormalities.

Albumin serves as the main transport protein for micronutrients so that the nutrients in the blood will be bound in albumin. The decrease in dietary protein will be seen from the serum albumin level. Liver cells produce and excrete large amounts of albumin, so the intake of protein from food and essential nutrients must be adequate. Protein synthesis in the liver, especially albumin synthesis, is very responsive to the influx of amino acids from food. If adequate protein intake, albumin synthesis will increase.

Deficiency of protein, energy and micronutrients is very common in developing countries. This shows that pregnant women in developing countries consume less protein, iron and folic acid during pregnancy. The results of Nutritional Status Monitoring (PGS) show that in Indonesia 29.3% of pregnant women meet protein adequacy in their daily consumption, while pregnant women who experience a protein deficit are 51.9%. This is seen from the diet of the Indonesian people, especially those from low socio-economic groups, generally low consumption of animal protein, whereas the Indonesian people's diet is relatively high in phytate and fiber.

The purpose of this study was to determine the relationship between protein intake and serum albumin levels in pregnant women in KEK trimester I in the city of Padang.

2. Method

This research is a type of observational correlative analytic research with a cross sectional approach. Interviews for protein intake using a semi quantitative food frequency modified questionnaire designed by Lipoeto were conducted at Pauh Puskesmas and Puskesmas Lubuk Kilangan while sample examinations were carried out at the Technical Implementation Unit of the West Sumatra Health Laboratory Service from June 2019 to November 2020. The sample in this study was pregnant women with KEK In the first trimester, there were 34 people using proportional stratified random sampling technique.

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3. Result and Discussion

3.1 Mean protein intake and serum albumin levels

The mean protein intake and albumin levels in pregnant women in the first trimester of KEK in Padang City can be seen in table 1 below:

Table 1

Average Protein Intake and Serum Albumin Levels in Pregnant Women in 1st Trimester KEK in Padang City, 2020

Variable	Mean ± SD	Minimun	Maximum
Protein Intake (g)	56.40 ± 14,612	33.7	99.3
Albumin levels (g / dl)	3.8 ± 0.604	2.96	5,10

The results showed that the average protein intake in pregnant women in the first trimester of KEK was 56.40 g / day. While the average albumin levels in pregnant women in the first trimester of KEK was 3.8 g / dl. This shows that the total protein intake is still far below the standard value recommended by the RDA for trimester I pregnant women aged 20-35 years 76 grams / day.

Table 2

Frequency Distribution of Research Subjects Based on Adequacy Level of Protein Intake in Pregnant Women in Trimester I SEZ in the City of Padang in 2020

Variable	N	%
Protein Intake		
Not enough	30	88.2
Enough	4	11.8
Total	34	100

In table 2 it can be seen that most pregnant women have insufficient protein intake (88.2%), while only (11.8%) pregnant women have sufficient protein needs.

Table 3

Frequency Distribution of Research Subjects Based on Albumin Levels for Pregnant Women in KEK Trimester I in the City of Padang in 2020

Albumin levels	n	%
Albumin levels (<3.5 g / dl)	13	38.2
Albumin levels (3.51-5.0 g / dl)	21	61.8
Total	34	100

In table 3 it can be seen that out of 34 KEK pregnant women there were 13 pregnant women (38.2%) who had albumin levels <3.5 g / dl. Meanwhile, 21 pregnant women (61.8%) had normal albumin levels.

3.2 Relationship between protein intake and serum albumin levels in pregnant women in KEK trimester I in the city of Padang

Based on the results of the study, the relationship between protein intake and serum albumin levels can be seen in Figure 1 below:

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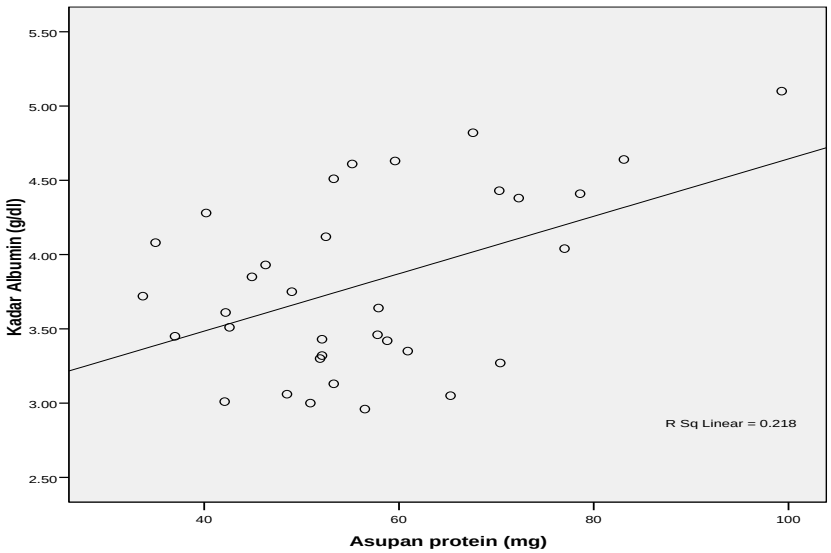

Fig 1 The relationship between protein intake and serum albumin levels in pregnant women in KEK trimester I in the city of Padang

In Fig. 1 it can be seen that there is a significant relationship between protein intake and serum albumin levels in the first trimester of KEK in Padang City (p = 0.005). The data analysis showed that the direction of the positive relationship with the strength of the relationship was moderate (r = 0.468), it means that the tendency was that the lower the protein intake, the lower the serum albumin level. The value of Linear R Sq = 0.218 means that protein intake contributes 21.8% to serum albumin levels.

3.3 Relationship between Protein Intake and Serum Albumin Levels for Pregnant Women in KEK Trimester I

In this study, there was a statistically significant positive relationship between protein intake and serum albumin levels for pregnant women in the first trimester of KEK in Padang City with moderate strength (p = 0.005 r = 0.467). This shows a tendency that the lower the protein intake, the lower the albumin levels.

Protein intake can stimulate albumin synthesis in the liver. The reduction in protein consumption slows down the synthesis of albumin mRNA causing low albumin levels. Liver cells secrete albumin normally when adequate protein intake. Albumin synthesis in the liver requires an adequate supply of amino acid components and is activated by binding to tRNA (David, 2012). Albumin synthesis is very responsive to the influx or input of amino acids, especially those from food. It is indicated that if protein intake increases, albumin synthesis also increases (Kurnia, 2010).

Albumin synthesis can only be synthesized under a suitable nutritional, hormonal, and osmotic environment. The colloid osmotic pressure of the hepatocyte interstitial fluid is the most important regulator of albumin synthesis (Evans, 2002). The main factors affecting the synthesis of albumin are the intake of foods containing protein, colloid osmotic pressure, the action of certain hormones (eg thyroid hormones and glucorticoid hormones) and disease incidence. Factors that cause decreased albumin levels are protein deficiency, energy deficiency, zinc deficiency, infection and liver disorders. Meanwhile, the factors that cause increased albumin levels are dehydration, vomiting and diarrhea. (Larson, 2017).

When the rate of albumin synthesis decreases due to malnutrition, the body will move extravascular albumin into the bloodstream and slow down the degradation of albumin as compensation (Guyton and Hall, 2008). Chronic energy deficiency is a condition where there is a continuous and long-lasting lack of energy and protein intake. This situation results in decreased levels of branched chain essential amino acids in plasma and serum albumin levels in the blood. So that changes in albumin levels that occur can increase protein intake (Arisman, 2010).

A study by Salehi et al (2013) found that high protein intake was associated with high albumin levels through an optimal diet that came from quality food sources. In line with Kurnia's (2010) research, it is shown that high protein intake is associated with higher serum albumin levels through

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an optimal diet from protein-containing food sources. The indicator for the adequacy of protein intake can be determined by the level of albumin as a stored protein in the body and is associated with changes in nutritional status (Chowdhury, 2008).

The results of this study showed that as many as 88.2% of pregnant women with low protein adequacy levels had normal albumin levels. In line with research conducted in Indonesia by Wibowo et al (2017) that there is no relationship between low protein intake and serum albumin levels in first trimester pregnant women. In accordance with Mercer and Campbell said that there was no change in serum albumin concentration after 12 weeks of insufficient protein intake. This is due to the relatively long half-life of albumin in plasma and a temporary change in daily food intake and nutrient consumption.

The source of protein most consumed by pregnant women in the first trimester of KEK in this study was vegetable protein. Rice is the main contributor to the mother's protein intake of 18.2 grams, followed by tempeh at 9.2 grams. Meanwhile, animal protein only contributed 5.1 grams of fish and 4.6 grams of eggs from the average protein intake of pregnant women in the first trimester of KEK of 56.4 g / day. This shows that pregnant women in the first trimester of KEK in the city of Padang consume large amounts of vegetable protein with a frequency that is consumed almost every day. Meanwhile, animal protein is only consumed in small amounts with a frequency of 1-2 times a week.

The factors that cause this occur because of the socioeconomic status and knowledge of the pregnant mother. The middle to lower economic status conditions have an impact on the ability of mothers to buy foodstuffs so that food choices are less diverse. Poor knowledge of pregnant women at the time before and during pregnancy related to nutrition that must be prepared. This results in pregnant women not knowing how to choose and compile a balanced diet that contains nutrients. In terms of maternal parity, this study was mostly the first pregnancy. Dharrma's research (2019) found that pregnant women with parity of 0-2 are more likely to experience KEK. A higher amount of parity will increase the experience and knowledge of pregnant women so that when they are pregnant the mother is ready in terms of nutrition.

A cross-sectioal study by Farzana et al that compared the mean value of albumin levels in the vegetarian and non-vegetarian groups, the results of this study showed that the average albumin level in vegetarians was slightly lower than non-vegetarians. One of the causes of low serum albumin in vegetarians is reduced albumin synthesis. The study by Caso et al also showed that the group given the dominant vegetable protein diet was lower than the group given the dominant animal protein diet. This is due to the reduction in synthesis by an average of 12-13%. Albumin synthesis is influenced by various contributions from the intake of animal and vegetable protein. The two diets are equivalent in terms of macronutrient content, amount of protein but differ in quality.

4. Conclusion

Based on the results of this study, there is a relationship between protein intake and serum albumin levels in pregnant women in the first trimester of KEK in Padang City.

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