

Blood Biochemical Differences That Influenced PMT in Puskesmas Mandala Medan

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Abstract

The health problem of the pregnant women which often faced are KEK (Less Energy Chronic) and Anemia. They can be detected by checking the total protein and albumin for KEK while anemia by detect the hemoglobin and hematocrit. One of the response to the problem is by supplementary feeding (PMT). This research aims to know the difference between the biochemistry of blood to influenced PMT (combination cookies forte and fruit juice). The type of experimental researchs by the Pretest-Posttest Design. The location of the research was in Puskesmas Mandala Medan working area. The Paired T test was used Data analyst. The results of the study showed that there was any influence of protein biochemical difference between the blood hemoglobin level, hematocrit level, total protein and albumin. It's needed to follow with supplementary feeding (PMT) continuously, accompanied with education/ health promotion for pregnant women.

Keywords: Blood Biochemical, PMT

1. Preliminary

Pregnancy is an important lifetime and a time when a woman needs much more nutritional elements than ordinary circumstances. Pregnancy causes increase energy metabolism. Hence, the need for energy and other nutrients increase during pregnancy. The increased energy and nutrients are necessary needed for the growth and development of the fetus, increasing the magnitude of organ content as well as changes in the composition and metabolism of the women (Kristiyanasari, 2010).

Supplementary feeding function for pregnancy nutrient increase nutrient intake in pregnant women can be done in variety form, one of effort that can be done to maintain and increase the nutritional status of pregnant women is to provide by provide supplementary food (PMT). PMT program for pregnant women aims to increase the nutritional intake of pregnant women so that the nutritional needs of pregnant women can be met (Mileiva, 2007). Food intake during pregnancy differs with the intake before pregnancy to the needs of the mother and the fetus, based on the nutritional adequacy rate (AKG) in 2013 required 300 kcal per day during pregnancy. By the addition of protein 20 gr / day, fat 10 gr / day and carbohydrates 40 gr / day during pregnancy and other micronutrient to assist the growth process of fetus in the womb. The growth and development of the fetus can be influenced by nutritional intake during pregnancy (Rahmaniar, 2013).

The low nutrient intake during pregnancy can cause the risk of Chronic Energy Deficiency. According to the Result of Basic Health Research, the prevalence of pregnant women aged 15-49 in 2013 is 24.2%, which means an increase compared to 2007 as much as (13.6 %). North Sumatera province the prevalence of pregnant women with KEK is 7.9% similar to prevalence in Medan city (Risksesdas, 2013).

Biochemical indicators of blood proteins such as total protein and albumin is one of the parameters early detection of less nutritional problems. While the examination of hemoglobin as well as hematocrit is an element of the combined heme and the protein globin is also a shortage detection of micronutrien iron and protein as a transport. Thus examination of these two indicators is the test specific for determining iron deficiency anemia (Bothwell, 2000).

One form of prevention to the problem of malnutrition in pregnant women is the provision of PMT in the form of tempe (forte) cookies and juice combination (papaya and passion fruit). Giving 50 gr cookies forte per day for 4 weeks may increase the weight of children under five by 0.4 kg and height 1.6 cm (Sihadi, 2009). Cookies forte is suitable as an alternative snack food refreshments of pregnant women who experience morning sickness in early pregnancy. Protein in the content of tempe cookies can accelerate the growth of fetal growth in the womb walk normally, whereas in the formation of Hb, protein is needed to bind Fe in the form of transferrin is then transported that process also requires protein as a tool of transport (Bahar, 2011).

High vitamin C content can be obtained from fruits such as papaya and passion fruit that can be mixed into a combination juice. The combination of papaya and passion fruit contains high fiber that serves to reduce the risk of constipation in pregnant women (Andriani & Bambang, 2012).

Papaya fruit contains papain enzymes that can speed up the protein digestion process, so the transport of iron (Fe) can run effectively. While the passion fruit other than high vitamin C content, also can reduce the scent of lango papaya fruit. Citrus scent and strong acid in passion fruit can stimulate appetite, especially in pregnant women who experience nausea and vomiting (Kartikawati, 2012).

1.1 Research Methods

This research is experimental with research design of pretest and posttest design, that is knowing the difference of blood biochemistry (Hb content, Ht content, total protein content and albumin level) before and after treatment in pregnant women in working area of Mandala Medan Health Center. Sampling is determined by screening according to inclusion criteria such as maternal age at 20-35 years of pregnancy, 1-7 months gestational age, pregnant women who rarely consume Fe tablets. While the exclusion criteria in this study are as follows: Willing to be included in this study by filling the consent letter to the respondent. Not in a state of illness according to doctor and midwife diagnosis, pregnant women does not have experience complications in pregnancy and can be invited to communicate well. From the sample criteria specified above, then found a sample of 43 people pregnant women. Data collection was done by obtaining primary data and secondary data both of which are obtained directly or through recording data from the sources of the health center. The Researchers assisted by 10 enumerators who come from students majoring in Nutrition. The data of biochemical blood protein was carried out by ezamination the Hb level and Ht levels by Cyanmethemoglobin method, while total protein content and albumin content using Brom Cressol Green (BCG) with Spectofotometry tool aid. The examination biochemical blood proteins is made by taking blood in pregnant women assisted by skilled health analysts and the scale of measurement of Hb, total protein and albumin gr / dl while Ht%. This study has been approved by the medical research ethics commission of USU FK no. 433 / TGL / KEPK FK USU-RSUP HAM / 2016.

1.2 Data analysis

The data was then analyzed overall better variable independent and dependent variable. Analysis Univariate to describe each of the characteristics, namely: age or univariate pregnant women, pregnancy parity, gestational age. While the variable of the univariate include Hb levels, Ht content, total protein content and albumin levels are presented in the frequency distribution table. Bivariate analysis was performed to see the changes of Hb level, Ht content, total protein content and albumin levels in pregnant women before and after given treatment by using paired t test.

1.3 RESULTS

1.3.1 Sample Characteristics

Characteristics in this study include age, parity and type of gestational age while the number of samples of 43 people. The age percentage of the sample was dominated by the age group of 26-35 years is 53.4% (23 people). The percentage of parity the majority of sample have parity grandemultigravida parity of 44.1% (21 people). Percentage of pregnancy age is dominated in Trimester II that is 39,53% (17 people). The distribution of sample characteristics can be seen in Table 1.

Table 1. Sample Characteristics Based On Age, Parity, and Gestational Age

Sample Characteristics	Category	Frequency	
		N	%
Age (year)	17-25	15	35,0
	26-35	23	53,4
	>35	5	11,6
Parity	Primigravida	10	23,3
	Secondgravida	14	32,6
	Grandemultigravida	21	44,1
Gestational age	Trimester I	11	25,59
	Trimester II	17	39,53
	Trimester III	15	34,88

1.3.2 The average contribution of PMT to the nutritional value (Energy, Protein, Fat, Carbohydrate and Fe)

PMT cookies forte and combination juice given to pregnant women for 21 days. Giving PMT done every day, cookies forte given 6 pieces divided into 2 times gifts. Each keeping of forte cookies weighs 10 grams, while the combination juice is given 250 ml with a frequency of 1 time a day. The average contribution of PMT per day to pregnant women based on AKG 2013 can be seen in table 2 below.

Table 2. Average Contributions PMT Based On AKG 2013

Intake	Contributions	Percen
Energy	570,5 kcal	22,82%
Carbohydrate	87,3 gram	24,25%
Protein	11,1 gram	14,61%
Fat	274 gram	35,13%
Fe	7,84 mg	18,23%
Vitamin C	47,8 mg	56,4%

1.3.3 Analysis of Effect of PMT on Nutrient Intake

Distribution of nutrient intake (Energy, Protein, Fat, Carbohydrate, Fe and Vit C) before and after treatment can be seen in table 3 below.

Table 3. Nutrient Intake Average on Pregnant Mother Before and After PMT Treatment

Intake	Before	After	P Value
Energy (Kcal/day)			
• Average	1599,25	2099,15	0,012
• Standart deviation	286,12	300,3	
• Minimum Value	980,50	1520,10	
• Maximum Value	1824,65	2535,45	
Protein (Gr/day)			
• Average	39,25	61,70	0,015
• Standart deviation	6,34	10,00	
• Minimum Value	27,45	45,42	
• Maximum Value	46,36	86,92	
Fat (Gr/day)			
• Average	58,50	71,10	0,043
• Standart deviation	9,42	12,00	
• Minimum Value	36,27	45,46	
• Maximum Value	98,3	112,00	
Carbohidrate (Gr/day)			
• Average	245,92	306,7	0,048
• Standart deviation	46,20	52,00	
• Minimum Value	228,50	243,3	
• Maximum Value	532,60	552,6	
Fe Intake (Mg/day)			
• Average	14,10	38,28	0,001
• Standart deviation	4,28	6,48	
• Minimum Value	6,27	28,46	
• Maximum Value	18,26	40,25	
Vit C Intake (Mg/day)			
• Average	53,20	89,20	0,001
• Standart deviation	5,2	6,4	
• Minimum Value	34,21	66,90	
• Maximum Value	88,9	120,4	

Paired t test

In this study presented in table 3, that the treatment with the provision of cookies forte and combination juice (PMT pregnant women) gave a significant effect to increas the average intake of nutrients pregnant women (energy, carbohydrates, proteins, fats, Fe and vitamin C).

1.3.4 Analysis of Effect of PMT on Blood Biochemistry

Biochemical distribution of blood (Hb, Ht, Total Protein and Albumin) before and after treatment can be seen in table 4 below.

Table 4. Blood Biochemistry Analysis Before and After Treatment

Indicator	N	Minimum	Maximum	Mean	St. Deviation	P Value
Initial Hb Level	43	7,4	13,4	10,93	1,50	0,001
Final Hb Level	43	7,9	13,6	11,10	1,48	
Initial Ht Level	43	28	36	34,8	1,70	0,004
Final Ht Level	43	32	40	37,9	2,57	
Initial Total Protein Level	43	3,82	8,41	6,38	1,07	0,026
Final Total Protein Level	43	4,96	8,15	6,65	0,66	
Initial Albumin Level	43	3,08	4,68	3,76	0,48	0,038
Final Albumin Level	43	2,80	4,89	3,80	0,52	

The provision of forte cookie treatment as well as papaya fruit and passion fruit juice as a supplementary food for pregnant women has an effect on the biochemical component of blood in pregnant women. This is seen based on statistical tests conducted by paired t test method, the changes before and after treatment on levels of Hb, Ht, Total Protein and Albumin blood in pregnant women. Complete data presentation can be seen in table 4.

1.4 Discussion

1.4.1 Sample Characteristics

Pregnancy is an important time because it will determine the quality of a child. During pregnancy changes in the mother's body, either anatomically, physiologically or biochemically. Normal pregnancy occurs for 38-40 weeks (Waryana, 2010).

The results of the study were still found in pregnant women (<20 years old) and 4.7% (2) and age > 35 years old (21%). Pregnancy at <20 years or > 35 years can cause complications during pregnancy because at <20 years the female reproductive system is not mature enough to experience pregnancy and unstable psychological conditions in pregnancy while at 35 years of age there has been a decline or dysfunction in the reproductive organs. A healthy and safe reproductive lifespan is 26-35 years. Pregnant women <20 years of reproductive organs are not yet physiologically mature, while > 35 years range against pregnancy risk such as bleeding, preeclampsia and eclampsia (BKKBN, 2012; Runiari, 2010).

The results of this study also showed that the highest percentage of pregnancy was present in Grandemultigravida as much as 44.3% consisting of 3rd pregnancy parity as much as 18.6%, 4th pregnancy as much as 16.3%, parity of 5th and 6th pregnancies respectively as much as 4.7%. Womens who have given birth > 3 times or grandemultigravida have a big risk for the occurrence of postpartum hemorrhage because in multipara uterine muscles are often stretched so that the walls thinning and the contraction become weak (Khotijah et al, 2011). This is because pregnancy is a physiological process in a woman who requires stamina and energy very large for the mother and the fetus its contains. The risk for postpartum hemorrhage will be 4 times greater in pregnancy parity ≥ 4 and the incidence of maternal and child mortality at the time of 4th childbirth is higher than in 3rd childbirth (Cunningham, F.G.et al, 2005).

The results also showed that the distribution of pregnant women based on gestational age varies greatly, whereas the highest percentage is in second trimester of pregnancy 39.53% while the smallest percentage is the age of first trimester pregnancy 25,59%. This means that pregnant women with second and third trimester pregnancies require adequate nutrition intake. Nutrition required consists of macro and micronutrients required the process of fetal formation, the formation of vital organs such as the formation of heart, liver and some other organs in the second trimester whereas in the third trimester gestation at 36 weeks the body of the fetus undergoes deposition so that the body becomes round (Cunningham, F.G.et al, 2005).

1.4.2 Analysis of Effect of PMT on Nutrient Intake

Provision of additional food (supplementary feeding) in the form of cookies forte given 6 pieces in a day that each 10 grams and given 2 times a day. The nutrient content of 60 grams of forte cookies is 394,2 Kcal energy, 8.3 gram protein, 25,4 gram fat, 49,1 gram carbohydrate, Fe equal to 6,24 mg and vitamin C equal to 15,2 mg . While in this study also provided fruit juice consisting of a mixture of passion fruit and papaya given every day within a period of 21 days. The nutrient content of 250 cc of the combination of passion fruit and papaya juice contains the energy of 176,3 Kcal, 2.8 gram protein, 2 gram fat, 38,2 gram carbohydrate, 1,6 mg Fe and 32,6 mg of vitamin C . During pregnancy especially third trimester pregnant women, should always be given supplementary food in the form of high nutrients, especially foods that contain protein, folic acid and cyanocobalamin. Pregnant women's PMTs are an alternative to enhancement and improvement intake nutrition during pregnancy (Andriani & Bambang, 2012). This is in line with the government's program of pregnant women's PMT in the form of regular food or snacks with servings of 600-700 kcal / day and 11-20 grams of protein / day for 90 days (Putri, 2011).

PMT is given in the form of cookies forte and juice combination can increase nutrient intake of pregnant women. The results of nutrient intake based on the category found, good energy intake as much as 65.1%, good category of protein as much as 58.14%, fat category good as much as 67,41%, carbohydrate with good category

as much as 74,42%, and Fe with good category counted 41,86%.

This result is in line with the reasearch by Meilieva which states that supplementary feeding in the form of garut cookies with the contribution of nutrients of 525 calories and 15 grams of protein can increase the nutrient intake in pregnant women (Mileiva, 2007). Another reasearch in Surabaya, PMT programme of pregnant women who experienced KEK can significantly increase nutrient intake especially macronutrient intake (Nugrahini et al, 2014).

1.4.3 Analysis of Effect of PMT on Blood Biochemistry

1.4.3.1 Haemoglobin (Hb)

Hb level is one of parameter that can be measured to determine the status of anemia. Physiological changes occurring in the pregnancy, fetal age, and nutritional status of previous pregnant women may affect the status of anemia in pregnancy (Noverstiti, 2014).

Based on the examination of Hb level before giving of PMT, it was found that nutritional status of anemia was 23,3% (10 people) and normal was 76,7% (33 people), after PMT nutritional status of anemia was reduced to 11,6% (5 people) an increase in normal haemoglobin level of 88.4% (38 people). Based on paired t test found p value <0,05, so it can be concluded that giving of PMT cookies forte and combination juice give change at Hb level.

This is due to the contribution of nutrient content of PMT is high enough and contains some elements of nutrients needed for the formation of Hb. Proteins derived from tempe, eggs and wheat flour in cookies, are the nutrients needed to help the Fe transportation process. While Fe and vitamin B12 is a nutrient that is also contained in tempe which also required the formation of Hb and maturation ertitrocytes of blood. Vitamin C contained in fruits, is also a nutrient that has a role in the process of helping the absorption of Fe especially non heme derived from vegetable (Masrizal, 2007; Muwakhidah, 2009; Almatsier et al, 2011).

1.4.3.2 Haemotocrit Level (Ht)

Examination of Ht levels in pregnant women is usually in line with Hb examination of pregnant women. Examination of Hb and Ht is intended to determine anemia gravidarum in pregnancy (Handini, 2010). The series of examinations of these two elements is the final indicator of the Fe deficiency stage and is a specific test for the determination of Fe nutritional anemia (Paendong et al, 2016).

The results of the study found that the provision of treatments can increase the blood content of pregnant women after treatment where the p value = 0.004. Cookies forte and juice combination that can increase Hb automatically turned out in this study also able to increase levels of Ht. Elements of nutrients such as protein, Fe, Vitamin B12 and Vitamin C also have an important role in increasing pregnant women's blood Ht level. When the Ht level decreases it is usually due to a decrease in cellular blood or an increase in blood plasma. While in this study there is an increase in Hb levels that allow Ht levels also increased. Protein intake from cookies plays a role in maintaining a decrease in blood plasma volume (Rasyada et al, 2014). The results of the study in 2015 also suggest that pregnant women with more Fe deficiency in pregnant women with low protein intake, the mineral source of Fe is also low. This indicates that respondents with low protein intake are more at risk of iron deficiency which can be seen from the measurement of Fe status component that is haemoglobin and haemotokit blood of pregnant women (Pontoh et al, 2015).

1.4.3.3 Total Protein

Protein is one of the most important nutrients during pregnancy. Pregnant women need more protein than normal female conditions as supporting the formation of cells for the mother and fetus like the builder of body structure (muscle, skin and bone). Protein deficiency will cause growth to be slow and if in a long time protein deficiency will result in cessation of growth process. Based on result of paired t test found p value <0,05, so it can be concluded giving of PMT give a real change in total protein after treatment.

The higher protein content in cookies made from tempe and eggs which in its manufacture is mixed into batter, proved better in improving the total protein of the pregnant women (Susianto, 2013). The absorption of protein is influenced by the impaired function of the stomach, pancreas and small intestine. Therefore, total proteins can describe nutritional deficiencies and digestive function problems. Decreased int the value of total protein values may indicate malnutrition, impaired digestive function and impaired liver function. Malnutrition leads to a decrease in total protein caused by less avaiability of essential amino acids which is often experienced by pregnant women of low economic class (Dhinaa & Palanisamy, 2010). Blood proteins are also a rapid description of the protein metabolism in the liver. The half-life required for total protein synthesis ranges from 3 to 5 days. The higher total blood protein, indicating the total protein reserves during pregnancy is better because total protein can also be used as a guide to the occurrence of KEK in pregnant women, which may have occurred since the age of WUS (Frances, 2007).

1.4.3.4 Albumin Level

The albumin examination is one of the biomarkers used in the determination of blood protein status. Albumin is the most protein in plasma about 60% of the total protein plasma synthesized in the liver. Albumin is very needed as a transportation of food juices through the placenta, for the development of new tissue (Arisman,

2007). Albumin are most of the total protein concentrated in heart and has a half-life of 19-22 days. Serum albumin examination is very useful for pregnant women because it can be made an early diagnosis for chronic energy deficiency (KEK) that is often experienced by pregnant women (Murray et al, 2009). It should be noted that hypoalbuminemia almost always be a warning that a person needs comprehensive evaluation and intervention (Veronika et al, 2015).

The research results showed, based on paired t test result can be concluded that there is a significant change in albumin levels before and after the giving of PMT. High protein content in forte cookies derived from tempe and eggs, it also can increase blood albumin levels. In a study conducted by Pratiwi 2015 which also provided treatments in increasing serum albumin levels of malnutrition patients, there was a significant effect (Pratiwi et al, 2015). On the sample treatment occurs increase in level of albumin, but did not increase serum albumin levels in the control samples. This is consistent with the Ogawa study in 2014 that the increased level of albumin helps prevent bleeding during partus (Ogawa et al, 2014). Albumin is also strongly associated with preeclampsia, especially in the third trimester, when blood albumin is found in low concentrations (Rossi et al, 2013). Other studies that also provide biscuits derived from cork fish flour which high amino acid for 90 days, apparently have a very real effect with serum albumin level in children under five (Widodo et al, 2013).

1.5 Conclusions And Suggestions

1.5.1 Conclusion

PMT in the form of cookies forte and juice combination provides the difference of the average value of nutrient intake in pregnant women such as energy, protein, fat, carbohydrate, Fe and vitamin C. It also gives significant difference in blood biochemistry such as Hb, Ht, total protein and albumin.

1.5.2 Suggestions

- a. This PMT should be given as an example of PMT pregnant women program in Mandala Puskesmas working area.
- b. This PMT can also be applied to be consumed not only pregnant women but can also for children under five who are malnourished and WUS who prepare for the process of pregnancy.
- c. This PMT should be used as other food not only in the form of cookies, but can be consumed directly or made other types of snack foods such as cake, steamed sponge cake, fried tempe, etc.
- d. Its necessary for training Posyandu cadres and young mothers, to know how the process of making processed tempe in the form of simple and practical.

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