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Article

Relationship between Micronutrients Consumption During Pregnancy and the Incidence of Preeclampsia

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A B S T R A C T

Preeclampsia is the second largest cause of maternal death in pregnancy in the world. This can be seen with the high rate of pre-eclampsia morbidity and mortality. One effort to reduce it is to know the risk factors that can cause preeclampsia, including the lack of nutrient intake of micronutrients consumed by pregnant women during their pregnancy. This study aims to determine the relationship between consumption of micronutrients to the incidence of preeclampsia in the RSUD Sarolangon District Hospital.. The design used was cross sectional with 27 samples. The approach used is retrospective where data collection is based on secondary data, namely medical records. The sampling technique uses the value of the proportion of previous research. Data collection techniques in this study were using questionnaires, food count, household size, and application of Nutrisurvey as a medium for calculating the level of nutrient intake for each sample. Data is processed using the chi square test. The results showed that micronutrients (in this study represented by calcium, zinc, and

Magnesium) contributed to the incidence of preeclampsia with a p value of 0.004, 0.033 and 0.013 respectively. Thus, it can be concluded that micronutrient intake influences the incidence of preeclampsia in Sarolangon District Hospital. It is necessary to prevent Preeclampsia by fulfill micronutrient intake before pregnancy

I. INTRODUCTION

Preeclampsia is a disorder that is found at the time pregnancy which is characterized by various clinical symptoms such as hypertension, proteinuria, and edema that usually occurs after gestational age 20 weeks to 48 hours after delivery. The morbidity of preeclampsia in Indonesia reaches 128,273 per year or around 5.3%. This is appropriate with the incidence of preeclampsia that occurs in other developing countries viz

around 1.8% - 18%.

Severe preeclampsia and eclampsia are a group of symptoms can occur during pregnancy and childbirth. These changes are necessary well recognized, because the effect it creates is problems that according to determine the welfare and safety of the mother and fetus it contains. The occurrence of severe preeclampsia and eclampsia are reportedly varies greatly. Preeclampsia is a leading cause of mortality and maternal and fetal morbidity. Preeclampsia is a marked syndrome with hypertension and new proteinuria appearing in the second trimester pregnancy (Elizabeth, 2011).

Preeclampsia is the second largest cause of death in pregnancy in the world. Deaths generally occur due to late handling and ignorance of the mother regarding preeclampsia. Preeclampsia is a collection of symptoms arising in pregnant women, childbirth and in the postpartum period consisting of hypertension and proteinuria. The main cause of preeclampsia is placentation (formation of structures and types of placenta) that is abnormal. Preeclampsia jeopardizes the safety of mother and fetus and preeclampsia can cause complications in the form of acute kidney failure.

Nutritional deficiency during pregnancy can have a beneficial effect detrimental to both the mother and child. The quality of food eaten during pregnancy deserves special attention to improve optimal health for both mother and child. Nutrition in general contains macro and micro nutrient components. Macronutrient is relatively large amounts of nutrients needed by the body. Micronutrients are nutrients that the body needs in relative amounts small, as for which includes macronutrients are carbohydrates, proteins, and fat, while micronutrients are vitamins and minerals. The 70% in total calories consumed by pregnant women in Indonesia are carbohydrates while the needs of most micronutrients are not fulfilled. Micronutrient which is generally recommended by doctors and experts is calcium that was used for growth of bones and teeth for the fetus to reduce the risk of preeclampsia during pregnancy. Pregnant women need to be educated on the importance of nutritional values for the health of the fetus and the baby. They must also realize that micronutrient deficiencies not only affect the fetus during pregnancy, but also throughout his life (obstetrics and gynecology department UI medical faculty, 2017).

Pregnancy-induced hypertension (preeclampsia or toxemia gravidarum) characterized by hypertension, albuminuria and excessive edema. This matter is a common in the third trimester of pregnancy. The cause is not known but adequate food such as protein, calories, and calcium sodium is associated with a low incidence of induced hypertension by pregnancy. The risk of complications of preeclampsia can be prevented, the mother needs reduce salt consumption to avoid excessive swelling and prevent blood pressure from getting high. Pregnant women must be sufficient nutritional needs, both macronutrients and micronutrients especially calcium. Mothers who lack calcium are more at risk of developing preeclampsia. Therefore it is very important for pregnant women to know and understand the questions this nutrient. Thus they do not neglect and strive to fulfill it. Meeting nutritional needs is done through food intake and daily drinking and supplementation. These nutritional needs include are zinc and folic acid. Zinc (Zn) plays an essential role in many cases bodily functions. As part of an enzyme or as a cofactor in activities more than 200 enzymes, zinc plays a role in various aspects of metabolism, such as reactions related to the synthesis and degradation of carbohydrates, proteins, fats and nucleic acids. While folic acid is a nutrient has an important role in the production of red blood cells and helps the tube fetal nerves develop well and avoid defects at birth.

The results of research conducted by Selina Achtar et al in the year 2013 which shows the results that there is a relationship between intake micronutrient in patients with preeclampsia, in this case mainly on nutrition calcium, magnesium, and zinc. While based on Rudy's research results Hartono and the 2017 team note that there is no relationship between intake macronutrient nutrients in Preeclampsia patients at the Mother and Child Siti RSKD Fatimah of Makassar City with their respective p values for carbohydrates, protein and fat respectively 0.649, 0.611, 0.416.

II. METHODS

The design used was cross sectional survey with 27 samples. Samples were every pregnant woman who did their antenatal care in the hospital. Inclusion criteria for samples were pregnant women who diagnosed preeclampsia and agree to become samples. The approach used is retrospective where data collection is based on secondary data, namely medical records. The sampling technique uses the value of the proportion of previous research.

Variables were measure in this study was Calcium, Zinc, Magnesium consumption. Data collection techniques in this study were using questionnaires, food count, household size, and application of Nutrisurvey as a medium for calculating the level of nutrient intake for each sample. Data was analyzed using the chi square test.

III. RESULT

Table 1 Preeclampsia in Pregnancy

Preeclampsia	n	%
Mild	14	51.9
Severe	13	48.1
Total	27	100

Based on Table 1 we know that from 27 respondent, as much as 14 (51.9) were Mild Preeclampsia. In 2017 at the Hospital Prof. Dr. H. M. Khatib Quzwain Sarolangun District as many as 169 mothers pregnant with preeclampsia and the average every month around 15 pregnant women with preeclampsia.

Table 2. Micronutrient Consumption

Micronutrient Consumption	N	%
Calsium		
Not Fulfilled	9	33.33
Fulfilled	18	66.67
Zinc		
Not Fulfilled	19	70.37
Fulfilled	18	19.63
Magnesium		
Not Fulfilled	8	29.63
Fulfilled	19	70.37
Total	27	100

Based on Table 2 we know that from 27 respondent 18 (66.67%) respondent were fulfilled their calcium consumption; 19 (70.37%) were not fulfilled their zinc consumption; and 19 (70.37%) were fulfilled their magnesium consumption.

Table 3 Relationship between Micronutrient Consumption and Preeclampsia

Micronutrient Consumption	Preeclampsia				Total	%	p-value
	Mild		Severe				
	n	%	N	%			
Calsium							
Not Fulfilled	1	11.11	8	88.89	9	100	0.004
Fulfilled	13	72.22	5	27.78	18	100	
Zinc							
Not Fulfilled	7	39.84	12	63.16	19	100	0.033
Fulfilled	7	97.5	1	12.5	18	100	
Magnesium							
Not Fulfilled	1	12.5	7	87.5	8	100	0.013
Fulfilled	13	68.42	6	31.58	19	100	

Based on Table 3 we know that there was a relationship between Calsium, Zinc, and Magnesium consumption to Preeclampsia. 5 pregnant women were diagnosed severe

preeclampsia; even though calcium intake has met it turns out Preeclampsia in pregnant women can also be triggered by a deficiency intake of macronutrients and other micronutrients or other factors. As for factors that can increase the risk a pregnant woman experiences

Preeclampsia includes: first pregnancy, history of preeclampsia before, a family history of preeclampsia, nutritional deficiencies, pregnancy distances that are too far away, pregnant too young or too old, obesity and other complications. In this study it has been obtained the p value of calcium intake on the incidence of preeclampsia is equal to 0.004 means that there is a relationship between the effects of lack of calcium intake the incidence of preeclampsia.

IV. DISCUSSION

In Indonesia the incidence of preeclampsia is estimated at 3.4% to 8% in 2012, and in 2017 preeclampsia incidence increases between 3-10% of all pregnancies. Preeclampsia and eclampsia are the main causes (RI DEPKES, 2017).

Otchi Putri Wijayadi Research in RSI Siti Khadijah Palembang suggested that the incidence of preeclampsia was 4.66% which was a little low. This number shows the incidence preeclampsia is still within the range of incidence (Otchi P, 2013).

In contrast to research conducted by Rizka Ariani research on the relationship between preeclampsia at H. Adam Malik General Hospital Medan in 2000, from the study reported affected mothers preeclampsia as much as 26.5% (26 people). In other studies too reported that the incidence of preeclampsia in Indrasari Pematang Hospital Reba Regency of Indragiri Hulu is still quite high, which is 13.66% (Rizka A, 2000).

From the analysis of researchers conducted it was found that incidence of preeclampsia still high, this is due to lack of fulfillment micronutrient consumption that was accompanied by a lack of understanding of respondents regarding preeclampsia. Differences in the results of this study are possible caused by differences in research sites and samples used.

According to data released by WHO, calcium deficiency can causes 200 types of diseases, including preeclampsia in pregnant women. The hypothesis that calcium is a predisposing factor first mentioned in 1980. The Journal of Nutrition found that calcium can also reduce the risk of preeclampsia, where calcium deficiency can also affect development cardiovascular in the fetus and increase high blood pressure after baby born. Lack of calcium in pregnant women can affect growth in the fetus is not perfect, such as bones and teeth. Lack of calcium intake was found in the majority of study cases associated with the incidence of preeclampsia in pregnant women (Mulya, 2014).

From the results of the analysis of researchers who have found that more than half 18 (66.67%) of pregnant women were declared eligible fulfillment of calcium intake. and follow the advice of health workers for pregnant women diagnosed with preeclampsia.

Kamru et al. showed that the serum zinc level was lower 43% of women with preeclampsia when compared to women normal pregnancy in Turkey. Research on Indians with comparing serum zinc levels in mild preeclampsia or severe preeclampsia with control, it was found that the serum zinc level in normal pregnant women 15.64 μmol / L, in female patients mild preeclampsia 12.72 and in women with severe preeclampsia which is 12.04 μmol / L. This shows that serum zinc levels are at patients with mild preeclampsia are lower than serum zinc levels in normal pregnant women, and serum zinc levels in severe preeclampsia lower than mild preeclampsia (Kamru et al.).

Approximately 60% of 20-28 mg of magnesium in the body found in bones and teeth, 26% in muscles and the rest in in other soft tissues as well as body fluids. Magnesium function in plants is the same as the role of iron in bonding hemoglobin in the blood in humans that is for breathing. Magnesium is also involved in the metabolic process. Besides that, magnesium also plays an important role in more than 300 types of enzyme systems in the body. For the content of magnesium intake for pregnant women is 270 mg / day (Ana Pujiastuti, National Journal of Health 2014).

This is in line with research conducted by Reni Nofita which states that there is a significant relationship between compliance calcium consumption on the incidence of preeclampsia with p value are 0.012 and OR 3.30 (Reni N, 2018). This is confirmed by the results of research conducted by Nur Rahmawati based on the significance value found that the value of the results showed that calcium consumption have a significant relationship with the incidence of preeclampsia (Nurrahmawati, 2010).

Research conducted by Dr. Habibunnisha B. Sirajwala in India on those who researched about the level of calcium (Ca) intake along with other factors on the incidence of preeclampsia in pregnant women with normal pregnancies as control. In his research, there were 160 samples of pregnant women researched about the intake of calcium content it consumes by taking blood and urine samples. It was found that the preeclampsia sample has a serum content lower calcium compared to normal pregnancy mothers with the average intake for normal mothers is 7.91 mg / dl and preeclampsia of 7.09 mg / dl and the p value is 0.0001 it means that there is a significant relationship between intake calcium with the incidence of preeclampsia (Dr. Habibunnisha B. Sirajwala, 2013).

This is in line with research conducted by Ermawati conduct research on the effect of serum zinc on incidence preeclampsia at RSUP Dr.M. Djamil Padang, RSUD Solok, RSUD Painan, Batu Sangkar Hospital and Biomedical Laboratory FK Unand with p value value of 0.02 (Ermawati, 2015).

Based on Selina Akhtar's research on the effect of micro intake, p value for each type of preeclampsia was obtained by performing a chi square test, namely p value deficiency zinc against mild preeclampsia 0.492 and p value zinc deficiency against severe preeclampsia 0.02 (Selina A, 2013).

The relationship between zinc intake and the incidence of preeclampsia as well supported by research conducted by Deepa V. Kanagal et al in South India which conducted research on 120 pregnant women, of which 60 sample as control and 60 sample as case. In this case, testing of blood pressure and testing for zinc intake in each sample. It was found that in normal pregnant women had zinc intake of 14.87 ± 0.89 μmol / L compared to preeclampsia mothers with zinc intake of 8.84 ± 0.87 μmol / L. On this study, they obtained a p value of <0.001 which indicates there is a significant relationship between zinc intake and incidence preeclampsia (Deepa V et al, 2014).

But the exact opposite is found in the research conducted by L Chababa et al in Zambia. 41 samples of preeclampsia and 57 normal pregnancies were measure for 4 months at the Teaching Hospital University, Zambia. Blood pressure of samples was taken and zinc intake content taken by separating the concentration of zinc with Atomic Absorbtion Specthometric. In this study it was found that in normal mothers zinc content of 76.20 ± 35.23 mg / dL and in preeclampsia of 89.17 ± 47.19 mg / dL with a p value of 0.122, so that there was no evidence of an association between zinc content and the incidence of preeclampsia in the sample of pregnant women. In this research, things are affect the incidence of preeclampsia is the age and age of the pregnancy itself (L Chababa et al, 2016).

In this study, it was found that from 19 respondents who were meeting the fulfillment of magnesium, 13 (48.15%) were declared suffering mild preeclampsia. Risk factors for occurrence of preeclampsia are not only because of magnesium. Many other factors can allow a pregnant woman to get preeclampsia. Factor macronutrients and other micronutrient factors are also factors triggers for preeclampsia, another factor that is also linked as risk factors for the incidence of preeclampsia include first pregnancy, history previous preeclampsia, family history of preeclampsia, nutritional deficiencies, pregnancy distance that is too far away, getting pregnant too young or too old, obesity and other complications. From research it was found that magnesium intake played a role in the incidence preeclampsia for pregnant women with a p

value of 0.013. That is there the relationship between magnesium intake and the incidence of preeclampsia, where Pregnant women who lack magnesium intake are at 0.66 times more risk prone to preeclampsia compared to pregnant women whose intake enough magnesium.

This is also supported by research conducted by Hendri Devita who examined the relationship of magnesium content on the occurrence of preeclampsia in RSUP Dr. M. Djamil Padang in the year 2015. In his research stated that the occurrence of preeclampsia is based on the presence of magnesium deficiency with a p value of 0.002 (Hendri D, 2015).

There is a relationship between levels of magnesium intake with the incidence preeclampsia is also supported by research conducted by Ugwuja el and Famurewa AC in Nigeria. In this research conducted of 40 samples of normal pregnant women as control of 40 samples preeclampsia as a case. This research was conducted in a way blood sampling, where the sample is taken and analyzed by using the Atomic Absorption Spectrophotometer method (Buck Scientific, Model AVG 210) and found that the content of magnesium in normal pregnancy women is 4.2 (0.78) and preeclampsia of 3.2 (1.10) with a p value of <0.001 (Ugwuja el, 2016).

Based on research Selina Akhtar (2013) about the effect of intake micro, in the study obtained p value for each types of preeclampsia by performing a chi square test, magnesium deficiency in mild preeclampsia 0.002 and on severe preeclampsia 0.01 (Selina, 2013).

V. CONCLUSION

Preeclampsia is one of a disease which causes maternal morbidity. Micronutrient intake such as calcium, zinc, and magnesium was related to the incidence of Preeclampsia besides other factors. It is necessary to do further study to study every factor as a comprehensive measure. But as a preventive way, it was recommended to have enough micronutrient intake even before pregnancy.

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