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The Role of Social Determinants and Nutrient Intake on Nutritional Status of Pregnant Women in Malaria Endemic Areas, Pesawaran District

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Keywords: Endemic of malaria, Nutrient intakes, Nutritional status, Pregnant women, Social determinants.

Abstract: The nutritional status of pregnant women is influenced by food consumption, infectious diseases (malaria), and social determinants. Pesawaran district is one of the malaria-endemic areas in Lampung Province. The study aims to determine the role of social determinants and nutrient intake in pregnant women in Pesawaran. This study is a cross-sectional design, in Hanura and Gedongtaan community health centers Pesawaran, from May to December 2019. The sample was 70 pregnant women, taken by purposive sampling technique. Nutritional status was measured by examining mid-upper arm circumference, data on educational age, family income, race, and parity were obtained from interviews, maternal knowledge ang food intake were obtained from interviews using questionnaires. Data were analyzed using univariate, bivariate, and multivariate. The results showed that malnutrition in pregnancy was 22.9%. Most of the pregnant women are highly educated (55.7%), sufficient knowledge (58.6%), high family income (58.6%), multiparous (57.1%), non-Lampung race (60%), adequate energy intake (55.7%), and protein intake (68.6%). The results showed education (p=0.11), knowledge (p=0.025), income (p=0.005), parity (p=0.036), race (p=0.017), energy intake (p=0.011), and protein intake (p = 0.033) have a role in the nutritional status of pregnant women. The factors that must play a role are education, knowledge, income, and parity.

1 INTRODUCTION

Efforts to improve the nutritional status of the community, including reducing the prevalence of stunted toddlers, are one of the national development priorities listed in the main targets of the 2020 – 2024 National Medium-Term Development Plan (Ministry of Health, 2020). Improving the nutritional status and health of pregnant women is the best way to overcome stunting. Fetal nutrition depends entirely on the mother's nutrition so that pregnant women must receive adequate nutrition. Insufficient energy and protein intake in pregnant women can cause malnutrition/chronic energy deficiency (CED). Chronic Energy Deficiency is a condition in which women experience long-lasting or chronic malnutrition (calories and protein), which describes a "steady state" of a person's body being in an energy imbalance between energy intake and expenditure and causes low body weight and low body energy supply (Wiyono et al., 2020).

Factors that play a role in the nutritional status of a woman of childbearing age, both pregnant and non-pregnant, consist of many factors, namely food intake, illness (infectious diseases such as malaria, anemia, protein deficiency), food availability, environment (family, environmental hygiene, culture), history of illness/health, health services, education and maternal knowledge (UNICEF, 2015; Ministry of Health, 2015).

The results of the 2018 Basic Health Research (Riskesdas) showed that in Indonesia, the prevalence of CED in pregnant women reached 17.3% and in Lampung province, it was 13.6%. The prevalence of CED in pregnant women aged 15-19 years is 33.5% and at the age of 20-24 years is 23.3%; this figure is still high so further intervention is needed (Ministry of Health, 2018). One indicator of efforts to improve nutrition in Indonesia is a decrease in the prevalence of chronic energy deficiency in women of childbearing age, both pregnant and non-pregnant (Ministry of Health, 2017).

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In Pesawaran district, Lampung province, the number of pregnant women suffering from SEZ in 2018 was 485 people and pregnant women suffering from malaria were 1,922 people (Dinas Kesehatan Pesawaran, 2019). The nutritional status of pregnant women is influenced by food consumption and infectious diseases. Malaria suffered by a person can cause malnutrition and anemia (Gulo, 2008).

Pesawaran Regency is one of the malaria-endemic areas. Based on data on the health profile of Pesawaran district in 2016, malaria cases were 1.915, with the highest distribution being in the working area of the Hanura community health center, followed by Padang Cermin, Pedada, and Gedongtataan community health centers (Dinas Kesehatan Pesawaran, 2017).In malaria-endemic areas, parasitic infections and malnutrition, especially in pregnant women, are problems that arise simultaneously. The state of malaria infection can cause anemia and other micronutrient deficiencies. Micronutrient deficiency can also lead to an increased risk of infection and this will harm the unborn baby (Steketee et al., 2001).

2 SUBJECT AND METHOD

This research is an observational analytic study with a cross-sectional research design. The study was conducted at the Hanura and Gedongtaan community health centers in Pesawaran district from May to December 2019. The population in this study were pregnant women in Pesawaran district. Based on the results of the sample calculation, the minimum number of samples that must be met is 70 people. The sample size calculation uses the sample size formula for unpaired categorical comparative analytics with a 95% confidence value, the power of the test is 80%. Sampling was done by the purposive sampling method. The inclusion criteria for this research sample were pregnant women aged 18-35 years and willing to participate in the research process. The exclusion criteria for this study were pregnant women with malignancy, diabetes mellitus, and tuberculosis.

The independent variables in this study were social determinants (education, knowledge, income, parity, ethnicity/race) and nutrients intake (energy and protein intake). The dependent variable in this study is nutritional status. Nutritional status data was measured by examining the upper arm circumference, data on educational age, family income, race/ethnicity, and parity were obtained from interviews, mother's knowledge data was obtained from interviews using a questionnaire, and nutrients intake data was measured using a 24h food recall questionnaire, to assess consumption of energy and protein in grams/day, then compared with the recommended nutritional adequacy rate (RDA) so that the nutritional adequacy level is obtained. Data collection was carried out by researchers with the help of 2 enumerators who had been given previous guidance and training. The data was analyzed with a significant degree of 95% ($p<0.05$) univariate, bivariate with chi-square test, and multivariate logistic regression. This research was carried out after obtaining a research ethical clearance letter from the Ethics Committee of the Faculty of Medicine, the University of Lampung with number 3138/UN26.18/PP.05.02.00/2019.

3 RESULTS

The results showed that malnutrition status in pregnant women was 16 people (22,9%) and good nutritional status was 54 people (77,1%), low education was 31 people (44.3) and high education was 39 people (55,7%), family income is low (less than the provincial minimum wage) as many as 29 people (41,4%) and family income is high (more than the provincial minimum wage) as many as 41 people (58,6%), knowledge of pregnant women is poor 29 people (41,4%) with sufficient knowledge as many as 41 people (58,6%), parity nulli/ primipara as many as 30 people (42,9%) and multi para as many as 40 people (57,1%), Lampung ethnicity as many as 28 people (40%) and non-Lampung was 42 people (60%), have an inadequate energy intake as many as 31 people (44,3%) and adequate energy intake as many as 39 people (55,7%) and have an inadequate protein intake as many as 22 people (31,4%) and adequate protein intake as many as 48 people (68,6%).

Table 1: Characteristic of study subject

Variable	n	%
Nutritional Status		
a. Malnutrition	16	22,9
b. Good nutrition status	54	77,1
Education		
a. Low	31	44,3
b. High	39	55,7
Family income		
a. Low	29	41,4
b. High	41	58,6
Knowledge		
a. Poor	29	41,4
b. Sufficient	41	58,6
Parity		
a. Nulli/primiparity	30	42,9
b. Multiparity	40	57,1

Race/ethnicity		
a. Lampung	28	40
b. Non-Lampung	42	60
Energy intake		
a. Inadequate	31	44,3
b. Adequate	39	55,7
Protein intake		
a. Inadequate	22	31,4
b. Adequate	48	68,6

The results of cross-tabulation as shown in Table 2, of pregnant women with low education and malnutrition, were 38,7% higher than those with high education and malnutrition status, which was 10,3%. The results showed that education had a role in the nutritional status of pregnant women (p = 0,011) and low education was a risk factor for malnutrition in pregnant women with OR = 5,5 (95% CI; 1,56-19,52), which means the pregnant women with low education are 5,5 times more likely to suffer from malnutrition than those with high education.

The results of cross-tabulation as shown in table 2, of pregnant women with family incomes low (less than the provincial minimum wage) and malnutrition, were 41,4% greater than family incomes high (more than the provincial minimum wage) and malnutrition, which was 9,8%. The results showed that family income had a role in the nutritional status of pregnant women (p = 0,005) and low family income (less than the provincial minimum wage) was a risk factor for malnutrition in pregnant women with OR = 6,5 (95% CI; 1,83-23,22), which means that pregnant women whose family income is low (less than the provincial minimum wage) will be 6,5 times greater risk of suffering from malnutrition than those whose family income is high (more than the provincial minimum wage).

The results of cross-tabulation as shown in table 2, of pregnant women with poor knowledge and malnutrition, are 37,9% greater than those with sufficient knowledge malnutrition, which is 12,2%. The results showed that knowledge played a role in the nutritional status of pregnant women (p = 0,025) and poor knowledge of mothers was a risk factor for malnutrition in pregnant women with OR = 4,4 (95% CI; 1,32-14,59), which meaning that pregnant women with poor knowledge will be at risk of 4,4 times greater to suffer from malnutrition than those with sufficient knowledge.

The results of cross-tabulation as shown in table 2, of pregnant women with nulli/primiparity and malnutrition status, were 36,7% higher than those with multiparity and malnutrition, which was 12,5%. The results showed that parity played a role in the nutritional status of pregnant women (p = 0,036) and nulli/primiparity was a risk factor for malnutrition in pregnant women with OR = 4 (95% CI; 1,22-13,39), which means the mother pregnant with nulli/multiparity will be at risk of 4 times greater to suffer from malnutrition than multiparity.

The results of cross-tabulation as shown in table 2, of pregnant women with Lampung race/ethnicity and malnutrition, were 39,3% greater than those of non-Lampung ethnicity/race and malnutrition, which was 11,9%. The results showed that race/ethnicity had a role in the nutritional status of pregnant women (p = 0,017) and Lampung race/ethnicity was a risk factor for malnutrition in pregnant women with OR = 4,7 (95% CI; 1,43-15,94), which means that pregnant women with Lampung race/ethnicity will have a 4,7 times greater risk of suffering from malnutrition than those of non-Lampung ethnicity/race.

The results of cross-tabulation as shown in table 2, of pregnant women who have inadequate energy intake and malnutrition, are 38,7% greater than those who have sufficient energy intake and malnutrition, which is 10,3%. The results showed that energy intake played a role in the nutritional status of pregnant women (p = 0,011) and inadequate energy intake was a risk factor for malnutrition in pregnant women with OR = 5,5 (95% CI; 1,56-19,52), which means that pregnant women who have inadequate energy intake will have a 5,5 times greater risk of suffering from malnutrition than those who have adequate energy intake.

The results of cross-tabulation as shown in table 2, of pregnant women who have inadequate protein intake and malnutrition, are 40,9% greater than those who have adequate protein intake and malnutrition, which is 14,6%. The results showed that protein intake had a role in the nutritional status of pregnant women (p = 0,033) and inadequate protein intake was a risk factor for malnutrition in pregnant women with OR = 4 (95% CI; 1,26-13,04), which means the pregnant women who have inadequate protein intake will have a 4 times greater risk of suffering from malnutrition than those who have adequate protein intake.

Based on the results of the bivariate analysis using the chi-square test, the independent variables were determined as candidates in the multivariate analysis; is the variable with p-value <0,25. The candidate variables included in the multivariate analysis were education, family income, knowledge, parity, race/ethnicity, energy intake, and protein intake. The results of the multivariate analysis using binary logistic regression with the backward stepwise method as shown in table 3 found that the factors that most contributed to the nutritional status of pregnant women were education, income, knowledge, and

parity. The null hypothesis in the Hosmer and Lemeshow test has a p-value of 0.998 so that the null hypothesis is accepted. This means that there is no difference between the observed value and the expected value/expectation so that it can be concluded that the obtained equation is well-calibrated (Dahlan, 2012).

4 DISCUSSIONS

This study shows that pregnant women in malaria-endemic areas, Pesawaran District, Lampung Province, have malnutrition as many as 16 people (22.9%). The results of this study are lower than the prevalence of malnutrition in pregnant women in the vivax malaria-endemic area of Bengkulu city, which is 40% (Aguscik & Ridwan, 2019) and in the district of Allada the economic capital of Benin, West Africa, which is 44,2% (Ouedraogo et al., 2012). Malnutrition in pregnant women illustrates that pregnant women do not have adequate reserves of nutrients to provide the physiological needs of pregnancy, namely hormonal changes and increase blood volume for fetal growth, so the supply of nutrients to the fetus is reduced. As a result, the growth and development of the fetus are harms and is born with a low weight (SACN, 2011; Sgarbieri & Pacheco, 2017).

Table 2: The role of social determinants and nutrients intake on nutritional status in pregnant woman

Variable	Nutritional Status				p	OR	95% CI
	Malnutrition		Good				
	n	%	n	%			
Education							
a. Low	12	38,7	19	61,3	0,011	5,5	1,56- 19,52
b. High	4	10,3	35	89,3			
Family income							
a. Low	12	41,4	17	58,6	0,005	6,5	1,83- 23,22
b. High	4	9,8	37	90,2			
Knowledge							
a. Poor	11	37,9	18	62,1	0,025	4,4	1,32- 14,59
b. Sufficient	5	12,2	36	87,8			
Parity							
a. Nulli/primiparity	11	36,7	19	63,3	0,036	4	1,22- 13,39
b. Multiparity	5	12,5	35	87,5			
Race/Etnic							
a. Lampung	11	39,3	17	60,7	0,017	4,7	1,43- 15,94
b. Non lampung	5	11,9	37	88,1			
Energy intake							
a. Inadequate	12	38,7	19	61,3	0,011	5,5	1,56- 19,52
b. Adequate	4	10,3	35	89,7			
Protein intake							
a. Inadequate	9	40,9	13	59,1	0,033	4	1,26- 13,04
b. Adequate	7	14,6	41	85,4			

Table 3: Initial model and final model of binary logistic regression analysis of factors contribute to the nutritional status of pregnant women

	B	p	OR	95% CI
Initial Model				
a. Education	2,014	0,03	7,4	1,21-46,31
b. Family income	2,152	0,017	8,6	1,47-50,21
c. Knowledge	1,804	0,036	6	1,12-32,75
d. Parity	1,865	0,060	6,4	0,92-44,98
e. Race/Ethnic	1,005	0,229	2,7	0,53-14,04
f. Energy intake	0,072	0,938	1	0,17-6,5
g. Protein intake	0,330	0,691	1,3	0,27-7,06
Constant	-12,374			
Final Model				
a. Education	2,377	0,008	10,7	1,86-62,05
b. Family income	2,435	0,004	11,4	2,14-60,86
c. Knowledge	1,773	0,028	5,8	1,21-28,52
d. Parity	2,136	0,012	8,4	1,61-44,48
Constant	-11,490			

Based on the results of the analysis obtained the following equation:

$$\text{Malnutrition in pregnant women} = -11.49 + (2{,}377 * \text{low education}) + (2{,}435 * \text{low family income}) + (1{,}773 * \text{poor knowledge}) + (2{,}136 * \text{nulli/multiparity}) \quad (1)$$

Pregnant women are more at risk of contracting malaria and suffer more severe consequences if they get malaria compared to women who are not pregnant (Schantz-Dunn & Nour, 2009). In addition, malaria also harms the fetus it contains. Malaria in pregnant women contributes to mother, infant, and neonatal mortality because it can cause complications in pregnant women such as anemia, fever, hypoglycemia, cerebral malaria, pulmonary edema, and sepsis (Saba, Sultana & Mahsud, 2008). The fetus it contains causes low birth weight, premature birth, stillbirth, congenital malaria, and others (Guyatt & Snow, 2004). Research in India shows that the prevalence of malaria in pregnant women is higher than in women who are not pregnant (Singh, Shukla & Sharma, 1999).

The results of this study stated that education plays a role in the nutritional status of pregnant women in malaria-endemic areas. Low education is a risk factor for malnutrition in pregnant women, pregnant women with basic education have a 5,5 times greater risk of experiencing malnutrition than higher education. Educational factors affect the diet of pregnant women, higher education levels are expected to have better knowledge and information about nutrition so that they can meet their nutritional intake (Goodarzi-Khoigani et al., 2018). Low education will cause nutritional knowledge by pregnant women to be also low, thus affecting food intake. Food intake plays a direct role in the nutritional status of pregnant women (Teweldemedhin et al., 2021).

Education also affects income. Higher education will make a person get wider opportunities to get a better job with a bigger income. Meanwhile, people with low education get jobs with small incomes. Family income is one of the factors that determine the amount of food available in the family so that it also determines the nutritional status of the family (Nofita & Darmawati, 2016).

The results showed that family income played a role in the nutritional status of pregnant women in malaria-endemic areas. Low income (less than the provincial minimum wage) is a risk factor for malnutrition in pregnant women, pregnant women with low income (less than the provincial minimum wage) have a 6,5 times greater risk of experiencing malnutrition than high income (more than the provincial minimum wage). The results of this study are in line with the research of Serbesa, Iffa & Geleto (2019) which states that low economic status is associated with malnutrition ($p = 0.035$) in pregnant women and lactating mothers at the Miesso Health Center, Ethiopia. Based on the Institute of Medicine & National Research Council (2015) and Jaffee et al. (2019), families with low economic levels will usually spend part of their income on food. Meanwhile, the more money, the better the food obtained because some of the income is used to buy food ingredients as desired. Economic status affects a person's nutritional status. Especially if the person concerned lives below the poverty line or in a pre-prosperous family, it is useful to ascertain whether the mother is capable of buying and choosing foods with high nutritional value.

The results of the study stated that knowledge plays a role in the nutritional status of pregnant women in malaria-endemic areas. Poor knowledge is a risk factor for malnutrition in pregnant women, pregnant women with poor knowledge have a 4,4 times greater risk of experiencing malnutrition than sufficient knowledge. The results of this study are following the research of Manaf et al. (2014) which states that nutritional knowledge score was positively correlated with gestational weight gain ($r = 0.166$, $p < 0.05$) in pregnant women from two selected private hospitals in Klang Valley, Malaysia. Based on Hamulka et al. (2018), the level of knowledge determines the behavior of food consumption, one of which is through nutrition education. Nutrition education seeks to increase knowledge and improve food consumption habits. Sakamaki et al. (2005) said that nutrition knowledge has an important role in using the right food, so that good nutritional status and status can be achieved. Knowledge is very important in determining whether or not in choosing the right food consumption which will ultimately affect their health status.

The results showed that parity had a role in the nutritional status of pregnant women in malaria-endemic areas. Low parity (nulli/primiparity) is a risk factor for malnutrition in pregnant women, pregnant women with low parity (nulli/primiparity) have a 4 times greater risk of experiencing malnutrition than high parity (multiparity). The results of this study are following the research of Kumera et al., (2018) which states that parity is related to the nutritional status of pregnant women ($p = 0.04$) in pregnant women

attending antenatal care at the University of Gondar Hospital, Northwest Ethiopia.

Low parity is related to low knowledge and experience when a woman is pregnant, thus affecting food selection, food intake, and nutritional status (Kumera et al, 2018). The risk of the occurrence of malnutrition in pregnant women who have never given birth, but if the mother has good knowledge about the nutritional status of pregnant women which is part of efforts to optimize the mother's ability so that pregnant women are expected in third-semester pregnancy has a good nutritional status as well (Hamel et al, 2015).

The results showed that race/ethnicity played a role in the nutritional status of pregnant women in malaria-endemic areas. Lampung race/ethnicity is a risk factor for malnutrition in pregnant women, pregnant women with Lampung race/ethnicity have a 4,7 times greater risk of experiencing malnutrition than non-Lampung races/ethnicities. Lampung is one of the tribes a patrilineal kinship system, which is a legal society whose members draw their lineage upward through the father's line, the father from the father, and continues upwards so that finally a man is found as his ancestor. The legal consequences arising from this patrilineal system is that the wife because of her marriage usually marriage with an honest money payment system), is removed from her family, then enters and becomes her husband's family. It is men who play a role, o that even traditional positions are controlled by men. This shows that the position of a husband is higher than the position of his wife, the wife is a companion in upholding the household, the wife follows her husband's kinship after marriage and the husband is the head of the family in the household. It is possible if the wife (preconception woman) of the Lampung race experiences malnutrition caused by eating behavior by prioritizing her husband, while the wife will eat when her husband and children have finished eating or just finished eating the existing food (Destryana, 2017).

The results of the study stated that energy intake plays a role in the nutritional status of pregnant women in malaria-endemic areas. Inadequate energy intake is a risk factor for malnutrition in pregnant women, pregnant women with inadequate energy intake have a 5,5 times greater risk of experiencing malnutrition than adequate energy intake. The results of this study are following the research of Desyibelew & Dadi (2019) which states that energy intake is related to the nutritional status of pregnant women. The lower the energy intake of pregnant women, the lower the nutritional status. The decrease in nutritional status is caused by the lack of food consumed both in quality and quantity.

Food intake is very influential on a person's nutritional status. If a person's food intake is low and unbalanced, it can lead to malnutrition. If the food intake (energy) is smaller than the energy expended, there will be an energy deficit and a decrease in body weight which in turn leads to poor nutritional status. On the other hand, if the energy expended is greater than the energy expended, there will be excess energy that will be stored as body fat and can lead to obesity. Lack of energy from food intake causes the body to take up stored energy reserves. If this happens continuously then a person can become malnourished. Pregnant women need additional energy for the growth and development of the fetus, placenta, breast tissue, and fat reserves (National Research Council, 1989; WHO, 2003).

The results of this study showed that protein intake played a role in the nutritional status of pregnant women in malaria malaria-endemicInadequate protein intake is a risk factor for malnutrition in pregnant women, pregnant women with less protein intake have a 4 times greater risk of experiencing malnutrition than adequate protein intake. The results of this study are in following of Kurniasari et al. (2018) which states that protein intake is related to the nutritional status of pregnant women in the city of Semarang ($p = 0,002$) with a positive correlation ($r = 0,502$), which means that the lower the protein intake of pregnant women, the lower the nutritional status. The role of protein in building the structure of body tissues becomes the final part to supply energy needs when carbohydrate and fat intake is reduced. Intake of fat and carbohydrates as a comparison of protein intake in its role as an alternative energy source.

Based on the results of the multivariate analysis, it was found that the most important factors on the nutritional status of pregnant women in malaria-endemic districts, were social determinants, namely education, family income, knowledge and parity. Based on the OR value, the biggest social determinant as a risk factor for malnutrition in pregnant women is family income, followed by education, parity, and knowledge of pregnant women. Family income is the biggest risk factor, this is possible because income will determine the amount of food that can be purchased so that it directly plays a role in the food intake and nutritional status of pregnant women.

5 CONCLUSIONS

The most influential factors on the nutritional status of pregnant women in the malaria-endemic areas of Pesawaran district are social determinants, namely education, family income, knowledge, and parity. However, food intake (energy and protein) is a direct factor that plays a role in the nutritional status of

pregnant women, and food intake is influenced by social determinants.

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