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RESEARCH ARTICLE

Analyzing the Level of Knowledge, Food Consumption Diversity, and Nutritional Intake on Chronic Energy Deficiency among Pregnant Women in Stunting Prevention

Fitriani*, Yarmaliza, and Teungku Nih Farisni

ABSTRACT

A long-term imbalance in macronutrient intake, such as energy and protein intake, might result in chronic energy deficiency in pregnant women. Several factors can impact pregnancy such as knowledge level, socio-economic status, marriage, education, family economics, and marital status. Chronic energy deficiency in pregnant women can result in a low birth weight, which is then linked to stunting. The aim of this research is to find out the relationship between the level of knowledge, food consumption diversity, and nutritional intake in pregnant women who reside in the area of this cross-sectional quantitative research. By using chi-square analysis, the result of these variables was determined. The result shows that the factors relate to energy deficiency in pregnant women with the details as knowledge with p-value = 0.0002, food variation with p-value = 0.0003, energy intake with p-value = 0.0022, protein consumption with p-value = 0.051, and fat with p-value = 0.005. However, the consumption of carbohydrates, lipids, vitamin IC, folic acid, iron, calcium, and iodine do have an effect but to the minimum extent in regards to chronic energy deficiency of pregnant women.

Keywords: CED, Food Consumption Diversity, and Nutritional Intake.

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Faculty of Public Health, Teuku Umar University, Indonesia.

**Corresponding Author:*
e-mail: fitriani@utu.ac.id

1. Introduction

One of the vital factors that could be the cause of a mother and child's mortality is a lack of health information in the community, one of which is the information about chronic energy deficit or CED in pregnancy [1]. CED in pregnant women can be caused by a lack of numerous nutrients such as protein, iodine, vitamin A, vitamin D, folic acid, iron, and calcium. There are several ways to detect CED, for example, to measure the circumference of the upper arm with the standard measurement should reach 23.5 cm. Based on Basic Health Research data, the prevalence of CED is based on the presence of pregnant women suffered from CED with problems in nutritional status between 15-49 years old (21.% in 2007)—which was then increased to 24.2% in in 2013 and decreased to 17.3% in 2018 [2]. This was followed by a growth of i24.2% in 2013, but a decline of i17.3% in 2018 [2].

Chronic Energy Deficiency (CED) during pregnancy can be caused by an infectious condition or a lack of essential nutrients like carbs and protein. Many factors influence adequate nutrition for pregnant women, including the pregnant woman's own knowledge of the nutrients she requires, the hygiene of the place where she lives and the surrounding environment, age, gender, marital status and age gap, educational level, the economic condition of the family, and the availability of food in the pregnant woman's household [3].

A pregnant mother's nutritional demands can be addressed by eating a wide range of foods, including fresh fruit and colorful vegetables. Pregnant women are a target population that requires assistance or information in implementing the Balanced Nutrition Guidelines as noted in *Pemantauan Status Gizi* or *PGS* [4]. The results of PSG [4] show that the average percentage of carbohydrate consumption to the standard of nutritional adequacy in pregnant women is 76.8%, protein is 86.4%, and fat is 70.0%. Based on energy adequacy, 53.9% of pregnant women experienced an energy deficit of up to <70% AKE and 13.1% experienced a light energy deficit of 70%-90%

AKE. Meanwhile, in protein adequacy of 51.9%, pregnant women can still experience a protein deficit for <80% AKP, and 18.8% would experience an energy deficit for 80%–99% AKP [5].

Pregnant women who have nutritional issues are extremely risky since they can cause exhaustion, weakness, and other major health problems. Additional difficulties that may arise include miscarriage, birth abnormalities, and low birth weight leading to stunting [6]. Based on these concerns, researchers are interested in scientifically investigating the relationship between knowledge, food diversity consumption, and nutritional intake in pregnant women in village Tepin Panah, disctrict of Kaway XV, Aceh Barat regency.

2. Research Methodology

This is an observational study with a cross-sectional design. From January to May 2022, this research was conducted in Kaway district XVI, West Aceh regency. The research population consists of all pregnant mothers—which there were 33 of them.

The independent variables in this study are knowledge, food diversity, and macro and micronutrient intake, while the dependent variable is an event of chronic energy deficiency (CED). Data collection was carried out using questionnaires to find out the characteristics of respondents, arm measurement, macronutrient (energy, protein, fat, and carbohydrate) and micronutrient (Vitamin C, folic acid, iron, calcium, Iodine). The data were gathered using *form Semi Quantitative Food Frequency (SQ-FFQ)* which was measured once a week within one month. This questionnaire SQ-FFQ contains types of foods and sizes of food portions based on Nutritional Adequacy Figures (AKG) [7], [8]. The data were analyzed employing univariate and bivariate analyses, and the Pearson correlation test was utilized as a statistical test [9], [10].

3. Results and Discussion

After the process of data analysis, the results are shown in this section. According to Table I, the majority of the 33 respondents (48.4%) were in their late adolescence. The gestational age of all respondents, comprising 13 people (39.3%), was largely in the final trimester (≥7 months). The majority of pregnant women, 28 persons (28%), do not work. The majority of pregnant women, precisely 20 persons (60.6%), had a high school education. The majority of respondents had a monthly salary of Rp. 1,000,000- or more. The details are shown in Table I.

Based on Table II, it can be seen that among the 33 respondents, the majority of those with nutritional status does not suffer from CED (arm circumference of <23.5 cm) are the 21 people (63.6%), compared to pregnant mothers who have good nutritional status/not suffered from CED (arm circumference ≥23.5 cm) was 12 people (36.3%). In this research, it can be seen that the majority of pregnant mothers consume less of a variety of foods (less than six types of foods) which was as many as 21 people (63.3%); while the number of pregnant mothers who consume a variety of foods (more than eight types of food) is 12 people (36.3%). Pregnant women with good knowledge are 11 people (33.3%), while those with poor knowledge are 22 people (66.6%).

TABLE I: Characteristic Frequency Distribution

Research variable	n	(%)
Mother's age		
Late adolescent (17–25 years old)	16	48.4
Early adult (26–35 years old)	5	15.1
Late adult (36–45 years old)	12	36.3
Pregnancy age		
1–3 months (first trimester)	10	30
4–6 months (second trimester)	10	30
≥7 months (third trimester)	23	69.6
Mother's occupation		
Work	5	15.1
Do not work	28	84.8
Mother's education		
Low (junior high school or less)	11	33.3
Medium (senior high school)	20	60.6
High (Diploma/graduate/undergraduate)	2	6
Family income		
<Rp 1.100.0000	28	84.8
Rp 1.100.0000–3.500.000	4	12.1
Rp 3.600.0000–5.000.000	1	3

TABLE II: Frequency Distribution of Nutritional Status (CED), Food Diversity and Knowledge in Pregnant Women

Research variable	n	(%)
Chronic energy deficiency (CED)		
Not CED (arm circumference ≥23.5 cm)	21	63.6
CED (arm circumference <23.5 cm)	12	363
Food diversity		
Various or ≥8 types	12	36.3
Not various <8 types	21	63.6
Knowledge level		
Good (≥75)	11	33.3
Poor (<75)	22	66.6

In accordance with Table III, the frequency distribution of nutritional consumption patterns of pregnant women in the macro group contains adequate energy intake with a total of 23 people (69.9%), which is greater than the less energy intake of 10 people (30.3%), the good carbohydrate intake of 30 people (90.9%) is greater than the less carbohydrate intake of 3 people (9%), the less protein intake consumed by pregnant women is 25 people (75.5%) is greater than the good protein intake, namely 8 people (24.2%), fat consumption in pregnant women is less, namely 24 people (27.2%) is greater than fat consumption good, namely 9 people (27.2%).

Food consumption before and during pregnancy has an impact on pregnant women's nutritional status. Pregnant women's average calorie intake is 1236.89 kcal, their average carbohydrate intake is 162.86 g, their average protein intake is 45.87 g, and their average fat intake is 51.82 g.

According to Table IV, pregnant women had enough vitamin C intake. This can be seen in 23 people (69.6%), greater than the lack of vitamin C intake, namely 10 people (30.3%). Insufficient folate intake in pregnant women was 17 people (51.5%) greater than the amount of good

TABLE III: Frequency Distribution of Macronutrient Intake in Pregnant Women

Intake variable	n	(%)	Mean ± SD
Energy			
Good	23	69.6	1236.89 ± 571.68
Poor	10	30.3	
Carbohydrate			
Good	30	90.9	162.86 ± 77.22
Poor	3	9	
Protein			
Good	8	24.2	45.87 ± 28.18
Poor	25	75.7	
Fat			
Good	9	27.2	51.82 ± 54.45
Poor	24	7.2	

TABLE IV: Frequency Distribution of Micronutrient Intake of Pregnant Women

Research variable	Micronutrient		
	N	(%)	Mean ± SD
Vitamin C			
Good	23	69.6	35.85 ± 140.74
Poor	10	30.3	
Folic acid			
Good	16	48.4	107.75 ± 187.55
Poor	17	51.5	
Iron			
Good	8	24.2	6.92 ± 11.79
Poor	25	75.7	
Calcium			
Good	14	42.4	341.44 ± 578.53
Poor	19	57.5	

folate intake, namely 16 people (48.4%), insufficient Fe consumption in pregnant women was 17 people (51.5%) greater than There were 16 people (48.4%) with good Fe intake, 19 people (57.5%) with poor calcium intake, more than 14 people (42.4%) with good calcium intake. In pregnant women, the average micronutrient intake is 35.85 mg vitamin C, 107.75 mcg folic acid, 6.92 mg Fe, and 341.44 mg calcium.

Table V demonstrates a significant association between pregnant women's knowledge and CED (p 0.0002). The proportion of pregnant women affected by CED is higher among those with low comprehension (41% vs. 20%). This demonstrates that pregnant women who have knowledge are at risk of CED. The variety of foods ingested by pregnant women and CED had a significant connection (p 0.003). CED is more likely in pregnant women who eat fewer diverse foods (40%) than in those who eat more diverse foods—which was found in 25% of respondents.

The connection between macro and micronutrient intake and the probability of CED in pregnant women is shown in Table VI. There is a link between calorie, protein, and fat consumption and the prevalence of CED in pregnant women. The results of statistical tests conducted are energy i0.200 i(p = 0.0022), protein i0.301 (p = 0.051), and fat i0.304 i(p = 0.005), and the value of the positive correlation coefficient indicates these factors are increasing. If a person is pregnant and consumes a lot of

TABLE V: Relationship between Knowledge, Food Diversity and Chronic Energy Deficiency (CED) in Pregnant Women

Variable	Chronic energy deficiency				Total		p-value
	Normal		CED				
	N	%	n	%	n	%	
Knowledge							
Good	8	80	2	20	10	100	0.0002
Poor	13	59	9	41	22	100	
Food diversity							
Various	9	75	3	25	12	100	0.0003
Not various	12	60	8	40	20	100	

TABLE VI: The Relationship Between Macro and Micro Nutrient Intake and Chronic Energy Deficiency in Pregnant Women

Variable	r	p-value
Macronutrient		
Energy (g)	0.200	0.0022
KH (g)	0.0056	0.765
Protein (g)	0.301	0.051
Fat (g)	0.304	0.005
Micronutrient		
Vitamin C (mcg)	0.079	0.510
Folic acid (mcg)	0.187	0.195
Iron (mg)	−0.011	0.813
Calcium (mg)	0.101	0.400
Iodine (mcg)	0.016	0.864

calories, protein, and fat, her ar circumference will rise or become abnormal. Carbohydrates, vitamin C, folic acid, iron, calcium, and iodine all have p-value of less than 0.005 and do not have a significant connection with CED.

Chronic Energy Deficiency (CED) is an undertaking that involves a lack of food intake over a lengthy period of time. CED occurrences are most common in women of fertile age—between the ages of 15 and 45. Measuring the circumference of the upper arm (LILA) at 23.5 cm helps for the diagnosis of CED [11]. According to the chi-square test results, there is a substantial association between pregnant women's awareness of CED and p-value = 0.0002. These findings are consistent with the work of Diningsih *et al*. [12] discovering an IP-value of 0.000–0.05 between the number of expectant mothers who received nutritional education and the prevalence of CED at the Matraman Health Center [12], [13].

Pregnant women's nutritional condition is governed by their knowledge, and the only thing that can keep them from developing CED is the pregnant lady herself. This is also consistent with Makhfudli's [14] theory, which states that knowledge has a significant role in determining individual behaviour, particularly health behaviour. A lack of nutritional knowledge results in a predilection for foods that appeal to the senses or flavour alone rather than nutritional value [14].

Retni's [15] research demonstrates that pregnant women's awareness of being in the group experiencing CED is less than that of pregnant women with high knowledge who have not encountered CED, with a p-value of 0.005. According to Notoadmodjo [13], there is a considerable mutual influence between knowledge and

participation in specific activities. Individuals would have a positive attitude towards superior behaviour if they were aware of its superiority. If this measure is regarded to have a positive influence, it is more likely to be implemented. Pregnant women must make positive efforts, such as eating nutritional foods during pregnancy, to prevent CED [16].

According to the findings of the interviews, respondents with insufficient knowledge are caused not only by their pregnant mothers' low level of education, but also by their lack of efforts to obtain better knowledge by searching for information about CED, whereas some respondents have sufficient knowledge because they have obtained information about CED. From having enough information, mothers would understand that pregnancy tests are performed by health professionals, they would consider a pregnant woman's comprehension of the fundamentals of food selection, become more aware pregnant women are more inclined to consider the nutritional content of the foods they consume [17]. Chronic Energy Deficiency (CED) in pregnant women can be influenced by their dietary habits, which are influenced by cultural influences, specifically the concept that pregnant women should not consume particular types of food because they will induce irritation [18].

The variety of foods consumed will provide the nutrients the body needs, even during pregnancy. According to research, pregnant women who eat fewer calories have a 70% chance of experiencing CED, while pregnant women who eat a variety of foods have a 30% chance of developing CED. This is because family consumption of more varied foods will enable nutritional needs to be met during pregnancy [7]. Diverse foods are divided into six categories, including staple foods as a source of carbohydrates, vegetable side dishes as a source of vegetable and animal protein, vegetables as a source of vitamins and minerals, and other food categories that pregnant women must consume [8].

According to research, pregnant women usually consume 1236.89 kcal and 45.87 g of protein per day, which is less than the 2018 Nutritional Adequacy Rate (AKG) standard, namely 2150 kcal plus 300 kcal during pregnancy [19]. The average consumption of pregnant women was not enough in this study and did not even meet the criteria of 50%. In terms of their metabolic needs, pregnant women have higher requirements for protein, iron, and micronutrients in addition to their overall dietary requirements. The body will lack energy to maintain metabolic homeostasis if the amount of food consumed is insufficient. If this is allowed to happen, there may even be the possibility of stunting in the future for both mother and child [20].

Energy intake ($p = 0.0022$; $r = 0.200$), protein intake ($p = 0.0301$; $r = 0.051$), and fat intake ($p = 0.005$; $r = 0.304$) all showed a good correlation with LILA of pregnant women. There is a positive r value which indicates that LILA, protein intake, and fat intake of pregnant women increase when calorie intake increases; however, the correlation probability was low ($r = 0.5$). There is no relationship between fat and carbohydrates and LILA in pregnant women.

According to field data, pregnant women consume more carbohydrate-derived food than protein-derived food, both animal and vegetable. This is because pregnant women experience nausea and vomiting when they ingest foods derived from protein sources, particularly animal sources, despite the fact that this food group is essential for nutrition supplementation. Anaemia in the mother, as well as anaemia in the foetus, can be avoided. If energy intake is insufficient, the body's ability to use nutritional substances such as carbs, proteins, and fats—which are alternate sources of energy—may vary, as will the availability of these nourishing substances, which may outcome in CED [11].

There is a link between energy and protein consumption, with the former having a low and unidirectional connection with LILA and the latter having values of 0.28 and ($p=0.02$), respectively [20], [21]. This association shows a positive r value overall, showing that LILA increases when calorie, protein, and fat intake increases [19]. Yuniarti [22] found a substantial association between calorie consumption and protein intake and CED in pregnant women, with a value of ($p = 0.05$). Pregnant ladies require a lot of food for energy because their basal metabolism increases. If energy needs are not satisfied, the body will utilize fat reserves, and if fat reserves are still used, metabolic shifts will occur in which protein in the muscles and liver is used to make energy [23]. As a result, muscle mass will decrease with LLA 23.5 cm [7].

There was no link identified between micronutrient intake and CED in pregnant women, including vitamin C ($p = 0.510$), folic acid ($p = 0.195$), iron ($p = 0.813$), calcium ($p = 0.400$), and iodine ($p = 0.864$). The reason for this is that, in addition to ingesting foods that naturally contain these nutrients, every pregnant woman receives a dose of vitamin C, folic acid, and calcium to maintain her health and meet her micronutrient demands at all times.

4. Conclusion

Tepin Panah village has 33 pregnant women, with 36.3% having CED status and 63.6% not having CED status. On CED, there is a strong association between knowledge, dietary diversity, and macronutrient consumption, specifically calories and protein, with $p = 0.05$. Therefore, it is suggested that increasing pregnant women's education is critical since it will increase comprehension of optimum nutritional intake. Health staff must do continuous measurements in order to identify the risk of malnutrition as early as feasible.

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Conflict of Interest

Authors declare that they do not have any conflict of interest.

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