RELATIONSHIP OF CHARACTERISTICS OF PREGNANT WOMEN AND FOOD INTAKE WITH CHRONIC ENERGY DEFICIENCY

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Abstract

The prevalence of pregnant women suffering from CED from 2017 to 2020 has increased. The main causes include the characteristics of pregnant women and lack of food intake of carbohydrates, protein, and fat. Research objective: to analyze the relationship between the characteristics of pregnant women and food intake as sources of carbohydrate, protein, and fat with the incidence of CED in pregnant women. This study belongs to an analytical observational study with a case-control approach, with a sample group of 19 pregnant women experiencing CED and 19 pregnant women not experiencing CED in the control group. This study applies purposive sampling as a sampling technique. Data analysis was performed with univariate and bivariate using the chi-square test. The results of the study showed that two variables had a p-value of < 0.05, namely infectious diseases and protein food intake. From the lower upper limit value, five variables were at risk of CED in pregnant women at Tegalrejo Health Center Yogyakarta, including age, infectious diseases, intake of carbohydrates, protein, and fat. It is suggested that the Health Center carry out surveillance and further studies to figure out the incidence and risk factors of CED in pregnant women in the Health Center in Yogyakarta.

Keywords: Characteristics of Pregnant Women, CED, Food Intake

Introduction

According to the World Health Organization (WHO), about 810 women died in 2017 from pregnancy-and childbirth-related preventable causes, and the maternal mortality ratio (the average rate of maternal deaths per 100,000 live births) decreased by approximately 38% worldwide and 94% of all maternal mortality occurred in low and middle-income countries from 2000 to 2017(1). This high maternal mortality rate occurs due to several factors. One factor that plays a major role in childbirth complications of pregnant women is chronic energy deficiency (2).

The prevalence of CED in developing countries such as Bangladesh is 47%. Indonesia is the fourth largest after India with an average incidence of 35.5% while Thailand is the lowest with 15-25%. Many CED cases in Indonesia occur due to an imbalance in nutritional intake which results in insufficient nutrients needed by the body. Therefore, body growth, both physical and mental, is not as perfect as it should be (3).

Pregnancy is an important period in the life cycle, where additional nutrients are essential to meet the metabolic needs of the mother and the needs of fetal growth (4). Nutritional needs during pregnancy are higher than during other life periods to meet the metabolic and physiological needs of the mother and growing fetus(5). Proper nutrition during pregnancy is important to determine the baby's growth and development as well as the mother's long-term health outcomes (6).The occurrence

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of CED in pregnant women can be affected by many factors, namely socioeconomic factors, birth spacing factors, parity factors, dietary factors, and behavioral factors. In addition, if the upper arm circumference size is < 23.5 cm and Hb anemia < 11 gram % weight gain during pregnancy per month < 3 kg, pregnant women are at risk of Chronic Energy Deficiency (CED) (3).

Based on profile data in the Special Region of Yogyakarta (DIY) in 2021 in three consecutive years, the incidence of pregnant women with CED has increased. The prevalence of pregnant women suffering from CED in 2017 was 10.7%, while in 2018 it increased to 11.76%. In 2019 it increased to 12.68 % and in 2020 it also increased to 12.96 %. Then, it decreased to 12.16% in 2021. The percentage of pregnant women suffering CED in each regency is Gunung Kidul (15.88%), Kulon Progo (13.67%), Yogyakarta City (12.60%), Bantul (10.85%), and Sleman (10.74%). The regencies that still show high numbers above the average in the Special Region of Yogyakarta are Gunung Kidul, Kulon Progo, and Yogyakarta City. Pregnant women with CED is a fundamental problem that needs to be better handled, considering that pregnant women's health status is very decisive in reducing maternal and infant mortality (7).

According to the data from the Health Office of Yogyakarta City in 2021, the highest number of pregnant women with CED incidents is at Tegalrejo Yogyakarta Health Center with 52 cases, followed by Health Center Umbulharjo I with 39 cases, and Kota Gede Health Center with 32 cases (8).

Based on a preliminary study at the Tegalrejo Health Center in Yogyakarta City on the 14th of October 2022, from the data of pregnant women, as many as 19 pregnant women suffered from CED from March to October 2022. The results of interviews conducted with 5 pregnant women checking their pregnancies at the Tegalrejo Health Center Yogyakarta showed that during pregnancy, they experienced a lack of appetite due to nausea and had a history of infectious diseases such as influenza, fever, and COVID-19. The results of these preliminary studies led the researchers to research the relationship between carbohydrate, protein, and fat intake with CED in pregnant women.

Methods

This research is an observational analytical study employing a case-control approach. The population of this study was 230 pregnant women who visited the Tegalrejo Health Center in Yogyakarta in the period of January to September 2022. The research took samples of 19 pregnant women experiencing CED as a case group and 19 pregnant women not experiencing CED as the control group. The study uses purposive sampling. There are several independent variables in this study, namely carbohydrate food intake, protein food intake, and fat food intake. The dependent variable is CED in pregnant women. Primary data was obtained directly through answers from pregnant women who filled out a 24-hour food recall sheet questionnaire consisting of data on pregnant women (name, age, body's weight, and body height, as well as the day of filling), meal time (morning, afternoon, night), food name, ingredients (type and quantity), and nutrients (Carbohydrates, Protein, Fat). Secondary data is obtained from the Health Center about data on pregnant women, both CED and non-CED. The research carried out data analysis in two stages. Univariate analysis was carried out to figure out and describe each research variable's characteristics. Then bivariate analysis was carried out using the chi-square test. An ethical test for this research was conducted at Health Science College of Surya Global Yogyakarta by the Number: No 4.18/ KEPK/SSG/XI/2022.

Results

Univariate analysis in Table 1 showed several findings. First, most of the ages of pregnant women as the respondents to the study were not at risk (20-35 years): 36 people (94.7%). Second, the gestational age of most mothers was in the first trimester: 15 people (39.5%). Third, the family income was mostly low and high: 19 people each (50.0%); the education of pregnant women was mostly secondary: 10 people (26.3%). Fourth, most pregnant women did not have infectious diseases: 30 people (78.9%).

Table 1. Distribution of Frequency based on the Characteristics of Pregnant Women

Description	Frequency	Percentage (%)
Maternal age		
At risk	2	5,3
No risk	36	94,7
Gestational Age		
First Trimester	15	39,5
Second Trimester	13	34,2
Third Trimester I	10	26,3
Family Income		
Low	19	50,0
High	19	50,0
Maternal Education		
Low	27	71.1
High	11	28.9
Infectious Disease		
Having diseases	8	21,1
No disease	30	78,9

Table 2. Results of Chi-Square Test of Relationship between Characteristics of Pregnant Women and CED at Tegalrejo Health Center Yogyakarta

Variables	Case Group of CED				P- value	OR (95 % CI)
	Case Group		Control Group			
	N	%	N	%		
Maternal Age						
At risk	2	5.3	0	0.0	0,146	2,118
No risk	17	44.7	19	50.0		(1,499-2,991)
Family Income						
Low	12	31.6	7	18.4	0,105	2.939
High	7	18.4	12	31.6		(0.786-10.982)
Maternal Education						
Low	13	34.2	14	36,8	1,000	0,744
High	6	15.8	5	13.2		(0,190-3,159)
Infectious disease						
Having diseases	8	21.1	0	0.0	0,003	2,727
No disease	11	28.9	19	50.0		(1,704-4,365)

Based on Table. 2, the Chi-Square test results showed no significant relationship between the age of pregnant women with Chronic Energy Deficiency (CED) incidence with p-value= 0.146 > 0.05. The risk calculation results obtained OR= 2.118 (95% CI = 1.499-2.99) which means that the high-risk age group (< 20 years and > 35 years) has a 2.118 times greater risk of developing CED

compared to the low-risk age group (20-35 years). Since the lower upper limit value does not include one value, Ha is accepted, which means that the mother's age < 20 years and > 35 years is at risk and meaningful for the occurrence of CED. Similarly, according to the results of the Chi-Square test, family income shows no significant relationship with the Chronic Energy Deficiency (CED) incidence with p-value = 0.105> 0.05. The risk calculation yield OR = 0.105 (95% CI = (0.786-10.982) which means that as a protective factor, there is a negative relationship of low family income and the occurrence of CED. Since the lower upper limit value includes a value of one, Ha is rejected, which means that low income is not at risk of CED. Furthermore, the Chi-Square test results show that maternal education has no significant relationship with the Chronic Energy Deficiency (CED) incidence with *p*-value= 1.000 0> 0.05. The risk calculation results obtained a value of OR = 0.744 (95% CI = (0.190-3.159) which means that as a protective factor, there is a negative relationship of low maternal education and the occurrence of CED. Since the lower upper limit value includes a value of one, Ha is rejected, which means that low education is not at risk of CED.

The Chi-Square test results show that infectious diseases have a significant relationship with Chronic Energy Deficiency (CED) incidence with p-value= 0.003 < 0.05. The risk calculation results obtained OR= 2.727 (95% CI = 1.704-4.365) which means that infectious diseases receive a 2.727 times greater risk of developing CED compared to non-infectious diseases. Since the lower upper limit value does not include one value, Ha is accepted, which means that infectious diseases are at risk and meaningful to the occurrence of CED.

Table 3. Results of the Chi-Square Test of the Relationship between Carbohydrate, Protein, and Fat Intake with CED in Pregnant Women at Tegalrejo Health Center Yogyakarta

Variable	CED				*P- value*	OR
	Case Group		Control Group			(95 % CI)
	N	%	N	%		
Carbohydrate intake						
Not fulfill	19	50,0	18	47,4	1,000	0,486
Fulfill	0	0,0	1	2,6		(0,349-0,677)
Protein intake						
Not fulfill	19	50,0	11	28,9	0,003	0,367
Fulfill	0	0,0	8	21,1		(0,229-0,587)
Fat Intake						
Not fulfill	19	50,0	16	42,1	0,230	0,457
Fulfill	0	0,0	3	7,9		(0,319-0,656)

Based on Table 3, Chi-Square test results show that food intake of carbohydrates has no significant relationship with Chronic Energy Deficiency (CED) incidence with p-value (p-value) =1.000> 0.05. The risk calculation results obtained the value of OR = 0.486 (95% CI = 0.349-0.677) which means as a protective factor, meaning that there is a negative relationship between the carbohydrate food intake that does not meet the needs of the body with the occurrence of CED. Since the lower upper limit value does not include one value, Ha is accepted, which means that carbohydrate intake that does not meet the needs of the body is at risk of CED.

The Chi-Square test results show that protein intake has a significant relationship with Chronic Energy Deficiency (CED) incidence with p-value = 0.003 < 0.05. The results of the risk calculation obtained the value of OR = 0.367 (95% CI = 0.229-0.587) which means as a protective factor, meaning that there is a negative relationship between the protein food intake that does not meet the body's needs with the occurrence of CED. Since the lower upper limit value does not include one

value, Ha is accepted, which means protein intake that does not meet the needs of the body is at risk of CED.

The Chi-Square test results showed that fat intake did not have a significant relationship with Chronic Energy Deficiency (CED) incidence with p-value = 0.230 > 0.05. The risk calculation results obtained the value of OR = 0.457 (95% CI = 0.319-0.656) which means as a protective factor, which means that there is a negative relationship between the intake of fatty foods that do not meet the needs of the body with the occurrence of CED. Since the lower upper limit value does not include one value, Ha is accepted, which means that fat intake that does not meet the needs of the body is at risk of CED.

Discussions

The Relationship of Maternal Age with Chronic Energy Deficiency (CED) Incidence in Pregnant Women.

The results stated no relationship between age and CED incidence in pregnant women at the Tegalrejo Health Center in Yogyakarta. However, the high-risk age group has a 2.118 times greater risk of suffering CED compared to the low-risk age group. Since the lower upper limit value does not include one value, Ha is accepted, which means that the maternal age < 20 years and > 35 years is at risk and meaningful for the occurrence of CED. This is in line with the opinion of Arisman (2010) who stated that the best age was more than 20 years old and less than 35 years, with the expectation that the pregnant women will receive better nutrition. Thus it can be said that age is not a factor that influences the occurrence of CED incidence because most of the respondents are in the ideal age for pregnancy (1). The study results are also in line with Novitasari, YD (2019) which stated that pregnant women's age was not related to the incidence of CED with statistical test results p-value = 0.173. This is because most respondents's age which is 20-35 years is the best age for pregnant women so there is no relationship between age and CED incidence in this study (2). The results of research from Amalia, et al., 2021 also stated similarly that there was no relationship between age and CED incidence in pregnant women (p-value = 0.305) (3).

On the other hand, the research conducted by Renjani and Misra (2017) stated that there was a significant relationship between age and CED incidence in the Krueng Barona Jaya Health Center in Aceh Besar Regency with p-value = 0.003 (4). Another study conducted by Rahmi, L (2016) stated that there was a significant relationship between age and CED incidence in pregnant women at the Belimbing Padang Health Center with a p-value = 0.024 (p <0.05) (5).Similarly, the results of research from Tejayanti, T., 2019 stated that the numbers of pregnant women with CED and BMI (Body Mass Index) are low, including the age of <20 years (AOR = 1.62; 95% CI = 1.60-1.65)(6).

The Relationship between Maternal Income and Chronic Energy Deficiency (CED) Incidence in Pregnant Women

The results stated that there was no relationship between maternal income and CED incidence in pregnant women at the Tegalrejo Health Center in Yogyakarta City. Since the lower upper limit value includes a value of one, Ha is rejected, which means that low income is not at risk of CED. This is following the results of Rezeki, S (2022) which stated that there was no relationship between income and CED incidence in pregnant women at the Titeu Health Center, Pidie Regency, with a p-value = 0.0915 (7). This contrasts with the study of Indriany et al (2014) which stated that there was a meaningful relationship between family income and CED incidence in pregnant women in Sedayu District, Bantul, Yogyakarta, with a p-value = 0.004(8) The results of research from Amalia, et al., 2021 stated similarly that there was no relationship between family income and CED incidence in pregnant women (*p-value* = 0,270)(3).

The Relationship of Maternal Education with Chronic Energy Deficiency (CED) Incidence in Pregnant Women.

The results of this study showed no significant relationship between maternal education and Chronic Energy Deficiency (CED) incidence in pregnant women at the Tegalrejo Health Center in Yogyakarta City. Since the lower upper limit value includes a value of one, Ha is rejected, which means that low education is not at risk of CED. This is following the results of research from Aini, N. and Zahariah, S., 2022 which stated that good knowledge and no dietary restrictions had a positive impact on selecting food types, therefore nutritional needs could be fulfilled during pregnancy and could improve the health of both mothers and children(9). This study follows the research conducted by Novitasari, YD (2019) stated that there was no significant relationship between the education level of pregnant women with the incidence of CED with p-value = 0.097(2), and also follows research conducted by Indriany et al (2014) which stated that there was no relationship between maternal education and CED incidence in pregnant women at Sedayu District, Bantul, Yogyakarta with *p-value* = 0.17(8). This study is in contrast to Tejayanti, T., 2019 which stated that the numbers of pregnant women with CED and BMI are low, including low education (AOR =1,92; 95% CI [0,91-0,93])(6). In addition, it does not follow the results of research by Swastika, R. (2017) stated that there was a relationship between maternal education and CED incidence in pregnant women in Aceh Besar Regency with the result of p-value = 0,001(4). and the result of chi-square test in Harismayantiwith *p-value* = 0,003 which means that there was a significant relationship between maternal education and the incidence of CED in pregnant women at the Limboto Health Center(10).

The Relationship between Infectious Diseases and Chronic Energy Deficiency (CED) Incidence in Pregnant Women

This study stated that there was a relationship between infectious diseases and CED incidence in pregnant women at the Tegalrejo Health Center in Yogyakarta City. Since the lower upper limit value does not include a value of one, Ha is accepted, which means that infectious diseases are at risk and meaningful to the occurrence of CED. Infectious diseases can also contribute to CED experienced by a person besides poor intake. This study results follow Kartini (2017) who stated that there was a relationship between infectious diseases and CED incidence in pregnant women at the Mekar Health Center in Kendari City, with *p-value* = 0,001, Pregnant women suffering infectious diseases have a risk of 6.17 times to experience CED (OR=6,171; 95%CI=2,155-17,675) (11). Similarly, Indriati et al (2018) showed the Chi-square test result of *p-value* = 0, 00 ($p<=0, 05$), then the infectious disease variable was statistically related to CED incidence in pregnant women.(12). Supariasa, IDN (2002) stated that infectious diseases could worsen nutritional conditions and poor nutritional conditions could facilitate infection. According to Scrimshaw et.al (1959) cited by Supariasa, they stated that there was a very close relationship between infections (bacteria, viruses, and parasites) with malnutritioni(13).

The Relationship between Carbohydrate Intake and Chronic Energy Deficiency (CED) Incidence in Pregnant Women

This study results stated that carbohydrate food intake did not show a significant relationship with Chronic Energy Deficiency (CED) incidence. Since the lower upper limit value does not include one value, Ha is accepted, which means that carbohydrate intake that does not meet the needs of the body is at risk of CED. The results of this study are in line with research by Dictara, AA (2020) which stated that there was no relationship between carbohydrate intake and CED incidence for pregnant women at the Sukaraja Health Center in Bandar Lampung City with *p-value* = 0,167 > α value =0,05. This also follows the research by Azizah, A. which stated that there was no relationship between carbohydrate intake and CED incidence in pregnant women with *p-value* = 1.000 > α value =0, 05

(14). However, the results of this study are not in line with the results of research conducted by Aulia, I. (2020) which stated that there was a significant relationship with p-value = 0.027 < α=0.05 between carbohydrate food intake and CED incidence in pregnant women.

The Relationship between Protein Intake and Chronic Energy Deficiency (CED) Incidence in Pregnant Women

The study results stated that protein food intake shows a significant relationship with the incidence of Chronic Energy Deficiency (CED). Since the lower upper limit value does not include one value, Ha is accepted, which means protein intake that does not meet the needs of the body is at risk of CED. The results of this study follow the results of research by Anggoro (2020) stated that there was a significant relationship between diet (carbohydrate and protein intake) with Chronic Energy Deficiency (CED) incidence in pregnant women at the Pajangan Bantul Health Center Yogyakarta, with *p-value* = 0,000 < = 0,05 (15). It is also in line with the results of research from Dictara, AA. (2020) stated that there was a significant relationship between protein intake and CED incidence at the Sukaraja Health Center in Bandar Lampung City, with *p-value* = 0.017 < α value= 0.05 (16); The results of Mahmudah and Sigit's (2015) research stated that there was a relationship between maternal protein intake and the incidence of CED (*p-value* = 0,017 > 0, 05 at the Bergas Health Center in Semarang Regency (17). It is not in line with different research results from Azizah, A. (2017) which stated that there was no relationship between protein intake and CED incidence in pregnant women, with *p-value* = 1,000 > 0,05 (14).

The Relationship of Fat Intake with Chronic Energy Deficiency (CED) Incidence in Pregnant Women

The study results showed no relationship between fat intake and CED incidence in pregnant women at the Tegalrejo Health Center in Yogyakarta City. Since the lower upper limit value does not include a value of one, Ha is accepted, which means that fat intake that does not meet the needs of the body is at risk of CED. The results of this study follow the research by Dictara, AA. (2020) stated that there was no relationship between fat meal intake and the incidence of CED in pregnant women at Sukaraja Health Center in Bandar Lampung City, with *p-value* =0,204 > 0, 05(16).It is also in line with the results of research from Azizah, A. (2017) which stated that there was no relationship between fat intake and CED incidence in pregnant women with *p-value* = 0,635 > =0,05(14).

 Conclusions

From the seven variables studied in this research, only two variables have a meaningful relationship with Chronic Energy Deficiency (CED) incidence in pregnant women at the Tegalrejo Health Center Yogyakarta, namely infectious diseases and protein intake. From the lower upper limit value, five variables are at risk of CED in pregnant women at Tegalrejo Health Center Yogyakarta, namely age, infectious diseases, intake of carbohydrates, protein, and fat. Further studies need to be conducted to determine the incidence and risk factors of CED in pregnant women in 4 districts in the Special Region of Yogyakarta.

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