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Factors Associated with Chronic Energy Deficiency (CED) in Pregnant Women: A Study in North Gorontalo Regency, 2023

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Abstract. The purpose of this study was to determine the factors associated with the incidence of chronic energy deficiency (CED) in pregnant women in North Gorontalo Regency in 2023. The sample for this study was selected using a random sampling method, resulting in 115 respondents from the Ilangata Health Center area, 80 respondents from the Monano Health Center area, and 55 respondents from the Molingkapoto Health Center area. The independent variables in this study included the age of the pregnant women, maternal occupation, parity, infectious diseases, economic status, and energy and protein intake, as well as the impact of local Supplementary Feeding (PMT) programs. The results showed that the majority of respondents had insufficient energy intake but adequate protein intake. Most did not experience infectious diseases, had a monthly income of more than Rp. 2,000,000, had no children, had a height of over 145 cm, and gained 6 kg during pregnancy. Additionally, they infrequently used health insurance, lived far from the health center, and experienced chronic energy deficiency.

1 Introduction

Achieving optimal health is one of the key markers of the 2030 Sustainable Development Goals (SDGs). The aim of this indicator is to improve well-being and ensure healthy lives for all individuals, regardless of age. One measurable target is the reduction of the maternal mortality rate (MMR). Chronic energy deficiency is a significant factor contributing to maternal mortality.

Complications during childbirth and labor are strongly influenced by Chronic Energy Deficiency (CED). Many pregnant women still experience nutritional complications, particularly CED, which is caused by malnutrition [1]. CED results from a deficiency in one or more essential nutrients during pregnancy. Factors such as inadequate nutrient intake, poor nutrient quality, or impaired nutrient absorption in the body can lead to malnutrition in pregnant women [1].

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The prevalence of Chronic Energy Deficiency (CED) increased from 30.1% in 2018 to 35% in 2019, as reported by the World Health Organization (WHO). Additionally, in developing countries, 40% of pregnant women experience CED, according to WHO data. Southeast Asian countries, including Thailand, Bangladesh, India, Indonesia, Myanmar, Nepal, and Sri Lanka, report CED incidence rates ranging from 15% to 47%. After India (35.5%), Bangladesh has the fourth highest prevalence of CED at 40%, while Thailand has the highest at 47%. The lowest recorded prevalence in Thailand was 15% [2].

Indonesia had the third-highest maternal mortality rate (MMR) in 2017, with 177 deaths per 100,000 live births [3]. A reproductive health journal investigating the leading causes of MMR in Indonesia found that socioeconomic and cultural factors significantly influence delivery behaviors in rural areas with both low and high MMR. Indirect causes of maternal mortality include anemia, chronic energy deficiency, and the "4 T's" (too young, too old, too frequent pregnancies, and having multiple births) [3].

According to the results of the 2018 Basic Health Research (Riskesdas), the proportion of pregnant women at risk of chronic energy deficiency (CED) in Indonesia is 17.3%. This includes 14.4% in North Kalimantan, and in Aceh Province, the rate is slightly higher at 14.8%. Additionally, the Gorontalo region has a significant proportion of pregnant women at risk of CED, with 15.5% [4].

The high maternal and child mortality rates indicate that efforts to improve the quality of life and nutrition for pregnant women remain insufficient. This issue is further compounded by numerous determinant factors that increase the risk of Chronic Energy Deficiency (CED) in pregnant women.

Preliminary data from the North Gorontalo Regency Health Office in 2023 showed that out of three Puskesmas studied, 200 pregnant women were found to have Chronic Energy Deficiency (CED). The highest prevalence was in Ilangata Health Center (41.5%), followed by Monano Health Center (35%) and Malingkapoto Health Center (23.5%). Ilangata Health Center, located on Trans Sulawesi Road in North Gorontalo Regency, recorded CED rates of 43.3% in 2020, 18.07% in 2021, 33.7% in 2022, and 4.8% in 2023, according to LB3 KIA data [5]. This data suggests that the risk of CED in pregnant women may be influenced by several factors, including behavior, nutritional status, and socioeconomic conditions. Therefore, more comprehensive research is needed on the 'Factors Associated with the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women: A Study in North Gorontalo Regency in 2023.

2 Methods

This study is an analytic observational study using a cross-sectional approach. The population consists of all pregnant women within the working areas of Ilangata, Monano, and Molingkapoto Health Centers in North Gorontalo Regency, totaling 250 pregnant women. Based on Lemeshow's formula, the calculated sample size was 154 respondents. A random sampling technique was employed, resulting in the selection of 115 respondents from the Ilangata Health Center, 80 from the Monano Health Center, and 55 from the Molingkapoto Health Center. The independent variables in this study include maternal age, occupation, parity, infectious diseases, economic status, and the evaluation of energy and protein intake through the local PMT program. Data collection involved researchers administering questionnaires directly to respondents, completing observation sheets, distributing PMT, and conducting health checks using tools such as weight scales and other medical instruments. The data were analyzed through univariate and bivariate methods using Chi-Square, and multivariate analysis was performed using multiple logistic regression

3 Results Research

3.1 Univariate Analysis

Based on the results of the research conducted on the respondents, the following respondent data were obtained:

Table 1. Frequency distribution of pregnant women based on research variables in North Gorontalo regency in 2023

Variables	n	%
Energy Intake		
Less	67	55.8
Simply	53	44.2
Total	**120**	**100**
Protein Intake		
Less	47	39.2
Simply	73	60.8
Total	**120**	**100**
Infectious Diseases		
Infectious Disease	11	9.2
No Infectious Diseases	109	90.8
Total	**120**	**100**
Income		
< Rp. 2,000,000	39	32.5
> Rp. 2,000,000	81	67.5
Total	**120**	**100**
Number of Children		
No children yet	60	50
1 child	31	25.8
2 children	19	15.8
3 children	7	5.8
4 children	3	2.5
Total	**120**	**100**
Height		
< 145 cm	17	14.2
> 145 cm	103	85.8
Total	**120**	**100**

Variables	n	%
Weight Gain		
6 kg	64	53.3
3 kg	49	40.8
1 kg	7	5.8
Total	**120**	**100**
Participation of Pregnant Women in Health Insurance		
Rarely check pregnancy at the health center	89	74.2
Frequent pregnancy check-ups at the health center	31	25.8
Total	**120**	**100**
Distance to Health Center		
Deep	82	68.3
Near	38	31.7
Total	**120**	**100**
Chronic Energy Deficiency		
There is a Chronic Energy Deficiency	62	51.7
No Chronic Energy Deficiency	58	48.3
Total	**120**	**100**

Based on the results of table 1 above, it is known that energy intake in 120 pregnant women in North Gorontalo Regency in 2023, the most pregnant women were found to have insufficient energy intake, namely 67 people (55.8%) and the least found to have sufficient energy intake, namely 53 people (44.2%). While in protein intake, the most pregnant women were found to have sufficient protein intake, namely 73 people (60.8%) and the least found to have insufficient protein intake, namely 47 people (39.2%).

In terms of the presence of infectious diseases in pregnant women, out of 120 pregnant women, most were found to have no infectious diseases, namely 109 people (90.8%) and the least pregnant women were found to have infectious diseases such as herpes and tuberculosis, namely 11 people (9.2%). At the level of monthly income in pregnant women, 81 people (67.5%) have an income of more than Rp. 2,000,000 while only 39 people (32.5%) whose income is less than Rp. 2,000,000.

In the number of children, out of 120 pregnant women, most were found to have no children, namely 60 people (50%) and the least pregnant women were found to have 4 children, namely 3 people (2.5%). While at the time of measuring height, the most pregnant women with a height of more than 145 cm were 103 people (85.8%) and the least pregnant women were found with a height of less than 145 cm.

During pregnancy, pregnant women experience weight gain where in this study the data obtained that out of 120 pregnant women, most of them were found to have a weight gain of 6 kg, namely 64 people (53.3%) and the least pregnant women with an increase of 1 kg, namely 7 people (5.8%). In terms of participation in health insurance, all pregnant women have been registered in health insurance by having a Healthy Indonesia Card (KIS). However, the data obtained showed that most pregnant women rarely checked their pregnancy at the health center, namely 89 people (74.2%) and there were 31 people (25.8%) who often checked their pregnancy at the health center. This indicates that although all pregnant women have been registered as health insurance users, not many pregnant women utilize their health insurance to check their pregnancy at the Puskesmas.

One of the things that causes the lack of utilization of health services by pregnant women is the distance to the Puskesmas. The data obtained shows that as many as 82 people (68.3%) of pregnant women have houses far from the health center and there are 38 people (31.7%) whose houses are close to the health center. In terms of the occurrence of CED in pregnant women in North Gorontalo Regency in 2023, the data showed that the majority of pregnant women experienced chronic energy deficiency, namely 62 people (51.7%) and 58 people (48.3%) pregnant women did not experience chronic energy deficiency during pregnancy.

3.2 Bivariate Analysis

The purpose of the bivariate analysis is to assess the relationship between various factors such as energy intake, protein intake, infectious diseases, monthly income, number of children, height, weight gain, participation in health insurance, and distance to health centers and the incidence of CED in North Gorontalo Regency in 2023.

Table 2. Bivariate analysis results

	Chronic Energy Deficiency						
Variables	**There is an CED**		**No CED**		**Total**		***P-value***
	n	**%**	n	**%**	**N**	**%**	
Energy Intake							
Less	50	41.7	17	14.2	67	55.8	
Simply	12	10	41	34.2	53	44.2	0.000
Total	**62**	**51.7**	**58**	**48.3**	**120**	**100**	
Protein Intake							
Less	31	25.8	16	13.3	47	39.2	
Simply	31	25.8	42	35	73	60.8	0.012
Total	**62**	**51.7**	**58**	**48.3**	**120**	**100**	
Infectious Diseases							
Infectious Disease	8	6.7	3	2.5	11	9.2	
No Infectious Diseases	54	45	55	45.8	109	90.8	0.142
Total	**62**	**51.7**	**58**	**48.3**	**120**	**100**	
Income							
< Rp. 2,000,000	23	19.2	16	13.3	39	32.5	
> Rp. 2,000,000	39	32.5	42	35	81	67.5	0.266
Total	**62**	**51.7**	**58**	**48.3**	**120**	**100**	
Number of Children							
No children yet	40	33.3	20	16.7	60	50	
1 child	15	12.5	16	13.3	31	25.8	
2 children	3	2.5	16	13.3	19	15.8	0.002
3 children	2	1.7	5	4.2	7	5.8	
4 children	2	1.7	1	0.8	3	2.5	
Total	**62**	**51.7**	**58**	**48.3**	**120**	**100**	

	Chronic Energy Deficiency						
Variables	**There is an CED**		**No CED**		**Total**		***P-value***
Height							
< 145 cm	11	9.2	6	5	17	14.2	
> 145 cm	51	42.5	52	43.3	103	85.8	0.246
Total	**62**	**51.7**	**58**	**48.3**	120	100	
Weight Gain							
6 kg	40	33.3	24	20	64	53.3	
3 kg	22	18.3	27	22.5	49	40.8	0.003
1 kg	0	0	7	5.8	7	5.8	
Total	**62**	**51.7**	**58**	**48.3**	**120**	**100**	
Participation of Pregnant Women in Health Insurance							
Infrequent pregnancy check-ups at the PKM	**60**	50	29	24.2	89	74.2	
Frequent pregnancy check-ups at the PKM	2	1.7	29	24.2	31	25.8	0.000
Total	**62**	**51.7**	**58**	**48.3**	**120**	**100**	
Distance to Health Center							
Deep	47	39.2	35	29.2	82	68.3	
Near	15	12.5	23	19.2	38	31.7	0.069
Total	**62**	**51.7**	**58**	**48.3**	**120**	**100**	

Source: secondary data research 2022

According to Table 2, among the 120 pregnant women studied, those with insufficient energy intake had the highest incidence of CED, with 50 women (41.7%) affected. In contrast, 41 women (34.2%) with adequate energy intake did not experience chronic energy deficiency. The Chi-Square test results indicate a significant relationship between energy intake and the incidence of chronic energy deficiency in pregnant women in North Gorontalo Regency in 2023, with a p-value of 0.000, which is well below the 0.05 threshold.

Regarding protein intake, among the 120 pregnant women studied, the majority who had adequate protein intake did not experience CED, totaling 42 women (50%). Conversely, 31 women (25.8%) with insufficient protein intake experienced chronic energy deficiency. The Chi-Square test results reveal a significant relationship between protein intake and the incidence of chronic energy deficiency, with a p-value of 0.012, which is less than 0.05.

From the data related to the presence of infectious diseases, it is known that out of 120 pregnant women, the most pregnant women who do not have infectious diseases and do not experience CED are 55 people (45.8%). Whereas in pregnant women who have infectious diseases, most of them are found to experience chronic energy deficiency, namely as many as 8 people (6.7%). The Chi-Square test results indicated that there is no significant relationship between infectious diseases and the incidence of chronic energy deficiency, as shown by a p-value of 0.142, which is greater than 0.05.

In terms of monthly income, it is known that out of 120 pregnant women, the most pregnant women with an income of more than Rp. 2,000,000 who do not experience CED are 42 people (35%). While pregnant women whose income is less than Rp. 2,000,000, many are found to experience chronic energy deficiency, namely 23 people (19.2%). The Chi-Square test results indicated that there is no significant relationship between infectious diseases and the incidence of chronic energy deficiency, as shown by a p-value of 0.142, which is greater than 0.05.

Regarding the number of children, among the 120 pregnant women studied, those without children had the highest incidence of chronic energy deficiency, with 40 women (33.3%) affected. In contrast, the lowest incidence was found among pregnant women with four children, with only 2 women (1.7%) experiencing chronic energy deficiency. The Chi-Square test results show a significant relationship between the number of children and the incidence of chronic energy deficiency in pregnant women in North Gorontalo Regency in 2023, with a p-value of 0.002, which is less than 0.05.

Regarding height, among the 120 pregnant women studied, those with a height of more than 145 cm had the highest proportion of women not experiencing chronic energy deficiency, totaling 51 women (42.5%). On the other hand, 11 women (9.2%) with a height of less than 145 cm were found to experience chronic energy deficiency. The Chi-Square test results indicate that height does not have a significant relationship with the incidence of chronic energy deficiency, with a p-value of 0.246, which is greater than 0.05.

From the research data, it is known that in 120 pregnant women, the most pregnant women with a weight gain of 6 kg who experience chronic energy deficiency are 40 people (33.3%). And pregnant women with a weight gain of 1 kg were not found to experience chronic energy deficiency. The chi square test results show that weight gain has a significant relationship with the incidence of chronic energy deficiency in pregnant women in North Gorontalo Regency in 2023, with a p-value of 0.003 which means <0.05.

The results showed that all pregnant women had participated in health insurance. However, out of 120 pregnant women, most of them rarely checked their pregnancy at the health center and experienced chronic energy deficiency, namely 60 people (50%). While pregnant women who often check their pregnancy at the health center are found not to experience chronic energy, namely 29 people (24.2%). The results of the chi square test showed that the participation of pregnant women in health insurance had a significant relationship with the incidence of chronic energy deficiency in pregnant women in North Gorontaalo Regency in 2023, with a p- value of 0.000 which means <0.05.

In terms of distance to the health center, it is known that out of 120 pregnant women, most of them are found far from the health center and experience chronic energy deficiency, namely 47 people (39.2%). Whereas pregnant women whose homes are close to the health center are found not to experience chronic energy deficiency, as many as 23 people (19.2%). The results of the chi square test showed that the distance to the health center did not have a significant relationship with the incidence of chronic energy deficiency in pregnant women in North Gorontalo Regency in 2023, with a p- value of 0.069 which means > than 0.05.

Table 3. Recapitulation of Factors Associated with the Incidence of CED in Pregnant Women in North Gorontalo Regency in 2023

Research Variables	*P*-value
Energy Intake	0.000
Protein Intake	0.012
Infectious Diseases	0.142
Monthly Income	0.266
Number of Children	0.002
Height	0.246
Weight Gain Participation of Pregnant Women in the Health Insurance program	0.003
Distance from Home to Health Center	0.069

Table 3 above shows that the factors significantly associated with the incidence of CED in pregnant women in North Gorontalo Regency in 2023 are energy intake, protein intake, number of children, weight gain and participation of pregnant women in health insurance with a P- value <0.05.

3.3 Multivariate Analysis

Based on the data analysis conducted to identify the factors most strongly associated with the incidence of CED, a logistic regression test was performed using the enter method. The analysis revealed the variables that have the most dominant relationships as follows.

Table 4. The most dominant factors of CED in 2023

Research Variables	Sig	Exp(B)	*P*-value	
			Lower	Upper
Energy Intake	0.000	0.020	0.003	0.143
Protein Intake	0.947	1.057	0.203	5.519
Infectious Diseases	0.233	6.604	0.297	146.623
Monthly Income	0.656	0.704	0.151	3.286
Number of Children	0.003	0.350	0.174	0.701
Height	0.697	0.690	0.107	4.454
Weight Gain	0.002	6.039	1.939	18.812
Participation of Pregnant Women in the Health Insurance program	0.000	0.005	0.001	0.055
Distance from Home to Health Center	0.159	2.857	0.662	12.329

The results of the Logistic Regression test showed that the most dominant factors associated with the incidence of CED in pregnant women in North Gorontalo Regency in 2023 were energy intake with a P-value of 0.000 and an Exp(B) value or Odds Ratio (OR) of 0.020.

4 Discussion

4.1 Energy intake in pregnant women with CED

In the statistical analysis with the Chi Square test on the variables of this study showed that Energy Intake in Pregnant Women has a significant relationship to the incidence of CED in North Gorontalo Regency in 2023 with a P-value of 0.000 which means <0.05. The results of the above study indicate that energy intake in pregnant women has a significant relationship with the incidence of CED in North Gorontalo Regency.

In this study there were also mothers whose energy intake was sufficient but experienced CED, this happened because the mother had physical activities that drained a lot of energy, which showed that there was a significant relationship between physical work demands (OR = 4.65) with the incidence of CED in pregnant women.[6] Several studies have reported similar results regarding the impact of pregnant women's work. In this study, there were also mothers who consumed insufficient energy but did not experience CED, this happened because the mother always consumed enough energy but in the last 1 week the mother's energy consumption decreased.

This study is in line with the results that showing there is a relationship between energy intake and the incidence of CED in pregnant women.[6] In addition, this study is in line with that conducted [7], which says that between energy intake and nutritional status of pregnant women has a significant relationship. If a person experiences energy deficiency, even with light activity, it can cause weight loss [7]. This is in accordance with the results of the study which show that if energy intake is sufficient but does not experience CED, due to variations in maternal food intake. Whereas if energy intake is lacking and experiencing CED, it is due to the lack of energy intake in pregnant women that has not been fulfilled, often due to lazy eating habits and consumption of less varied foods, especially instant foods such as instant noodles.

Energy intake is influenced by food availability. If the available food does not meet the needs, it will result in less consumption. The input of nutrients from food is not balanced with the body's needs, nutritional deficiencies will occur which are manifested by the symptoms that arise. Nutrient input that comes from food eaten every day must be able to meet the needs. In addition to meeting the needs of the mother's own body, nutrients are also needed for fetal growth and development [8].

4.2 Protein intake in pregnant women with CED

Analysis of research data shows that protein intake in pregnant women is sufficient, namely 73 people (60.8%). Where the most pregnant women with adequate protein intake were found who did not experience CED, namely 42 people (35%). Protein consumption by pregnant women in this study consumes a lot of foods containing animal protein such as meat and also vegetable protein such as tofu, tempeh and beans, many pregnant women only consume fish but the fish consumed does not meet the AKG standards needed during pregnancy, also many mothers who have gestational age in the 1-3 trimester so they still experience nausea and vomiting so that a lot of food consumed is expelled again and sometimes they also have no appetite [9]. The most important factor in determining the protein intake of pregnant women is motivation from within themselves, even though PMT and recall programs have been carried out, but as long as the habits of pregnant women do not change consistently, it will be difficult to improve their nutrition in order to reduce the risk of CED.

In statistical results with the Chi Square test, it shows that protein intake in pregnant women has a significant relationship with the incidence of CED with a P- value of 0.012 which means <0.05. The above shows that protein intake has a significant relationship with the incidence of CED in North Gorontalo Regency in 2023.

This is in line with research that showing the same results, namely there is no significant relationship between protein intake and the incidence of CED in pregnant women [10]. This has been explained earlier in this study that energy intake is closely related to the risk of CED in pregnant women. Although protein intake is not associated with the risk of SEVERE in pregnant women, protein intake must still be met by pregnant women, given the increased need for protein for the health of the mother and fetus, and the protein has a main function that cannot be replaced with other nutrients, namely as a building and maintaining substance for body cells / tissues [11].

4.3 Infectious diseases in pregnant women with CED

Data analysis shows that there is an interrelated pattern of chronic energy deficiency (CED) in pregnant women based on the presence of infectious diseases in the North Gorontalo Regency area in 2023. This can be seen from univariate and bivariate data analysis which shows that most pregnant women do not experience infectious diseases, namely 109 people (90.8%). Where pregnant women who did not suffer from infectious diseases did not experience CED, namely 55 people (45.8%).

Statistical analysis with the Chi Square test showed that infectious diseases in pregnant women did not have a significant relationship with the incidence of CED in North Gorontalo Regency in 2023 with a P-value of 0.142 which means > than 0.05. The results of the above study state that there is no relationship between infectious diseases and the incidence of CED in pregnant women, because only a few were found to experience infectious diseases during pregnancy.

The results of this study are in line with research that shows there is no relationship between disease history and the incidence of CED in pregnant women [12]. Irdayani's research (2018) also showed no significant relationship between infectious disease factors and the incidence of CED in TM II pregnant women at the West Ring Health Center of Bengkulu City in 2018.

Infectious diseases can act as a trigger for malnutrition because they can reduce appetite, interfere with the absorption of nutrients in the digestive tract, or increase the body's need for nutrients. Infectious diseases can worsen nutritional conditions, while poor nutrition can worsen infectious conditions. Diseases often associated with nutritional problems include diarrhea, tuberculosis, measles and whooping cough. Based on the researcher's assumption, mothers who experience infectious diseases tend to have a higher risk of experiencing CED because symptoms such as loss of appetite or vomiting can hinder the fulfillment of nutritional needs during pregnancy, as well as reduce the mother's immune system, which in turn can cause CED. However, in this study out of 11 pregnant women who experienced infectious diseases there were 8 pregnant women who experienced CED.

4.4 Monthly Income of Pregnant Women with CED

Frequency distribution analysis showed that 81 people (67.5%) of pregnant women had a monthly income of more than Rp. 2,000,000, of which 42 people (35%) did not experience chronic energy deficiency during pregnancy. The Chi-Square test results reveal that there is no significant association between the monthly income of pregnant women and the incidence of CED in North Gorontalo Regency in 2023, with a P-value of 0.266, which exceeds the 0.05 significance level.

Income of pregnant women is not always significantly associated with the incidence of CED. Although higher income may increase access to nutritious food and health services, factors such as understanding of nutrition, diet, and access to health services also play an important role in determining nutritional status. Despite having a high income, pregnant women may also have different spending priorities, which may affect the allocation of funds for nutritional needs. Therefore, a pregnant woman's income is not the only factor that determines her risk of CED.

This suggests that, although there is a trend showing that pregnant women with income above IDR 2,000,000 tend to have a lower risk of CED, this relationship is not statistically significant. This suggests that other factors may also influence CED risk, such as access to health services, baseline nutritional status, and other socioeconomic factors. Therefore, it is important to consider the various factors that influence the risk of CED holistically when designing interventions to improve the health of pregnant women.

According to the findings of this study, there is alignment with Johanis (2011), who observed no relationship between income and the incidence of chronic energy deficiency (CED) among pregnant women in Singkil district, Manado City, with a P-value of 0.565. In contrast, research by Mohammad Sadli identified a significant association between family income and the incidence of CED in pregnant women at the Cibolang Cirebon Community Health Center, with a P-value of 0.001.

When family income is sufficient, CED can be avoided if the mother eats a diverse diet. However, if the mother experiences vomiting after eating or has an infectious disease that reduces her appetite, even if the family income is sufficient, the risk of CED remains. On the other hand, even if the family income is low, CED can occur if the mother's food intake is not varied enough or does not meet her nutritional needs. The mother's knowledge and education level are also influential, as lack of knowledge can lead to consumption of less nutritious food, increasing the risk of CED. However, if mothers with less family income have adequate and varied food intake, CED can be avoided.

While having a high income does not necessarily lead to increased consumption of essential nutrients, it can provide opportunities to choose foodstuffs and increase the intake of preferred foods, which may not always be nutritious. Some families with high incomes may be less effective in managing their expenses, leading to the purchase of smaller quantities and lower-quality food. This can negatively impact the health of pregnant women.

4.5 Number of children in pregnant women with CED

Analysis of the questionnaire showed that 60 pregnant women (50%) did not have children, and among them, 40 women (33.3%) experienced chronic energy deficiency (CED). The results of the Chi-Square test indicate that the number of children a pregnant woman has is significantly associated with the incidence of CED in pregnant women in North Gorontalo Regency in 2023, with a P-value of 0.002, which is less than 0.05.

This suggests that many of these women are experiencing their first pregnancy. As such, it is crucial to provide information on maternal and child health to reduce the risk of CED. The number of children and the experience of a first pregnancy are closely related to the risk of CED, as a lack of experience in managing nutrition during the first pregnancy can increase this risk. Therefore, it is important to take into account the number of children and whether it is a first pregnancy when seeking to prevent CED and meet the nutritional needs of pregnant women.

Having closely spaced births can negatively affect both fetal and child development, as well as the mother's health, potentially leading to CED. This is because the mother may not have sufficient time to fully recover and restore her energy levels after childbirth [9].

4.6 Height of pregnant women and incidence of CED

From the analysis of the questionnaire with direct measurement of the height of pregnant women, it can be seen that the majority of pregnant women have a height of more than 145 cm, namely 103 people (85.8%). Where as many as 52 people (43.3%) did not experience CED and 51 people (42.5%) who experienced CED. Whereas in pregnant women whose height is less than 145 cm, most of them are found to experience CED, namely as many as 11 people (9.2%) and as many as 6 people (5%) who do not experience CED.

Height can increase the risk of CED in pregnant women. In general, women with lower height tend to have a smaller body volume, which may limit the storage capacity of energy and nutrients. As a result, they may be more susceptible to CED if food intake is insufficient to meet their nutritional needs during pregnancy. However, the height of pregnant women certainly cannot be used as the main factor that increases the risk of CED.

From the results of the Chi Square test, it shows that height (TB) in pregnant women has relatively no significant relationship with the incidence of CED in the North Gorontalo Regency area in 2023 with a P-value of 0.246 which means> from 0.05. There is no significant relationship between height and the risk of chronic energy deficiency [10]. Where there is a gap with the theory of Rustam Mochtar which states that less height is due to less nutritious food intake, women who have a height ≤ 145 cm not only have the potential to have a narrow pelvis but are at risk of experiencing CED, because pregnant women whose height size <145 cm should control their weight no more than 12.5 kg during pregnancy in order to avoid the risk of a narrow pelvis, this is what causes intake in pregnant women whose height is less well fulfilled than pregnant women whose height size >145 cm [10].

Researchers' assumptions about the relationship between height and the incidence of CED in pregnant women are based on the principle that height reflects body volume and nutrient storage capacity. Women with lower height tend to have smaller body volume which may result in limited energy and nutrient storage capacity. As a result, if food intake is insufficient to meet nutritional needs during pregnancy, they may be more susceptible to CED. Therefore, the researcher assumes that height can be a predictor or indicator of the risk of CED in pregnant women but not necessarily the main and dominant factor in the occurrence of CED.

4.7 Weight gain of pregnant women with CED

From the analysis of respondent data, it shows that the majority of pregnant women experienced a weight gain of 6 kg during pregnancy, namely 64 people (53.3%), of which 40 people (33.3%) experienced CED. This shows that every weight gain in pregnant women increases the risk of CED.

This increase is mainly due to the growth of the fetus, placenta, amniotic fluid, and changes in the mother's reproductive organs. However, significant weight gain is required if the mother was severely under-weight previously. Interventions to achieve ideal pre- pregnancy weight should be carried out from the beginning of pregnancy or the first trimester. Otherwise, the mother's body may not be able to support fetal growth properly, increasing the risk of miscarriage and other health problems for the mother and her fetus. Meanwhile, according to Elizabeth (2008), normal weight gain during pregnancy ranges from 11 kg to 12.5 kg, or about 20% of body weight before pregnancy. Weight gain of about 0.5 kg occurs in the first trimester, followed by the addition of about 0.5 kg every week in the next trimester. [1]

The results of the chi-square test indicated that height was not significantly associated with the incidence of chronic energy deficiency in pregnant women in North Gorontalo Regency with a P-value of 0.246, which is greater than 0.05. There was a significant difference in weight gain between the initial measurement before receiving supplementary feeding (PMT) and the final measurement after receiving PMT in relation to the occurrence of CED in pregnant women.[11] The researchers suggest that variations in weight gain during pregnancy may reflect the health condition of pregnant women and could increase the risk of CED due to insufficient nutritional intake to support fetal growth and maternal metabolic needs. [13]

4.8 Participation of pregnant women in health insurance with incidence of CED

An analysis of the respondent data shows that all pregnant women had access to health insurance. However, the data revealed that the majority of pregnant women who rarely attended check-ups at the Puskesmas amounted to 89 people (74.2%), of which 60 women (50%) experienced chronic energy deficiency (CED). The low utilization of health services in this study is attributed to difficulties in accessing health facilities, as two of the three Puskesmas where the respondents were registered are located in highland and rural areas.

The Chi-Square test results indicate that the participation of pregnant women in health insurance had a significant relationship with the incidence of CED in North Gorontalo Regency in 2023, with a P-value of 0.000 (<0.05). The utilization of the Healthy Indonesia Card (KIS), one of the health insurance programs, by pregnant women directly influenced the incidence of CED. This relationship is evident because the more frequently pregnant women utilize health care facilities, the lower their risk of experiencing CED, as their health and nutritional status are monitored by medical and nutrition professionals. As a result, pregnant women gain awareness and knowledge about maintaining their quality of life.

Additionally, the association between pregnant women's participation in health insurance and the incidence of CED may vary depending on several factors, such as their knowledge and understanding of the importance of nutrition during pregnancy, access to health facilities, availability of quality health services, and other socio-economic conditions. Participation in the KIS program for pregnant women has the potential to reduce the risk of low birth weight (LBW) by providing better access to essential health services during pregnancy. However, its effectiveness depends on whether pregnant women actively utilize these services.

4.9 Distance to Health Center with Incidence of CED

Analysis of the research data showed that the majority of pregnant women lived a considerable distance from the health center in their respective areas, with 82 women (68.3%) residing more than 1 kilometer away, of which 47 women (39.2%) experienced chronic energy deficiency (CED) during pregnancy. This distance may increase the risk of CED, particularly for pregnant women who lack sufficient knowledge or resources to meet their nutritional needs. As a result, distance from the health center could be a contributing factor to the incidence of CED, especially in areas with limited access to primary health facilities. The data on respondent characteristics showed that most pregnant women had to travel over 1 kilometer to access health services. However, the challenge is not just distance; it also involves the availability of transportation and the terrain, as many health centers are located in rural, mountainous regions, making access to health services more difficult.

The results of the Chi-Square test showed that distance to the health center did not have a statistically significant relationship with the incidence of CED in North Gorontalo Regency in 2023, with a P-value of 0.069 (greater than 0.05). This suggests that the distance from home to the health center is not a primary factor in the incidence of CED, as CED is more influenced by nutritional factors and access to nutritious food rather than proximity to health facilities. Other factors, such as socio-economic status, education, and dietary habits, have a more significant impact on the risk of CED than physical distance. Therefore, distance to the health center may be considered a secondary factor in determining the nutritional status and risk of CED.

To address this issue, the role of health workers should be maximized in providing data collection and assistance to pregnant women in areas with limited access. This would ensure that pregnant women still receive crucial information about their pregnancy, including guidance on proper nutritional intake. High-quality health services can encourage pregnant women to attend regular check-ups, enabling early intervention for risks such as CED by providing additional food supplements and necessary health information.[12] However, services and access are often limited by poor road conditions and long distances to health centers, as two of the three Puskesmas in this study are located in rural highland areas. [13]

The researcher assumes that respondents who experienced CED may have received less support from health workers because they did not attend regular antenatal check-ups. Furthermore, health workers do not always provide adequate counseling about the importance of supplementation, the benefits, or potential side effects of taking nutritional supplements during pregnancy. This lack of guidance contributes to low awareness of nutritional issues during pregnancy. Additionally, pregnant women with CED may not consistently take their nutritional supplements due to a lack of awareness about the consequences of malnutrition. Therefore, interventions targeting health workers are needed to improve coverage and adherence to nutritional supplementation in pregnant women, with the goal of reducing the incidence of CED.

4.10 The most significant factor related to the incidence of CED in pregnant women

The most dominant variable, as seen from the results of the logistic regression test, shows that the variable most significantly associated with and contributing to the incidence of CED in pregnant women in North Gorontalo Regency in 2023 is energy intake, with a P-value of 0.000 and an Exp (B) value or Odds Ratio (OR) of 0.020. This means that energy intake is the factor most strongly associated with the occurrence of chronic energy deficiency, where the OR results indicate that pregnant women with insufficient energy intake are 0.020 times more likely to experience chronic energy deficiency compared to those with sufficient energy intake.

This highlights the importance of adequate energy intake for pregnant women, as they need to share nutrients with their fetus, leading to increased nutritional demands. By ensuring sufficient energy intake, the risk of CED in pregnant women can be minimized. Energy intake is crucial for the formation of new tissues, including the placenta and fetus, as it supports cell growth and differentiation, helps build blood reserves, and prepares the body for breastfeeding. In addition to its role in tissue building, regulation, and maintenance, protein can also serve as an energy source for the body. Therefore, energy intake is an essential factor that can influence the health of pregnant women.

According to the research assumption, the significant link between behavior and the incidence of suspected frambusia cases is due to the mode of transmission, which occurs through contact with the sores of infected individuals. If healthy and clean-living practices are not followed, the disease can easily spread to those in close contact. It is recommended that the community consistently practice healthy behaviors in daily life. Parents should teach children the importance of washing hands with running water after activities, cutting their nails weekly, and avoiding sharing personal items like towels to reduce the risk of infection.

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