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Analysis Prediction Model Determinants of Chronic Energy Deficiency (CED) Pregnant Women in Jambi City

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Abstract
Introduction: *One of the nutritional problems in pregnant women that is important to overcome is Chronic Energy Deficiency (CED).* ***Objective:*** *This study aims to determine the prediction model of the determinants of the causes of CED in pregnant women.* ***Method:*** *This type of quantitative research with a cross-sectional design on 98 pregnant women in Jambi City in 2024, sampling was purposive. Data analysis used Chi Square test and Logistic Regression.* ***Result and Discussion****: There is a significant relationship between income (0.008), Hb levels (0.009), provision of additional food (0.008), knowledge (0.003), attitude (0.032), the role of health workers (0.043) with the incidence of CED in pregnant women. There is no relationship between age (0.377), education (0.294), occupation (0.306), infectious diseases (0.117), and non-infectious (0.206) with the incidence of CED in pregnant women. The dominant factor is the knowledge of pregnant women.* ***Conclusions:*** *The prediction model for the incidence of CED in pregnant women is income, Hb levels, provision of additional food, knowledge, and the role of health workers. It is recommended that the Health Service and Health Centers always provide education to improve the knowledge of pregnant women about the prevention and treatment of CED.*

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Introduction

The quality of human resources is largely determined by nutritional status and health from an early age, even while still in the womb. Therefore, attention to the health and nutritional status of pregnant women is key to the successful growth and development of children into adulthood. One important nutritional problem in pregnant women that needs to be addressed is chronic energy deficiency (CED). CED in pregnant women is a condition in which a mother suffers from chronic malnutrition, resulting in health problems, so that the increased nutritional needs during pregnancy cannot be met. Pregnant women at risk of CED can be identified by measuring their Upper Arm Circumference (UAC), which should be less than 23.5 cm (Utami, Setyawati, & Ariedha, 2020)

According to data from *the World Health Organization* (WHO) in 2015, the global prevalence of CED among pregnant women ranges from 35% to 75%. The WHO notes that 40% of maternal deaths are related to CED. In developing countries, the prevalence of KEK (Bangladesh, India, Indonesia, Nepal, Sri Lanka, Myanmar, and Thailand) is 15%-47%, with a BMI < 18.5. The country with the highest prevalence of CED is Bangladesh at 47%, followed by Indonesia at 35%, and the lowest is Thailand at 15%-25%. According to the results of the 2018 Basic Health Research (Riskesdas), the prevalence of CED risk in pregnant women in Indonesia was 17.3% among adolescents (aged 15-19 years). This figure has decreased compared to the 2013 Riskesdas, which was 24.2%. However, despite this decline, CED remains an important nutritional problem that needs to be addressed due to its impact (Indonesian Ministry of Health, 2018). In addition, based on routine data collected from 34 provinces, the percentage of pregnant women at risk of KEK in 2020 was 9.7%. From this data, it is also known that the number of pregnant women with CED in Jambi Province is 7.2% (Indonesian Ministry of Health, 2021).

There are several factors that can influence the incidence of CED in pregnant women. These factors include direct factors (food intake or consumption patterns and infection) and indirect factors (socioeconomic factors including family income, maternal education, maternal knowledge, biological factors including maternal age, pregnancy spacing, and behavioral factors) (Supariasa, 2016). Based on the results of research by Syarifuddin (2013), there is a significant relationship between dietary patterns and socioeconomic status with the incidence of CED. Mahirawati (2014) concluded that education and employment status are related to the incidence of KEK in pregnant women. Various effects caused by Chronic Energy Deficiency (CED) in pregnant women. These effects include anemia, bleeding, abnormal weight gain in mothers, and infectious diseases. Meanwhile, the effects of CEM on the delivery process can result in difficult and prolonged labor, premature birth, postpartum hemorrhage, and an increased tendency for surgical delivery (Rosadi, Setiawan, Fakhriadi, Sundjaya, & Wiratama, 2025); (Wati, Murwani, Kartasurya, & Sulistiyani, 2024); (Selamet, Megatsari, & Hairi, 2024). CED in pregnant women can affect fetal growth and can cause miscarriage, abortion, stillbirth, neonatal death, congenital defects, anemia in infants, intrapartum asphyxia (death in the womb), and low birth weight (LBW) (Sumantri, 2009; (Pertiwi, Permatasari, & Rodliya, 2025)

The number of CED cases in pregnant women in Jambi Province in the last 3 years was 3,083 cases (2021), 4,290 cases (2022), and 3,752 cases (2023) (BPS, 2024). This indicates that there are still many cases of CED among pregnant women in the Jambi Province in general and in the city of Jambi in particular. In an effort to overcome CED

in pregnant women, there is a Supplementary Feeding Program (SFP) to meet the nutritional needs of mothers during pregnancy. The coverage of supplementary feeding for pregnant women with CED in 2022 was 96.81%. There are six districts with the highest coverage of supplementary food provision for pregnant women with CED: Bungo, Tanjung Jabung Timur, Muaro Jambi, Tanjung Jabung Barat, Sungai Penuh, and Sarolangun, all at 100.0%. Meanwhile, the district/city with the lowest achievement is the City of Jambi at 88.67% (Jambi Provincial Health Office, 2023). However, the fact that there are still cases of CEM among pregnant women proves that further research is needed to explore the various factors that cause CEM in pregnant women so that these factors can provide solutions to prevent or treat CEM in pregnant women quickly and appropriately (Lubna, Kariny, Dari, & Sulistiawati, 2024); (Agustina et al., 2023)

Method

This study is an analytical survey with a *cross-sectional* design. A *cross-sectional* study is conducted to examine the relationship between independent variables (age, education, income, knowledge, Hb levels, SFP provision, infectious diseases, non-infectious diseases, and the role of health workers) and dependent variables (the incidence of CED in pregnant women). This study will be conducted in Jambi City from May to November 2024. The sample in this study consists of pregnant women in Jambi City, with a sample size of 98 respondents. Data collection will be conducted using purposive sampling, and the sample will also be selected based on inclusion and exclusion criteria. Data analysis will be performed using univariate analysis to examine the frequency distribution of the study variables, bivariate analysis using the Chi-Square test, and multivariate analysis using logistic regression.

Result and Discussion

1. Result

Univariate Analysis

Based on the analysis results, the distribution of Chronic Energy Deficiency (CED) among pregnant women in Jambi City is described in the following frequency distribution table:

Table 1
Frequency Distribution of Research Variables

Variable	Frequency	Percentage
Chronic Energy Deficiency		
- Yes	75	76.5
- No	23	23.5
Age		
- At risk (<20 & > 35)	31	31.6
- Not at risk (20-35)	67	68.4
Education		
- Low (< Senior High School)	22	22.4
- High (≥ Senior High School)	76	77.6
Occupation		
- Not working	72	73.5
- Working	26	26.5
Income		
- Low	72	73.5
- High	26	26.5
Hemoglobin Level		
- Anemia	57	58.2

- Normal	41	41.8
Supplementary Feeding		
- No	26	26.5
- Yes	72	73.5
Knowledge		
- Low	60	61.2
- High	38	38.8
Attitude		
- Poor	49	50
- Good	49	50
Infectious Diseases		
- Yes	12	12.2
- No	86	87.8
Non-Infectious Diseases		
- Yes	17	17.3
- No	81	82.7
Role of Health Workers		
Insufficient	23	23.5
Good	75	76.5

Table 1 shows that of the 98 respondents, 76.5% of pregnant women experienced CED, 68.4% were in the non-risk age category (20-35 years), 77.6% were in the higher education category (≥ high school), 73.5% were unemployed, 73.5% were in the low income category (< UMK Rp3,387,064), 58.2% had anemia-level hemoglobin, 73.5% received PMT, 61.2% had low knowledge levels, 50% had good attitudes, 87.8% did not have infectious diseases, 82.7% did not suffer from non-infectious diseases, and 76.6% considered the role of health workers to be good.

Bivariate Analysis

The analysis of the relationship between the variables of age, education, occupation, income, hemoglobin level, parity, birth spacing, PMT, knowledge, attitude, personal hygiene, environmental sanitation, infectious diseases, non-infectious diseases, and the role of health workers on chronic energy deficiency (CED) in pregnant women in Jambi City can be seen in Table 2 below.

Tabel 2

Relationship between Determinant Variables and Occurrence of CED in Pregnant Women

Variable	CED in Pregnant Women				P-Value
	Yes		No		
	n	%	n	%	
Age					
- At risk	22	71	9	29	0.377
- Not at risk	53	79.1	14	20.9	
Education					
- Low	15	68.2	7	31.8	0.294
- High	60	78.9	16	21.1	
Occupation					
- Not working	57	79.2	15	20.8	0.306
- Working	18	69.2	8	30.8	
Income					
- Low	60	83.3	12	16.7	0.008
- High	15	57.7	11	42.3	
Hemoglobin level					
- Anemia	49	86	8	14	0.009

- Normal	26	63.4	15	36.6	
Supplementary Feeding					
- No	15	57.7	11	42.3	0.008
- Yes	60	83.3	12	16.7	
Knowledge					
- Low	52	86.7	8	13.3	0.003
- High	23	60.5	15	39.5	
Attitude					
- Poor	42	85.7	7	14.3	0.032
- Good	33	67.3	16	32.7	
Infectious Diseases					
- Yes	7	58.3	5	41.7	0.117
- No	68	79.1	18	20.9	
Non-Infectious Diseases					
- Yes	11	64.7	6	35.3	0.206
- No	64	79.0	17	21.0	
Role of Health Workers					
- Insufficient	14	60.9	9	39.1	0.043
- Good	61	81.3	14	18.7	

Table 2 shows that there is a significant relationship between income (0.008), Hb level (0.009), PMT provision (0.008), knowledge (0.003), attitude (0.032), and the role of health workers (0.043) with chronic energy deficiency (CED) in pregnant women. Conversely, there is no significant relationship between age (0.377), education (0.294), occupation (0.306), infectious diseases (0.117), and non-infectious diseases (0.0206) with the incidence of chronic energy deficiency (CED) in pregnant women.

Multivariate Analysis

The multivariate analysis used in this study was logistic regression testing. The initial multivariate modeling results for the variables that passed the model candidate selection were used as the standard model. Next, elimination/selection was performed on variables with a p-value > 0.05. The final model of the multivariate analysis of chronic energy deficiency (CED) in pregnant women can be seen in Table 3 below:

Tabel 3

Final Multivariate Model of CED in Pregnant Women

No	Variable	P-Value	POR
1	Income	0.047	3.949
2	Hemoglobin level	0.008	7.124
3	Supplementary Feeding	0.006	7.426
4	Knowledge	0.002	9.753
5	Role of Health Workers	0.002	9.391

Based on the table above, it is known that the knowledge variable is the most dominant factor in the occurrence of Chronic Energy Deficiency (CED) in pregnant women in Jambi City. The determinants associated with CED in pregnant women in this study are income, Hb levels, PMT provision, knowledge, personal hygiene, and the role of health workers.

2. Discussion

Based on the results of the study, it is known that there is a significant relationship between income (0.008), Hb levels (0.009), SFP provision (0.008), knowledge (0.003), attitude (0.032), and the role of health workers (0.043) with chronic energy deficiency

(CED) in pregnant women. Conversely, there was no significant relationship between age (0.377), education (0.294), occupation (0.306), infectious diseases (0.117), and non-infectious diseases (0.0206) with the incidence of chronic energy deficiency (CED) in pregnant women.

This is in line with research conducted by Nur'aini et al. (2021) which showed a relationship between nutritional knowledge (p-value 0.000) and CED in pregnant women (Nur'aini, Avianty, & Prastia, 2021). Similarly, research conducted by Fransiska et al. (2022) also found a relationship between income (p-value = 0.005) and chronic energy deficiency in pregnant women (Fransiska, Murdiningsih, & Handayani, 2022). Thus, it can be stated that there is a relationship between the knowledge of pregnant women and the occurrence of chronic energy deficiency, where lack of knowledge about nutrition and health can allow chronic energy deficiency to occur in pregnant women, and it is known that low income can cause the ability of households to buy food to be reduced so that there is a risk of causing KEK in pregnant women due to lack of consumption of healthy and nutritious food

This study found that there was no association between infectious and non-infectious diseases and the incidence of CED in pregnant women. However, it was found that some pregnant women with CED experienced diarrhea, tuberculosis, and asthma. This differs from the results of a study by Hasyim et al. (2023), which found that pregnant women with infectious diseases are at risk of CED because infectious diseases inhibit the absorption of nutrients in the body, so that the food consumed by pregnant women cannot meet their needs during pregnancy. The types of infectious diseases that can cause CED in pregnant women include diarrhea, respiratory tract infections, and asthma. Furthermore, the role of health workers in this study shows a significant relationship with the occurrence of CED in pregnant women (Hasyim et al., 2023).

The results of the study also show that there is a relationship between the role of health workers and the incidence of CED in pregnant women, whereby pregnant women who assess the role of health workers as good are those who always find health workers available when they visit the health center, are given clear and complete information, are served well and kindly, and are actively provided with education/counseling, one of which is through pregnancy classes.

Conclusion

Based on the results of this study, it can be concluded that there is a relationship between income, Hb levels, PMT provision, knowledge, attitudes, and the role of health workers with chronic energy deficiency (CED) in pregnant women. It is hoped that pregnant women will increase their knowledge, especially about health during pregnancy and after childbirth and infant care. Pregnant women must also maintain hygiene to avoid various infectious diseases. In addition, the role of health workers is very important in providing education and health services, including PMT provision to pregnant women, in order to improve the health status of the community.

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