

Analysis of Macronutrient Intake and the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women in Stunting Village, Argamakmur Sub-District, North Bengkulu Regency, Bengkulu Province

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ABSTRACT

Background: The nutritional requirements of pregnant women significantly rise compared to their non-pregnant state, and failing to meet these heightened needs can lead to the development of Chronic Energy Deficiency (CED). This study was designed to investigate macronutrient intake and the prevalence of Chronic Energy Deficiency (CED) in pregnant women residing in the Stunting Village area of Argamakmur Sub-District, North Bengkulu Regency, Bengkulu Province.

Materials/Methods: This study was of a quantitative nature, employing a cross-sectional design. The population comprised all 165 pregnant women in Argamakmur Sub-District, North Bengkulu Regency, with a sample of 60 pregnant women selected through cluster sampling techniques. Data collection involved the use of a 3 x 24-hour food recall questionnaire. The analysis of the data was performed using univariate, bivariate, and multivariate methods.

Result: The findings of this study indicated that over 50% of pregnant women had insufficient carbohydrate intake (56.7%), and 50% had inadequate protein intake, while 58.3% had deficient fat intake. There was a significant relationship between carbohydrate intake and the occurrence of Chronic Energy Deficiency (CED) in pregnant women, as well as between protein intake and CED in pregnant women. Similarly, there was a significant relationship between fat intake and the incidence of CED in pregnant women in Argamakmur Sub-District, North Bengkulu Regency, with a p-value less than 0.05.

Conclusion: Carbohydrate intake, protein intake, and fat intake are all associated with the occurrence of Chronic Energy Deficiency (CED) in pregnant women. This underscores the importance of enhancing health services to provide nutritional education concerning maternal dietary intake during pregnancy. Such efforts aim to ensure that pregnant women consistently consume food that aligns with their nutritional requirements

KEYWORDS: carbohydrates, protein, fat, CED pregnant women

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INTRODUCTION

Pregnant women play a pivotal role in the government's First 1000 Days of Life (1000 HPK) initiative, a key health development indicator outlined in the 2020-2024 national medium-term development plan (RPJMN)¹. Pregnancy brings about changes in maternal metabolism that influence the development of the fetus and its organs. Expectant mothers who are unable to fulfill their nutritional requirements face the potential of encountering issues related to inadequate nutrition, which can adversely affect both the baby and the mother.

The prevalence of Chronic Energy Deficiency (CED) among pregnant women stood at 17.3% in 2018, as indicated by the Basic Health Research (Riskesdas). This rate was highest among the age group of 15-19 years, with a percentage of 33.5%². In Bengkulu Province, the percentage of CED among pregnant women was 11.8%, which remained below the national target of 16%³. Meanwhile, in 2022, in North Bengkulu Regency, there were 461 individuals, accounting for 9.75% of the population affected by CED⁴.

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As of 2022, the prevalence of stunting in Indonesia stands at 21.6%. In Bengkulu Province, the rate is slightly lower, at 19.8%, but still above the national average. North Bengkulu Regency, on the other hand, reports a higher stunting prevalence at 22.8%⁵. These figures indicate that the stunting rate remains relatively high, particularly when compared to the results from the Basic Health Research (Riskesdas) report, which identified stunted toddlers at 29% and stunted infants at 27.98%². To address this issue, North Bengkulu Regency has taken action through North Bengkulu Regent Decree No. 441/163/DINKES/2020, designating Argamakmur Sub-District as a special stunting location to address this health concern.

The 2022 routine report from the North Bengkulu Health Service reveals a relatively high number of pregnant women with Chronic Energy Deficiency (CED), amounting to 461 individuals. Among them, Argamakmur Sub-District stands out with the highest number of CED pregnant women, totaling 55 individuals. This highlights the importance of conducting a study focused on the analysis of macronutrient intake and its connection to the incidence of CED in pregnant women. Such study is believed to play a significant role in reducing the stunting rates in North Bengkulu Regency, particularly in Argamakmur Sub-District. The Sub-District is designated as a stunting locus, making it especially crucial to address this issue and improve the nutritional status of pregnant women.

Several studies indicate that maintaining a healthy pre-pregnancy weight and adhering to a well-balanced diet are essential factors for ensuring the health of the baby during pregnancy⁶. These studies have found that higher consumption of carbohydrates is linked to greater birth weight, while increased fat intake is associated with lower birth weight⁷. Furthermore, there is a positive correlation between fat intake and the baby's birth length⁸.

A strong correlation is evident between the intake of fat and protein and birth length, implying that elevated levels of fat and protein consumption play a significant role in enhancing birth length, particularly throughout the gestational period⁹.

Energy and dietary limitations can have adverse effects on fetal development and may lead to long-lasting health issues such as type II diabetes, hypertension, and cardiovascular disease¹⁰. The objective of this study was to examine the relationship between macronutrient intake and the prevalence of chronic energy deficiency in pregnant women residing in Argamakmur Sub-District, North Bengkulu in the year 2023.

METHODS

This study was classified as quantitative study and followed a cross-sectional design. This study was conducted on the entire population of 165 pregnant women in Argamakmur Sub-District, North Bengkulu Regency, with a sample of 60 pregnant women selected using a cluster sampling technique. Data collection involved the use of a 3 x 24-hour food recall questionnaire. Anthropometric measurements were obtained through LILA measurements. Data analysis encompassed univariate, bivariate, and multivariate approaches, with the chi-square test applied and processed using SPSS for Windows Version 24.00 software

RESULTS

The findings of the study on macronutrient intake (carbohydrates, protein, fat) and the occurrence of CED in pregnant women in Argamakmur Sub-District, North Bengkulu Regency, Bengkulu Province, are presented in Table 1.

Table 1. The Macronutrient Intake (Carbohydrates, Protein, Fat) and the incidence of Chronic Energy Deficiency (CED) in pregnant women in Argamakmur Sub-District, North Bengkulu Regency

Nutrient Intake	n	%
Carbohydrate Intake		
- Insufficient	34	56.7%
- Adequate	26	43.3%
Total	60	100.0%
Protein Intake		
- Insufficient	30	50.0%
- Adequate	30	50.0%
Total	60	100.0%
Fat Intake		
- Insufficient	35	58.3%
- Adequate	25	41.7%
Total	60	100.0%

Source: Study Results

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In Table 1, it is evident that over 50% of pregnant women fall into the deficient category for carbohydrate intake (56.7%), protein intake (50%), and fat intake

(58.3%). The association between carbohydrate, protein, and fat intake and the occurrence of Chronic Energy Deficiency (CED) in pregnant women is further explored in Table 2.

Table 2. The Relationship Between Carbohydrate, Protein, and Fat Intake and the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women in Argamakmur Sub-District, North Bengkulu Regency

Variable	CED						P	OR
	LILA ≤ 23.5		LILA > 23.5		Total			
	n	%	n	%	n	%		
Carbohydrate Intake								
- Insufficient	12	100.0%	22	45.8%	34	56.7%	0.002	0.647
- Adequate	0	0.0%	26	54.2%	26	43.3%		
Total	12	100.0%	48	100.0%	60	100.0%		
Protein Intake								
- Insufficient	12	100.0%	18	37.5%	30	50.0%	0.000	0.600
- Adequate	0	0.0%	30	62.5%	30	50.0%		
Total	12	100.0%	48	100.0%	60	100.0%		
Fat Intake								
- Insufficient	11	91.7%	24	50.0%	35	58.3%	0.022	11.000
- Adequate	1	8.3%	24	50.0%	25	41.7%		
Total	12	100.0%	48	100.0%	60	100.0%		

Source: Study Results

Table 2 provides an overview of the carbohydrate intake of pregnant women, indicating that those with an intake less than 100% were prone to Chronic Energy Deficiency (CED). A statistically significant relationship between carbohydrate intake and the incidence of CED was observed (p value <0.05), with an odds ratio (OR) of 0.647. Furthermore, the table illustrates that less than 100% of pregnant women had adequate protein intake, and this was linked to the occurrence of CED among them (p value <0.05), with an OR value of 0.6. Similarly, fat intake in pregnant women, which falls below 91.7%, was associated with CED. There was a significant relationship between fat intake and the incidence of CED in pregnant women from Argamakmur Sub-District, North Bengkulu Regency (p value <0.05), with an OR value of 11.00.

Following a comprehensive multivariate analysis involving the variables of carbohydrate, protein, and fat, the results did not indicate statistical significance. This suggests that no single dominant factor can be identified as being strongly associated with the incidence of Chronic Energy Deficiency (CED) in pregnant women within Argamakmur Sub-District, North Bengkulu.

DISCUSSION

The study results indicated that a majority of pregnant women had an insufficient intake of carbohydrates compared to the recommended nutritional requirements^{11,12}. This figure is nearly the same as the findings from the study conducted in Pontianak¹³. Corresponding to the study carried out in Pekanbaru, it was observed that all pregnant

women with protein energy deficiency also exhibited a 100% deficit in carbohydrate intake¹⁴.

In contrast, a study conducted in Jember indicated that carbohydrate intake among pregnant women was relatively high¹⁵. Carbohydrates are required by pregnant women to fulfill their nutritional needs.

The study revealed that a portion of pregnant women had an inadequate protein intake, with this percentage being lower than the findings in Pekanbaru, where 53% of pregnant women were reported to have insufficient protein intake¹⁴. However, this percentage is higher when compared to the study conducted in Pontianak, where 25.3% of pregnant women had insufficient protein intake¹³.

The primary role of protein is to support growth, but in cases where the body lacks energy, protein can also serve to produce energy. Protein requirements during pregnancy are nearly equivalent to energy requirements. The need for protein in pregnant women increases by approximately 68% compared to non-pregnant conditions. It is crucial to ensure that an adequate and sufficient amount of protein is available throughout the entirety of the pregnancy.

The study indicated that a significant portion of pregnant women had an insufficient intake of fat, which differs from the findings of the study conducted in Jember, where the fat intake among pregnant women was categorized as high¹⁵. Fat represents the largest energy reserve in the body and is primarily derived from the excessive consumption of fatty food sources. Fat is the most concentrated source of energy, providing 9 kilocalories (kcal) for every gram consumed¹⁶.

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Maternal nutritional status during pregnancy is the physical condition that emerges from the intake, distribution, absorption, and utilization of food. It significantly impacts the growth and development of the fetus in the womb. Meeting the nutritional requirements of the mother during pregnancy is of utmost importance for the healthy development of the fetus she carries. When pregnant women experience chronic energy deficiency, it can result in the birth of children with stunted physical growth¹⁷.

The data collection on the dietary intake of pregnant women in Argamakmur Sub-District, North Bengkulu Regency, revealed that their food intake falls short of the Recommended Dietary Allowances (RDA) for pregnant women. Consequently, the intake of macronutrients (carbohydrates, protein, and fat) among some pregnant women did not meet the RDA.

Bivariate Analysis

The findings of this study revealed that all pregnant women with Chronic Energy Deficiency (CED) exhibited inadequate carbohydrate intake, demonstrating a significant relationship with the incidence of CED in pregnant women. Similarly, 100% of pregnant women with CED had insufficient protein intake, indicating a connection between protein intake and the occurrence of CED. Among CED pregnant women, 91.7% had a deficit in fat intake, underscoring the relationship between fat intake and CED incidence in pregnant women from Argamakmur Sub-District, North Bengkulu Regency (p value <0.05). These results align with the connection between diet and nutritional intake with CED in pregnant women¹⁹.

Several studies suggest that a normal pre-pregnancy weight in mothers and an appropriate dietary pattern are likely to be crucial for the health of the baby⁶. Energy and nutritional restrictions can disrupt fetal development and may lead to diseases that persist throughout later life, including type II diabetes, hypertension, and cardiovascular diseases¹⁰.

Macronutrients, as the term suggests, are nutrients that are necessary in substantial amounts and play a significant role in providing the energy required to fulfill the nutritional requirements of pregnant women in alignment with the Recommended Dietary Allowances (RDA)¹². Increased carbohydrate consumption was linked to higher birth weight, while conversely, increased fat intake was associated with lower birth weight⁷.

Carbohydrates consumed by pregnant women are transformed into glucose within the body to provide energy for their daily activities. A portion of these carbohydrates is stored as glycogen in the liver and muscle tissue. Additionally, some of them are converted into reserves of body fat²⁰.

A strong correlation exists between the intake of fat and protein and the length of newborns at birth, implying that higher fat and protein intake can significantly contribute

to an increase in birth length, particularly during the gestational period⁹.

Protein is a vital nutrient, serving as a building block in the body and making significant energy contributions, especially for pregnant women. The quantity of protein intake required by pregnant women should align with the Recommended Dietary Allowances (RDA). During each trimester, pregnant women require an increasing amount of protein in relation to the gestational age. A deficiency in protein can deplete energy stores in the body, leading to weight loss. Protein deficiency conditions can be identified through a decrease in the overall protein concentration²¹.

There was a direct correlation between fat intake and the length of newborns at birth⁸. Fat is one of the nutrients that provides the highest energy yield, as 1 gram of fat contributes 9 Kcal of energy. Consequently, pregnant women require a sufficient intake of fat during pregnancy. Meeting the Recommended Dietary Allowance (RDA) for fat intake can offer substantial energy reserves for both the mother and the fetus during pregnancy. Furthermore, fat intake was significantly associated with the incidence of Chronic Energy Deficiency (CED)²².

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