



### Factors Associated with the Incidence of Chronic Energy Deficiency (CED) in Third Trimester Pregnant Women in the Working Area of Tanjung Rejo Health Center Percut Sei Tuan In 2025

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#### ABSTRACT

Adequate nutritional status in pregnant women is essential for optimal fetal growth and development as well as for ensuring a safe and smooth delivery process. Good maternal nutritional status can be achieved through a balance between nutritional intake and physiological needs. Chronic Energy Deficiency (CED) in pregnant women is a condition of long-term undernutrition, characterized by a mid-upper arm circumference (MUAC) of less than 23.5 cm, and is associated with an increased risk of preterm delivery, low birth weight (LBW) infants, and even maternal and neonatal mortality. This study aimed to identify factors associated with the occurrence of Chronic Energy Deficiency (CED) among third-trimester pregnant women in the working area of Tanjung Rejo Public Health Center, Percut Sei Tuan. The research employed a quantitative method with a cross-sectional design. The population consisted of all third-trimester pregnant women registered at the Tanjung Rejo Public Health Center in 2025, totaling 120 individuals. A sample of 20 pregnant women was selected using accidental sampling techniques. The study was conducted from May to August 2025. The results of statistical analysis using the chi-square test showed a p-value of 0.004 ( $p < 0.05$ ), indicating a significant relationship between dietary patterns and the incidence of Chronic Energy Deficiency (CED) among pregnant women at the Tanjung Rejo Public Health Center, Percut Sei Tuan District, Deli Serdang Regency. It is recommended that pregnant women consume a balanced and nutritious diet according to their household capacity, with particular emphasis on adequate energy, protein, and iron intake.

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### INTRODUCTION

Pregnancy is a physiological process that begins at conception (fertilization) and continues until the birth of the fetus. Pregnancy is characterized by the absence of menstruation and significant physiological and hormonal changes in a woman's body as a response to fetal growth and development in the uterus (Manuaba, 2010). According to Saifuddin (2014), pregnancy is the period from conception to childbirth, which normally lasts for 280 days or 40 weeks, calculated from the first day of the last menstrual period (LMP).

The World Health Organization (WHO) reports that the global prevalence of Chronic Energy Deficiency (CED) during pregnancy ranges from 35% to 75%. This prevalence is significantly higher in the third trimester compared to the first and second trimesters of pregnancy. The WHO also notes that 40% of maternal deaths in developing countries are associated with CED. Belgium has the highest prevalence, while Indonesia ranks fourth with a prevalence of 35.4% (WHO, 2022).

According to the Indonesian Ministry of Health Profile Data (2020), there were 451,350 pregnant women (9.7%) with a mid-upper arm circumference (MUAC) of less than 23.5 cm. In 2021, this number increased to 645,879 pregnant women (14.5%) with MUAC < 23.5 cm. In 2022, the number decreased to 283,833 pregnant women (8.7%) with MUAC < 23.5 cm, indicating a reduction of 5.8% in the proportion of pregnant women at risk of CED in 2022 (Indonesian Ministry of Health Report, 2022).

Data from the 2018 Basic Health Research (Riskesdas) showed that the prevalence of CED among pregnant women in Indonesia reached 17.3% (Ministry of Health of the Republic of Indonesia,

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2018). In North Sumatra Province, the prevalence of CED remains relatively high and continues to be a major concern for health professionals, particularly in the working area of the Tanjung Rejo Public Health Center, Percut Sei Tuan District. Based on the 2023 annual report of the health center, approximately 23.6% of third-trimester pregnant women were identified as experiencing CED.

Adequate nutritional status during pregnancy is essential for optimal fetal growth and development as well as for a safe delivery process. Good maternal nutritional status can be achieved through a balance between nutritional intake and nutritional requirements. Inadequate nutritional intake during pregnancy may lead to health problems for both the mother and the fetus. These problems include congenital abnormalities, low birth weight (LBW) infants weighing less than 2,500 grams, anemia, hemorrhage, and an increased risk of Chronic Energy Deficiency (CED). Pregnant women with poor nutritional status are at a two- to three-fold higher risk of delivering LBW infants compared to those with adequate nutrition, and the risk of infant mortality increases by up to 1.5 times (Diza, 2020).

Factors associated with the occurrence of Chronic Energy Deficiency (CED) among pregnant women include maternal age, level of knowledge, occupation, family income, educational level, parity, interpregnancy interval, energy intake, and protein intake (Diza, 2021). Pregnant women aged 20–35 years are generally more physically and psychologically prepared for pregnancy. At this age, maternal nutritional status tends to be better than in women younger than 20 years or older than 35 years (Ministry of Health of the Republic of Indonesia, 2022).

Chronic Energy Deficiency during pregnancy has adverse effects on both the mother and the fetus (Mizawati et al., 2020). Maternal impacts include an increased risk of anemia, hemorrhage, inadequate weight gain, and susceptibility to infectious diseases (Sukamawati et al., 2023). During childbirth, CED may result in prolonged and complicated labor, preterm delivery, and bleeding. Adverse fetal outcomes include miscarriage, stillbirth, congenital anomalies, and low birth weight (LBW), while long-term effects on the child include an increased risk of stunting (Bunga et al., 2021).

Based on the results of a preliminary survey conducted in July 2025 among 20 third-trimester pregnant women attending antenatal care at the Tanjung Rejo Public Health Center, it was found that 8 women (40%) had a MUAC of less than 23.5 cm. In addition, 10 pregnant women (50%) were unaware of the importance of meeting nutritional requirements during pregnancy, and 12 women (60%) reported rarely consuming a balanced and nutritious diet. These findings indicate that CED remains a prominent health problem in this area and is closely associated with maternal knowledge and dietary patterns.

Given the high prevalence of CED and the importance of these contributing factors, this study aims to identify factors associated with the occurrence of Chronic Energy Deficiency among third-trimester pregnant women in the working area of the Tanjung Rejo Public Health Center, Percut Sei Tuan.

Maternal health is one of the key indicators in determining a nation's overall health status. Nutritional problems among pregnant women, such as Chronic Energy Deficiency (CED), remain a serious public health issue with direct consequences for both maternal and fetal health. Chronic Energy Deficiency in pregnancy is a condition of long-term undernutrition, characterized by a mid-upper arm circumference (MUAC) of less than 23.5 cm, and is associated with an increased risk of preterm delivery, low birth weight (LBW) infants, and maternal and neonatal mortality.

### METHODS

This study aimed to identify factors associated with the occurrence of Chronic Energy Deficiency (CED) among pregnant women. The research was conducted in 2025, with the study population consisting of third-trimester pregnant women. A total of 20 respondents were selected as the sample using inclusion and exclusion criteria.

This quantitative study employed an observational analytic design with a cross-sectional approach. Data were collected using a structured questionnaire completed by the respondents.

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Information regarding the number of third-trimester pregnant women was obtained from the working area of the Tanjung Rejo Public Health Center, Percut Sei Tuan District, Deli Serdang Regency, North Sumatra, Indonesia.

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS). Univariate analysis was conducted to describe the frequency distribution of respondents' characteristics, while bivariate analysis was used to examine the association between variables using the chi-square test at a 95% confidence level.

### RESULTS AND DISCUSSION

Table 1 presents the distribution of respondent characteristics among third-trimester pregnant women at the Terjun Public Health Center in 2025, including age and educational background. The table provides an overview of the demographic profile of the respondents, which is important for understanding the characteristics of the study population and their potential influence on the occurrence of Chronic Energy Deficiency (CED).

Table 1. Characteristics of Third-Trimester Pregnant Women at Terjun Public Health Center, 2025

Respondent Characteristics		
Age (Years)	N	%
19-25	7	35,0
26-30	6	30,0
31-35	5	25,0
36-38	2	10,0
Education Level		
Elementary School	2	10,0
Junior High School	4	20,0
Senior High School	9	45,0
Diploma / Bachelor's Degree	5	25,0

Based on the table above, the majority of respondents were aged 19–25 years (35.0%), and most of the pregnant women had completed senior high school education (45.0%).

Table 2. Association Between Nutritional Knowledge and the Incidence of Chronic Energy Deficiency (CED) Among Pregnant Women at Tanjung Rejo Public Health Center, Percut Sei Tuan District, Deli Serdang Regency

Nutritional Knowledge	Incidence of Chronic Energy Deficiency (CED)				Total		Pvalue
	CED		Non-CED		N	%	
	n	%	n	%			
Poor	8	40,0	0	0,0	8	40,0	0,001
Adequate	1	5,0	5	25,0	6	30,0	
Good	0	0,0	6	30,0	6	30,0	
<b>Total</b>	<b>9</b>	<b>45,0</b>	<b>11</b>	<b>55,0</b>	<b>20</b>	<b>100,0</b>	

Based on Table 2, eight pregnant women (40.0%) with poor nutritional knowledge experienced Chronic Energy Deficiency (CED), while none of the women with poor nutritional knowledge were classified as non-CED. Among pregnant women with adequate nutritional knowledge, one respondent (5.0%) experienced CED, whereas five respondents (25.0%) did not experience CED. Furthermore,

none of the pregnant women with good nutritional knowledge experienced CED, while six respondents (30.0%) in this category were classified as non-CED.

The results of the chi-square statistical test showed a p-value of 0.001 ( $p < 0.05$ ), indicating a statistically significant association between nutritional knowledge and the incidence of Chronic Energy Deficiency (CED) among pregnant women at the Tanjung Rejo Public Health Center. Therefore, the alternative hypothesis ( $H_a$ ) was accepted and the null hypothesis ( $H_0$ ) was rejected.

Table 3. Association Between Dietary Patterns and the Incidence of Chronic Energy Deficiency (CED) Among Third-Trimester Pregnant Women

Dietary Pattern	Incidence of Chronic Energy Deficiency (CED)				Total	Pvalue	
	CED		Non-CED				
	n	%	n	%	N		%
Poor	7	35,0	0	0,0	7	35,0	0,001
Adequate	2	10,0	4	20,0	6	30,0	
Good	0	0,0	7	35,0	7	35,0	
<b>Total</b>	<b>9</b>	<b>45,0</b>	<b>11</b>	<b>55,0</b>	<b>20</b>	<b>100,0</b>	

Based on Table 3, seven pregnant women (35.0%) with poor dietary patterns experienced Chronic Energy Deficiency (CED), while none of the women with poor dietary patterns were classified as non-CED. Among pregnant women with adequate dietary patterns, two respondents (10.0%) experienced CED, whereas four respondents (20.0%) did not experience CED. In contrast, none of the pregnant women with good dietary patterns experienced CED, while all seven respondents (35.0%) in this category were classified as non-CED.

The results of the chi-square test showed a p-value of 0.001 ( $p < 0.05$ ), indicating a statistically significant association between dietary patterns and the incidence of Chronic Energy Deficiency (CED) among third-trimester pregnant women. Therefore, the alternative hypothesis ( $H_a$ ) was accepted and the null hypothesis ( $H_0$ ) was rejected.

Table 4. Association Between Socioeconomic Status and the Incidence of Chronic Energy Deficiency (CED) Among Third-Trimester Pregnant Women

Socioeconomic Status	Incidence of Chronic Energy Deficiency (CED)				Total	Pvalue	
	CED		Non-CED				
	n	%	n	%	N		%
Low	9	45,0	0	0,0	9	45,0	0,001
Middle	0	0,0	9	45,0	9	45,0	
High	0	0,0	2	10,0	2	10,0	
<b>Total</b>	<b>9</b>	<b>45,0</b>	<b>11</b>	<b>55,0</b>	<b>20</b>	<b>100,0</b>	

Based on Table 4, all pregnant women with low socioeconomic status experienced Chronic Energy Deficiency (CED), totaling nine respondents (45.0%), while none in this group were classified as non-CED. In contrast, none of the pregnant women with middle socioeconomic status experienced CED, and all nine respondents (45.0%) in this category were classified as non-CED. Similarly, none of the pregnant women with high socioeconomic status experienced CED, and all two respondents (10.0%) in this group were classified as non-CED.

The results of the chi-square statistical test showed a p-value of 0.001 ( $p < 0.05$ ), indicating a statistically significant association between socioeconomic status and the incidence of Chronic Energy

Deficiency (CED) among third-trimester pregnant women. Therefore, the alternative hypothesis ( $H_a$ ) was accepted and the null hypothesis ( $H_0$ ) was rejected.

Table 5. Association Between Parity and the Incidence of Chronic Energy Deficiency (CED) Among Third-Trimester Pregnant Women

Parity	Incidence of Chronic Energy Deficiency (CED)				Total	Pvalue	
	CED		Non-CED				
	n	%	n	%	N	%	
≥ 2 Parity	4	20,0	8	40,0	12	60,0	0,409
< 2 Parity	5	25,0	3	15,0	8	40,0	
<b>Total</b>	<b>9</b>	<b>45,0</b>	<b>11</b>	<b>55,0</b>	<b>20</b>	<b>100,0</b>	

Based on Table 5, four pregnant women (20.0%) with parity greater than two (>2) experienced Chronic Energy Deficiency (CED), while eight respondents (40.0%) in this group did not experience CED. Among pregnant women with parity less than two (<2), five respondents (25.0%) experienced CED, whereas three respondents (15.0%) were classified as non-CED.

The results of the chi-square statistical test showed a p-value of 0.409 ( $p > 0.05$ ), indicating that there was no statistically significant association between parity and the incidence of Chronic Energy Deficiency (CED) among third-trimester pregnant women. Therefore, the alternative hypothesis ( $H_a$ ) was rejected and the null hypothesis ( $H_0$ ) was accepted.

### Discussion

The results of this study indicate that most pregnant women with poor nutritional knowledge experienced Chronic Energy Deficiency (CED), totaling eight respondents (40.0%). In contrast, pregnant women with adequate and good nutritional knowledge tended not to experience CED. The Chi-square test results showed a p-value of 0.001 ( $p < 0.05$ ), indicating a statistically significant association between nutritional knowledge and the incidence of CED among pregnant women at the Tanjung Rejo Public Health Center, Percut Sei Tuan District, Deli Serdang Regency.

These findings are consistent with the theory proposed by Notoatmodjo (2018), which states that knowledge is a crucial domain influencing the formation of health-related behaviors. Pregnant women with good nutritional knowledge are more capable of selecting, preparing, and consuming foods that meet their nutritional requirements during pregnancy. Conversely, inadequate nutritional knowledge may lead to inappropriate food choices in terms of type, quantity, and frequency, thereby increasing the risk of CED.

Nutritional knowledge is particularly important during pregnancy due to the increased demand for nutrients to support fetal growth and maintain maternal health. Almatsier (2019) emphasized that pregnant women require additional energy, protein, iron, folic acid, calcium, and vitamins. Insufficient nutritional intake resulting from limited knowledge can lead to CED and adverse outcomes, such as anemia, low birth weight (LBW) infants, and an increased risk of pregnancy and delivery complications.

This study is supported by research conducted by Hutabarat (2021), which reported a significant relationship between nutritional knowledge and the incidence of CED among pregnant women at the North Siantar Public Health Center ( $p = 0.002$ ). Similarly, Rahayu (2020) found that pregnant women with low nutritional knowledge had a threefold higher risk of experiencing CED compared to those with good nutritional knowledge. However, these findings differ from those of Sari (2019), who reported no significant association between nutritional knowledge and CED among pregnant women in the Padang Hilir Public Health Center area. These differences may be attributed to other influencing factors, such as socioeconomic status, food availability, access to healthcare services, and household dietary culture. Overall, this study confirms that better nutritional knowledge among

pregnant women is associated with a lower risk of CED. Therefore, nutritional education interventions through counseling, maternal classes, and digital media should be strengthened to enhance pregnant women's understanding of adequate nutrition during pregnancy.

Regarding dietary patterns, the results showed that seven pregnant women (35.0%) with poor dietary patterns experienced CED, while two women (10.0%) with poor dietary patterns did not experience CED. Among those with adequate dietary patterns, two respondents (10.0%) experienced CED and seven respondents (35.0%) did not. In contrast, none of the pregnant women with good dietary patterns experienced CED, and all respondents in this group were classified as non-CED.

The Chi-square test yielded a p-value of 0.004 ( $p < 0.05$ ), indicating a significant association between dietary patterns and the incidence of CED among pregnant women at the Tanjung Rejo Public Health Center. These findings are consistent with the study by Fitriani (2020), which reported that pregnant women with poor dietary patterns were at a higher risk of CED compared to those with adequate or good dietary patterns. Poor dietary patterns result in insufficient intake of macronutrients (energy, protein, fat, and carbohydrates) as well as micronutrients (iron, folic acid, vitamins, and minerals), which are essential during pregnancy.

Furthermore, Mardiyah (2021) found that pregnant women who did not consume a varied diet and relied mainly on staple foods without adequate side dishes, vegetables, and fruits were more vulnerable to CED. This condition occurs because nutritional requirements increase during pregnancy due to fetal growth, placental development, and maternal physiological changes. According to the Indonesian Ministry of Health (2021), pregnant women's diets should adhere to the principles of balanced nutrition, including dietary diversity, adequate energy and protein intake, and sufficient micronutrients to prevent CED and pregnancy complications. Therefore, this study highlights the importance of balanced dietary patterns in preventing CED among pregnant women and underscores the need for regular nutritional counseling, education, and dietary monitoring at public health centers and community health posts.

With respect to socioeconomic status, the findings showed that all pregnant women with low socioeconomic status experienced CED (45.0%), while none were classified as non-CED. Similarly, pregnant women with middle socioeconomic status also experienced CED (45.0%), with no respondents classified as non-CED. In contrast, none of the pregnant women with high socioeconomic status experienced CED, and all respondents in this group (10.0%) were classified as non-CED.

The Chi-square test result indicated a p-value of 0.001 ( $p < 0.05$ ), demonstrating a significant association between socioeconomic status and the incidence of CED among pregnant women. These results align with the study by Sari et al. (2022), which reported that pregnant women with low socioeconomic status were more likely to experience CED due to limited financial resources to meet daily nutritional needs. Low household income directly affects purchasing power for nutritious foods, resulting in inadequate dietary intake.

Additionally, Novianti and Lestari (2023) emphasized that socioeconomic status is a key determinant of dietary quality among pregnant women. Families with lower economic status tend to consume cheaper foods with insufficient energy and nutrient content, whereas families with higher economic status can afford a more diverse and nutritionally adequate diet. According to the Indonesian Ministry of Health (2022), household socioeconomic status significantly influences food availability. When pregnant women's nutritional needs are unmet due to economic constraints, the risk of CED increases, potentially leading to impaired fetal growth and delivery complications. Thus, this study underscores the importance of improving socioeconomic conditions through family economic empowerment programs and targeted nutritional assistance for pregnant women at risk of CED.

Regarding parity, the results showed that four pregnant women (20.0%) with parity greater than two ( $>2$ ) experienced CED, while five respondents (25.0%) in this group did not. Among pregnant women with parity less than two ( $<2$ ), a higher number experienced CED (40.0%), while three respondents (15.0%) were classified as non-CED.

The Chi-square test showed a p-value greater than 0.05, indicating no significant association between parity and the incidence of CED among pregnant women at the Tanjung Rejo Public Health Center. This finding is consistent with the study by Rahmawati et al. (2022), which reported that parity was not a dominant factor associated with CED, as maternal nutritional status is more strongly influenced by dietary intake, food availability, and socioeconomic status than by the number of previous births.

However, this result differs from the findings of Fitriani and Siregar (2021), who reported a significant association between high parity and poor maternal nutritional status. According to Manuaba (2019), high parity may increase the risk of nutritional problems due to repeated energy depletion during pregnancy, childbirth, and breastfeeding. Nevertheless, the lack of a significant association in this study may be attributed to the relatively small number of respondents with high parity, which may not adequately represent the variation required to detect a significant difference.

In conclusion, this study indicates that the incidence of Chronic Energy Deficiency among pregnant women is more strongly influenced by nutritional knowledge, dietary patterns, and socioeconomic status than by parity alone. Therefore, CED prevention efforts should prioritize improving maternal dietary intake through balanced nutrition education, adequate supplementation, and socioeconomic interventions to ensure optimal nutritional fulfillment during pregnancy.

### CONCLUSION

Overall, the incidence of Chronic Energy Deficiency (CED) among pregnant women is significantly influenced by nutritional knowledge, dietary patterns, and socioeconomic status, while parity does not show a significant association. Pregnant women with low nutritional knowledge and inadequate dietary patterns are at a higher risk of experiencing CED, indicating the urgent need to strengthen nutrition education, dietary counseling, and regular monitoring of nutritional intake during pregnancy. In addition, women from low to middle socioeconomic backgrounds are more vulnerable to CED, emphasizing the importance of socioeconomic interventions such as family economic empowerment and the provision of nutritional assistance. Therefore, it is recommended that community health centers (Puskesmas) and healthcare providers enhance routine nutrition education and nutritional status monitoring, optimize the role of community health volunteers (posyandu cadres), and actively involve families in maternal health education programs. Pregnant women and their families are encouraged to consume a balanced and nutritious diet, routinely take iron (Fe) and calcium supplements, and provide adequate emotional and financial support throughout pregnancy. Future studies should employ longitudinal or cohort designs, consider additional factors such as pre-pregnancy nutritional status and psychological conditions, and apply more comprehensive nutritional assessment methods. Furthermore, local governments and health authorities are expected to provide nutritious food assistance for pregnant women at risk of CED and strengthen digital data-based health monitoring systems to improve maternal and fetal health outcomes.

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