

ASSOCIATION BETWEEN PARITY, MATERNAL AGE, AND CHRONIC ENERGY DEFICIENCY (CED) AMONG PREGNANT WOMEN AT BONTONOMPO II COMMUNITY HEALTH CENTER, GOWA REGENCY

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Abstract

Background: Chronic Energy Deficiency (CED) may adversely affect maternal health as well as fetal growth and development and is commonly identified using a Mid-Upper Arm Circumference (MUAC) value of less than 23.5 cm. **Objective:** This study aimed to analyze the association between maternal parity and age with the incidence of Chronic Energy Deficiency (CED) among pregnant women. **Methods:** A quantitative study with a cross-sectional design was conducted from October to November 2024. The study involved 50 pregnant women selected using a total sampling technique. Data were collected using structured questionnaires and MUAC measurements. Data were analyzed using univariate and bivariate analyses, with Fisher's Exact Test used to assess the association between maternal age, parity, and CED. **Results:** Among the respondents, 84.0% were classified as having CED. Fisher's Exact Test revealed a significant association between parity and CED incidence ($p = 0.001$). Odds ratio analysis showed that primiparous women had 4.70 times greater odds of experiencing CED than multiparous and grandemultiparous women ($OR = 4.70$; 95% CI: 1.06–22.99). In contrast, maternal age was not significantly associated with CED incidence ($p = 0.718$). Supplementary interview findings suggested that some primiparous women experienced challenges related to pregnancy symptoms and nutritional management; however, these observations were not included in the statistical analysis. **Conclusions:** Maternal parity was significantly associated with Chronic Energy Deficiency (CED) among pregnant women, with primiparous women being more vulnerable to CED than women with previous childbirth experience. In contrast, maternal age was not significantly associated with CED incidence. The prevalence of CED among pregnant women in the study area was high (84.0%), indicating a substantial burden of maternal undernutrition.



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Introduction

Pregnancy is a time that requires physical readiness and optimal nutritional intake, as energy and nutrient requirements increase during this period to support the nutritional

status and health of the pregnant woman, as well as fetal growth, and to ensure adequate nutrition for the unborn baby. Meeting these nutritional needs is closely linked to the mother's balanced dietary habits during pregnancy (1). One of the most prevalent nutritional complications during pregnancy that develops when nutritional needs are consistently unmet is Chronic Energy Deficiency (CED). Among pregnant women, CED represents defined as a state of undernutrition caused by inadequate long-term consumption of energy and protein relative to maternal nutritional requirements, potentially resulting in adverse maternal and fetal health outcomes (2).

Women who fail to meet maternal energy requirements during pregnancy may develop CED, which is associated with several complications affecting both mother and fetus. Maternal CED in pregnancy has been linked to an increased likelihood of adverse maternal outcomes, such as anemia, hemorrhage, inadequate gestational weight gain, and a greater susceptibility to infectious diseases. In addition, maternal CED during gestation may contribute to an increased risk of the likelihood of complications affecting the labor process and birth outcomes, including prolonged labor, obstructed childbirth, preterm birth, and postpartum bleeding, and an increased likelihood of cesarean delivery. Inadequate maternal nutritional status during pregnancy may compromise fetal growth and contribute to a range of several pregnancy complications affecting both maternal and infant health, including pregnancy loss, fetal mortality, neonatal death, and congenital abnormalities., infant anemia, intrapartum asphyxia, and the delivery of low-birth-weight infants (3)

Chronic Energy Deficiency (CED) continues to be a major nutritional concern affecting pregnant women and can lead to various health complications throughout pregnancy. Data published by the World Health Organization (WHO) indicate that maternal undernutrition remains highly prevalent in developing countries. In Indonesia, the prevalence of CED among pregnant women increased from 8.4% in 2022 to 16.9% in 2023, indicating a significant rise in maternal nutritional problems. This increasing trend highlights the need for greater attention to determinants of maternal undernutrition and the development of effective preventive strategies (4). At the local level, CED remains an important public health concern in Gowa Regency, particularly within the working area of the Bontonompo II Community Health Center. According to health center records from January to October 2024, 42 pregnant women were identified as experiencing CED, consisting of 16 cases in the first trimester, 16 cases in the second trimester, and 10 cases in the third trimester. The relatively high number of cases observed in this area further emphasizes the need to identify factors associated with the occurrence of CED among pregnant women (5). A similarly high burden of maternal CED, associated with anemia and an increased risk of child stunting, has been reported among pregnant women in other Indonesian regions (6).

The Bontonompo II Community Health Center serves a predominantly rural population where maternal nutritional problems remain an important public health concern. Variations

in socioeconomic conditions, access to health information, and maternal reproductive characteristics may contribute to nutritional vulnerability among pregnant women in this area. These local conditions make Bontonmpo II an important setting for investigating factors associated with CED.

Healthcare providers typically monitor the likelihood of acute malnutrition in pregnant women using anthropometric evaluation based on mid-upper arm circumference (MUAC) measurements. This measure is considered practical anthropometric assessment widely used to evaluate the likelihood of acute malnutrition among women of reproductive age, including those who are pregnant. Generally, a MUAC measurement below the cut-off value of 23.5 cm is used to identify pregnant women at risk of malnutrition, while a MUAC value of ≥ 23.5 cm indicates a safer nutritional status, particularly during the first trimester of pregnancy. During pregnancy, a mother needs energy not only to maintain her own bodily functions but also to support fetal growth and development. Therefore, the mother's nutritional status as reflected by the CED indicator is a critical factor in reducing the risk of childbirth complications and promoting healthy growth and developmental outcomes in the child. Although MUAC measurement is useful for identifying pregnant women at risk of CED, understanding factors associated with its occurrence is equally important to support effective prevention strategies during pregnancy (7).

Multiple factors have been recognized as potential contributors to Maternal CED during pregnancy, which can be divided into two categories: immediate and underlying factors. Immediate factors include dietary intake, protein, fat, and vitamins, underlying factors include socioeconomic conditions that lead to low educational levels, closely spaced births, parity, and the mother's young age, which may contribute to insufficient maternal energy and nutrient status during pregnancy due to increased energy requirements and insufficient recovery of nutritional reserves. In addition, high-workload jobs can increase the risk of CED if the physical demands of the work are not balanced by sufficient and high-quality food intake (8). Parity is one of the reproductive factors frequently associated with maternal nutritional status. High parity, particularly among grandmultiparous women, may increase the risk of CED due to repeated pregnancies that can gradually deplete maternal nutritional reserves. However, primiparous women may also be vulnerable because they generally have limited experience in managing pregnancy-related physiological and nutritional changes. Consequently, both low and high parity may contribute to the occurrence of CED through different biological and behavioral mechanisms (9).

Maternal age has been identified as a potential determinant associated with experiencing CED during pregnancy. Maternal CED during pregnancy commonly occurs in maternal age below 20 years a vulnerable adolescent age group as well as in women aged ≥ 35 years. Pregnancies occurring among women in the adolescent age group (< 20 years) are often still undergoing physical growth and development, so their nutritional needs are

greater; during pregnancy, these nutrients are divided between the adolescent's maternal health status and fetal development. Consequently, the likelihood of CED increases. Meanwhile, in women over 35, physiological changes occur one of which is a slowing of the body's metabolism: as a result, pregnant women in this age group may experience inadequate energy and nutrient intake, making them more vulnerable to CED. Nevertheless, findings from previous studies regarding the association between maternal age and CED remain inconsistent, suggesting that local characteristics may influence this relationship.

Previous studies have reported inconsistent findings regarding the association between parity and Chronic Energy Deficiency (CED) among pregnant women. Some studies have demonstrated a significant relationship between parity and CED, whereas others found no significant association. These inconsistencies indicate that the relationship between parity, maternal age, and CED may vary across different populations and settings. Therefore, further investigation is needed to clarify these relationships in the local context of the Bontonompo II Community Health Center, Gowa Regency. Given the serious consequences of inadequate maternal energy status during pregnancy for maternal health and fetal growth outcomes across the life cycle, the objective of this research was to evaluate whether maternal age and parity are correlated with the incidence of maternal CED during pregnancy among women receiving care within the Bontonompo II Community Health Center catchment area, Gowa Regency.

Materials and Methods

The present study employed a quantitative research approach using a cross-sectional design to examine the association between maternal age, parity, and Chronic Energy Deficiency (CED) among pregnant women. The study was conducted in the working area of the Bontonompo II Community Health Center, Bontonompo District, Gowa Regency, from October to November 2024. The study population consisted of all pregnant women registered within the service area of the Bontonompo II Community Health Center during the study period. Total sampling was applied because all pregnant women registered at the Bontonompo II Community Health Center during the study period who met the inclusion criteria were included in the study. This process resulted in a total sample of 50 respondents.

Participants were eligible if they were pregnant women who provided informed consent and agreed to participate in the study. Respondents who withdrew from the study, declined participation, or provided incomplete information were excluded from the analysis to ensure data completeness and reliability. Primary data were collected using a structured questionnaire adapted from a previous study. The questionnaire was used to obtain information on respondent characteristics, including gestational trimester, parity, pregnancy order, pregnancy spacing, educational level, employment status, and household income. The adapted questionnaire was reviewed by maternal and child health experts prior

to data collection to ensure its relevance and suitability for the study population. Only variables relevant to the objectives of the present study, namely maternal age, parity, and CED status based on MUAC measurements, were included in the statistical analysis.

Assessment of nutritional status was performed using Mid-Upper Arm Circumference (MUAC) measurements. MUAC was measured on the non-dominant upper arm using a standardized MUAC measuring tape by trained health personnel. Measurements were recorded to the nearest 0.1 cm. Pregnant women with MUAC values <23.5 cm were classified as having CED, whereas those with MUAC values ≥ 23.5 cm were categorized as non-CED. Data were processed and analyzed using IBM SPSS software. Univariate analysis was performed to describe the characteristics of respondents, including age, parity, and CED status. Bivariate analysis was conducted using Fisher's Exact Test to determine the association between maternal age, parity, and CED incidence. Fisher's Exact Test was selected because several cells in the contingency tables had expected frequencies of less than five, making it more appropriate than the Chi-square test for the available sample size. Statistical significance was determined at a confidence level of 95% ($p < 0.05$).

Results

Table 1 Overview of the Distribution of Parity Within the Population of Pregnant Women Receiving Care at the Bontonombo II Community Health Center

Category	N	%
Primipara (1 child)	34	68,0
Multipara (2-4 child)	14	28,0
Grandemultipara (>4 child)	2	4,0
Total	50	100

Table 1 the distribution of parity among the 50 pregnant women included in the study is presented according to the frequency of each parity category, 34 (68.0%) were in the primiparous category (1 child), 14 (28.0%) were in the multiparous category (2–4 children), and 2 (4.0%) were in the grandemultiparous category (>4 children).

Table 2 Characteristics of Pregnant Women Within the Working Area of the Bontonombo II Community Health Center

Age	N	%
15-20 years	8	16
21-30 years	29	58
31-40 years	13	26
Total	50	100

Table 2 which presents the distribution of respondents by the age of the pregnant woman, indicates that of the 50 respondents, 8 (16%) were in the 15–20 age group, 29 (58%) were in the 21–30 age group, and 13 (26%) were in the 31–40 age group. Among the 50 pregnant women included in this study, 42 respondents (84.0%) were classified as having Chronic Energy Deficiency (CED), while only 8 respondents (16.0%) were categorized as non-CED. The prevalence observed in this study was markedly higher than the national prevalence reported in Indonesia in 2023 (16.9%). This finding highlights the substantial burden of maternal undernutrition in the study area and underscores the importance of identifying factors associated with CED among pregnant women attending the Bontonmpo II Community Health Center.

Table 3 Association between parity status and chronic energy deficiency (ced) in pregnant women attending the Bontonmpo II Community Health Center

Parity	Incidence of Chronic Energy Deficiency (CED) in Pregnant Woman				Total		OR 95% CI	p value
	CED		Not CED					
	n	%	n	%	N	%		
	Primipara (1 child)	31	91.2	3	8.8	34		
Multipara (2 – 4 child)	10	71.4	4	28.6	14	28		
Grandemultipara (>4 child)	1	50	1	50	2	4		
Total	42	100	8	100	50	100		

Table 3 shows that the highest prevalence of CED was observed among primiparous women, with 91.2% classified as having CED. Statistical analysis demonstrated a significant association between parity and CED incidence ($p = 0.001$). Based on the results of Fisher's Exact Test, the obtained p -value was 0.001, which was lower than the significance level of 0.05. Therefore, there was a statistically significant association between maternal parity and the occurrence of Chronic Energy Deficiency (CED) among pregnant women in the working area of the Bontonmpo II Community Health Center.

In addition to the Fisher's Exact Test results, odds ratio analysis demonstrated that primiparous women were 4.70 times more likely to experience Chronic Energy Deficiency (CED) than multiparous and grandemultiparous women ($OR = 4.70$; 95% CI: 1.06-22.99). This finding suggests that first pregnancy may constitute a vulnerable period for maternal

nutritional problems and highlights the increased susceptibility of primiparous women to CED in the study population.

Supplementary interviews conducted with several respondents indicated that some primiparous women reported difficulties in managing pregnancy-related symptoms, particularly nausea and vomiting, as well as limited knowledge regarding nutritional requirements during pregnancy. These observations were used only to support the interpretation of the quantitative findings and were not included in the statistical analysis.

Association Between Maternal Age and Chronic Energy Deficiency (CED) Among Pregnant Women

Table 4 Association Between Maternal Age and Assessment of Chronic Energy Deficiency (CED) During Pregnancy Within the Bontonmpo II Community Health Center Service Area

Age	Incidence of Chronic Energy Deficiency (CED) in Pregnant Woman				Total	p value	
	CED		Not CED				
	n	%	n	%	N		%
15 – 20 years	7	87.5	1	12.5	8	16	0.718
21 – 30 years	25	86.2	4	13.8	29	58	
31 – 40 years	10	76.9	3	23.1	13	26	
Total	42	100	8	100	50	100	

Table 4, presents the association between maternal age and CED among pregnant women. Among respondents aged 15-20 years, 7 of 8 pregnant women (87.5%) experienced CED, while 1 respondent (12.5%) did not. Among respondents aged 21-30 years, 25 of 29 pregnant women (86.2%) experienced CED and 4 respondents (13.8%) did not. Meanwhile, among respondents aged 31-40 years, 10 of 13 pregnant women (76.9%) experienced CED, whereas 3 respondents (23.1%) were not classified as having CED.

Statistical analyses were performed using SPSS, which employed Fisher's Exact Test, the p-value was $0.718 > 0.05$; therefore, H_0 was accepted and H_1 was rejected. The statistical analysis showed no significant association between maternal age and CED status in pregnant women who received healthcare services from the Bontonmpo II Community Health Center. Although no significant association was found between maternal age and CED ($p > 0.05$), the largest number of CED cases was observed among women aged 21-30 years. This finding is noteworthy because this age group is generally considered the safest reproductive age category, yet it accounted for the majority of CED cases identified in this study.

DISCUSSION

Association Between Maternal Parity and Maternal Chronic Energy Deficiency (CED) During Pregnancy

The findings indicated an association between maternal parity status and CED status in primiparous mothers during pregnancy (34 respondents, 68%), 31 (91.2%) experienced CED, while 3 (8.8%) did not. Furthermore, among expectant mothers classified as multiparous comprising 14 respondents (28%) 10 (71.4%) experienced CED, while 4 (28.6%) did not. Meanwhile, among pregnant women in the grandemultipara category comprising 2 respondents (4%) 1 person (50%) experienced CED, while 1 person (50%) did not. Statistical analysis using SPSS and Fisher's Exact Test yielded a p-value of $0.001 < 0.05$, these findings indicate a statistically significant association between maternal parity and the occurrence of maternal CED status among pregnant women from the Bontonmpo II Community Health Center working area. Furthermore, odds ratio analysis indicated that primiparous women had 4.70 times greater odds of experiencing CED than multiparous and grandemultiparous women (OR = 4.70; 95% CI: 1.06–22.99). This finding emphasizes the increased vulnerability of first-time mothers to nutritional deficiencies during pregnancy.

This study found that the majority of expectant mothers receiving healthcare services at the Bontonmpo II Community Health Center were experiencing their first pregnancy, which can be considered a factor related to parity since a first pregnancy represents a woman's initial experience of pregnancy. Information obtained from supplementary interviews suggested that some primiparous women experienced anxiety related to childbirth and difficulties in managing common pregnancy symptoms, particularly nausea and vomiting during the first trimester. These conditions may have affected appetite and dietary intake, thereby contributing to inadequate nutritional consumption during pregnancy. In addition, several respondents reported limited experience and knowledge regarding nutritional requirements during pregnancy. However, these factors were not formally measured as study variables and were not included in the statistical analysis. Therefore, they should be interpreted as contextual explanations that may help explain the higher occurrence of CED among primiparous women rather than as statistically verified determinants.

The current study produced results that align with earlier investigations reported in a previous investigation (10), which indicate that primiparous pregnant women are at higher risk because first-time mothers tend to lack experience; consequently, they focus more on their own feelings, eating only what they want and consuming whatever is available, without considering their nutritional needs or the potential effects of nutritional deficiency (CED) they may experience later, which could endanger their babies. Meanwhile, the occurrence of CED among multiparous women may also be explained by the maternal depletion theory

(11), which suggests that repeated pregnancies can gradually reduce maternal nutritional reserves, particularly when recovery time between pregnancies is insufficient. This mechanism may increase vulnerability to nutritional deficiencies despite previous pregnancy experience.

This study is inconsistent with previous research conducted by (12) whose results showed no association between maternal parity and Chronic Energy Deficiency (CED), with a chi-square test p -value of 0.502 ($p > 0.05$), indicating the absence of a significant relationship between the variables. The discrepancy between the present findings and those reported by Sabrina et al. may be related to differences in sample characteristics, geographical settings, socioeconomic conditions, and maternal health services available in each study area. Variations in population composition and study design may also contribute to differences in the observed relationship between parity and CED. Information obtained from the questionnaire responses and supplementary interviews suggested that women with higher parity tended to have greater experience in managing pregnancy and family health, which may have contributed to the lower occurrence of CED among some respondents despite having multiple previous pregnancies.

A limitation of this study is that maternal nutritional knowledge, anxiety related to childbirth, and pregnancy-related symptoms such as nausea and vomiting were not quantitatively measured using validated instruments. Consequently, the contribution of these factors to the occurrence of Chronic Energy Deficiency (CED) could not be statistically evaluated. In addition, the relatively small sample size may limit the generalizability of the findings to other populations, and the use of self-reported questionnaire data may have introduced information bias. Future studies are encouraged to include these variables and involve larger study populations to better understand the mechanisms underlying the relationship between parity and maternal nutritional status during pregnancy.

Association Between Maternal Age and Chronic Energy Deficiency (CED) During Pregnancy

The findings demonstrated that among respondents aged 15–20 years, 7 of 8 pregnant women (87.5%) experienced CED, while 1 respondent (12.5%) did not. Among respondents aged 21–30 years, 25 of 29 pregnant women (86.2%) experienced CED and 4 respondents (13.8%) did not. Meanwhile, among respondents aged 31–40 years, 10 of 13 pregnant women (76.9%) experienced CED, whereas 3 respondents (23.1%) were not classified as having CED. From a physiological perspective, pregnancy is generally considered to be at the lowest risk when it occurs between 20 and 35 years of age, a period during which women have typically reached optimal physical maturity, psychological, and social conditions are considered optimal for carrying a pregnancy. In contrast, ages under 20 and over 35 are categorized as high-risk due to higher nutritional requirements resulting

from physiological conditions that are not yet optimal or have already declined. However, this study yielded different results, showing that pregnant women aged 21–30 were found to experience chronic energy deficiency more frequently. This finding suggests that factors other than maternal age may have contributed more substantially to the occurrence of CED in the study population. Because maternal age was not significantly associated with CED, it is possible that nutritional intake, socioeconomic conditions, health-related behaviors, and other unmeasured factors played a greater role in determining maternal nutritional status.

Although women aged 21–30 years are generally considered to be in the optimal reproductive age group, this category accounted for the largest number of CED cases in the present study. This finding suggests that factors other than biological age, such as dietary practices, socioeconomic conditions, workload, and access to nutrition-related information, may play a more substantial role in determining maternal nutritional status. The predominance of CED cases among women aged 21–30 years in this study may reflect local socioeconomic and nutritional conditions rather than biological age alone. As this age group represented the largest proportion of pregnant women attending antenatal care services in the study area, the higher number of CED cases may also be influenced by population distribution. Therefore, factors beyond maternal age should be considered when designing nutritional interventions for pregnant women in the Bontonompo II area.

The findings obtained in this study are in agreement with findings from a previous study (13), which identified pregnant women between 20 and 34 years of age as belonging to the lower-risk reproductive age group mostly experienced chronic energy deficiency and were underweight. Although the mothers' age falls within the low-risk category, this does not guarantee that they will avoid chronic energy deficiency during pregnancy; if their diet is unhealthy or lacks sufficient calories during pregnancy, chronic energy deficiency will occur. The findings of the present study differ from those reported by (14), the previous study reported that, among 74 pregnant women classified as being in the high-risk age group, 54 (73.0%) had chronic energy deficiency (CED), whereas 20 (27.0%) did not. These findings suggest that pregnancies occurring before the age of 20 years or after 35 years are associated with a greater likelihood of CED, considering that the 20–35-year age group is generally considered the most favorable for reproduction.

The absence of a significant association between maternal age and CED should be interpreted with caution. Several factors that may influence maternal nutritional status, such as dietary intake, socioeconomic conditions, educational background, and other potential confounding variables, were not included in the present analysis. Nutritional knowledge in particular has previously been shown to be significantly associated with nutritional status among pregnant women (15). Future studies are recommended to incorporate these factors to provide a more comprehensive understanding of the determinants of CED among pregnant women. Furthermore, information regarding local dietary practices, food

allocation patterns within households, and the coverage of food assistance programs was not collected in the present study. Therefore, the potential contribution of these factors to maternal nutritional status in the Bontonmpo II area could not be evaluated and should be explored in future research.

Conclusion

Maternal parity was significantly associated with the occurrence of Chronic Energy Deficiency (CED) among pregnant women in the working area of the Bontonmpo II Community Health Center. Primiparous women were found to be more vulnerable to CED than women with previous childbirth experience and had 4.70 times greater odds of experiencing CED. In contrast, maternal age was not significantly associated with CED incidence. Although no significant association was identified, the largest number of CED cases was observed among women aged 21–30 years. In addition, the prevalence of CED in the study area was notably high (84.0%), indicating that maternal undernutrition remains a major public health concern requiring strengthened nutritional interventions among pregnant women.

Healthcare workers are encouraged to strengthen nutrition education and early screening programs for Chronic Energy Deficiency (CED), particularly among women experiencing their first pregnancy. Routine nutritional assessment through Mid-Upper Arm Circumference (MUAC) measurements should be conducted during antenatal care visits to facilitate early detection and management of CED. In addition, nutrition counseling should be integrated into preconception, premarital, and antenatal health services to improve maternal knowledge regarding nutritional requirements before and during pregnancy. Special attention should be given to primiparous women, who were identified as a vulnerable group in this study. Future research is recommended to explore additional factors associated with CED, including maternal knowledge, dietary intake, anxiety related to pregnancy, socioeconomic conditions, and other potential determinants using larger sample sizes and more comprehensive study designs.

Maternal parity was significantly associated with the occurrence of Chronic Energy Deficiency (CED) among pregnant women in the working area of the Bontonmpo II Community Health Center. Primiparous women were found to be more vulnerable to CED than women with previous childbirth experience and had 4.70 times greater odds of experiencing CED. In contrast, maternal age was not significantly associated with CED incidence. Although no significant association was identified, the largest number of CED cases was observed among women aged 21–30 years. In addition, the prevalence of CED in the study area was notably high (84.0%), indicating that maternal undernutrition remains a major public health concern requiring strengthened nutritional interventions among pregnant women.

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