

Parity and the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women: A Case-Control Study

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ABSTRACT

Background: Chronic Energy Deficiency (CED) remains a significant nutritional challenge among pregnant women in developing countries, including Indonesia. CED is defined as a mid-upper arm circumference (MUAC) below 23.5 cm and poses serious risks to maternal and neonatal health outcomes. Parity, defined as the number of live births a woman has had, has been theoretically linked to nutritional depletion and an increased risk of CED. However, evidence on this relationship is inconsistent across different populations and settings. This study aimed to determine the relationship between parity and the incidence of CED in pregnant women at the Pasar Atas Village Midwife Practice, Bangko, Jambi, Indonesia.

Methods: A case-control study with a 1:1 ratio was conducted using secondary data from the antenatal care register of Pasar Atas Village Midwife Practice for 2023–2024. A total of 90 pregnant women were enrolled: 45 cases (CED, MUAC <23.5 cm) and 45 matched controls (non-CED, MUAC ≥23.5 cm). Controls were matched to cases by maternal age. Parity was categorized as at-risk (≥3 deliveries) and not-at-risk (<3 deliveries). Data were analyzed using univariate and bivariate (chi-square) analyses with SPSS. Statistical significance was set at $p < 0.05$.

Results: Of all 90 respondents, 50% experienced CED. The majority of respondents had non-risk parity (96.7%, $n=87$). Among the at-risk parity group ($n=3$), all were in the non-CED group. Chi-square analysis showed no statistically significant association between parity and CED incidence ($p\text{-value}=0.240$).

Conclusion: Parity was not significantly associated with CED among pregnant women in this study. The predominance of non-risk parity in the population may have limited the statistical power to detect an association. Other determinants such as pre-pregnancy weight, dietary intake, and inter-pregnancy interval may play more important roles in CED risk and should be further investigated.

Keywords: parity, chronic energy deficiency, CED, pregnant women, case-control

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INTRODUCTION

Chronic Energy Deficiency (CED) in pregnant women is a condition characterized by prolonged nutritional insufficiency, clinically identified through mid-upper arm circumference (MUAC) measurement below 23.5 cm. CED poses serious risks to both maternal and fetal health, including anemia, postpartum hemorrhage, intrauterine growth restriction, low birth weight (LBW), preterm birth, and increased maternal and infant mortality rates.

Globally, the prevalence of CED among pregnant women in developing countries ranges from 15% to 47%. Among South and Southeast Asian nations, Bangladesh records the highest prevalence (47%), followed by Indonesia (40%), India (35.5%), and Thailand (15%). In Indonesia, the national prevalence of CED among pregnant women was 16.9% based on the 2023 National Health Survey. The Indonesian government has set a target to reduce CED prevalence by 1.5% annually to achieve a 10% rate by 2024.

At the provincial level, data from the Jambi Provincial Health Office in 2023 recorded 5,784 cases of CED among 69,322 pregnant women (8.34%). In Merangin Regency, the prevalence increased dramatically from 9.09% in 2023 to 42.95% in 2024, indicating a worsening trend that demands urgent attention. At the study site, the Pasar Atas Village Midwife Practice recorded 26 CED cases (16.66%) out of 156 pregnant women in 2023 and 19 cases (15.70%) out of 121 pregnant women in 2024.

CED is caused by multiple interacting factors, including inadequate dietary intake, infection, maternal age, parity, inter-pregnancy interval, family income, education, and nutritional knowledge. Among these, parity — defined as the number of live births — has been theoretically associated with CED. High parity is thought to progressively deplete maternal nutritional reserves, impair uterine vascularity, and reduce the mother's capacity to recover between pregnancies. Mothers with three or more prior deliveries are considered to be at elevated risk.

However, findings across studies remain inconsistent. While Faozi et al. (2022) and Muliani et al. (2024) found significant associations between high parity and CED ($p < 0.05$), other studies conducted in different settings have not confirmed this relationship. These discrepancies may reflect differences in population characteristics, study design, and sample size.

This study was conducted using a case-control design to evaluate the relationship between parity and CED incidence among pregnant women attending the Pasar Atas Village Midwife Practice in Bangko, Jambi Province, Indonesia. The findings aim to contribute to evidence-based maternal nutrition interventions at the primary healthcare level.

METHODS

2.1 Study Design and Setting

This study employed an analytical retrospective case-control design. Data were obtained from the antenatal care (ANC) register of the Pasar Atas Village Midwife Practice (Bidan Kelurahan Pasar Atas Rizki Andriyani) in Bangko, Merangin Regency, Jambi Province, Indonesia, covering the period January 2023 to December 2024. The study was conducted in October 2025.

2.2 Population and Sample

The study population consisted of all pregnant women ($n=277$) who attended ANC visits at the study site across all trimesters during 2023–2024. Cases were pregnant women with CED (MUAC < 23.5 cm), and controls were pregnant women without CED (MUAC ≥ 23.5 cm).

Sample size was calculated using the Lemeshow case-control formula with an odds ratio (OR) of 2.841 derived from prior literature, a significance level of 90% ($Z\alpha=1.64$), and statistical power of 80% ($Z\beta=0.84$), yielding a minimum of 44 subjects per group. Given the limited number of CED cases, all 45 identified cases were included (total sampling), and 45 controls were selected by matching on maternal age at a 1:1 ratio, resulting in a total sample of 90 participants.

2.3 Inclusion and Exclusion Criteria

Cases were pregnant women attending ANC at the study site in 2023–2024 with MUAC < 23.5 cm. Controls were pregnant women at the same site with MUAC ≥ 23.5 cm. Both groups were required to have complete medical record data. Pregnant women with incomplete register data were excluded from the study.

2.4 Variables and Measurement

The dependent variable was CED status, measured by MUAC: KEK (MUAC < 23.5 cm) and non-CED (MUAC ≥ 23.5 cm), on an ordinal scale. The independent variable was parity, categorized as at-risk (≥ 3 live births) and not-at-risk (< 3 live births), also on an ordinal scale. The confounding variable was maternal age, controlled through matching. All data were extracted from the secondary register using a structured data extraction checklist.

2.5 Data Analysis

Data were processed through editing, coding, entry, scoring, tabulating, and cleaning using SPSS software. Univariate analysis described the frequency distribution of CED and parity. Bivariate analysis used the chi-square test to assess the association between parity and CED, with statistical significance defined as $p < 0.05$. Odds ratios (OR) with 95% confidence intervals were also calculated.

2.6 Ethical Considerations

This study adhered to the ethical principles of beneficence, confidentiality, and justice. Patient identifiers were anonymized using initials, and data were used solely for academic purposes. Ethical clearance was obtained from the STIKes Merangin Research Ethics Committee.

RESULTS

3.1 Univariate Analysis

Table 1 presents the distribution of CED among the 90 study participants. The sample was evenly split: 45 participants (50%) had CED and 45 participants (50%) did not have CED, by design of the case-control study.

Table 1. Frequency Distribution of CED among Pregnant Women at Pasar Atas Village Midwife Practice, 2023–2024 (n=90)

No.	CED Status	Frequency (n)	Percentage (%)
1	CED (MUAC <23.5 cm)	45	50.0
2	Non-CED (MUAC ≥23.5 cm)	45	50.0
	Total	90	100.0

Table 2 shows the distribution of parity. The overwhelming majority of respondents (n=87, 96.7%) had non-risk parity (<3 live births), while only 3 respondents (3.3%) had at-risk parity (≥3 live births).

Table 2. Frequency Distribution of Parity among Pregnant Women at Pasar Atas Village Midwife Practice, 2023–2024 (n=90)

No.	Parity Category	Frequency (n)	Percentage (%)
1	At-risk (≥3 deliveries)	3	3.3
2	Not-at-risk (<3 deliveries)	87	96.7
	Total	90	100.0

3.2 Bivariate Analysis

Table 3 presents the cross-tabulation of parity and CED status. All three respondents with at-risk parity (≥3 deliveries) were in the non-CED group (6.7%), while respondents with non-risk parity were found in both CED (100%) and non-CED groups (93.3%). Chi-square analysis revealed no statistically significant association between parity and CED incidence (p-value=0.240).

Table 3. Relationship Between Parity and CED Incidence among Pregnant Women at Pasar Atas Village Midwife Practice, 2023–2024

Parity	Non-CED		CED		Total	p-value	
	n	%	n	%	n	%	
At-risk (≥3)	3	6.7	0	0.0	3	3.3	0.240
Not-at-risk (<3)	42	93.3	45	100.0	87	96.7	
Total	45	50.0	45	50.0	90	100.0	

Chi-square test; significance level $p < 0.05$

DISCUSSION

The findings of this study indicate that parity is not significantly associated with CED among pregnant women at the Pasar Atas Village Midwife Practice in Bangko, Jambi (p-value=0.240). This result is contrary to the theoretical framework positing that repeated pregnancies progressively deplete maternal nutrient reserves, thereby increasing CED risk.

A key methodological factor influencing these findings is the extreme distributional imbalance in the parity variable: 96.7% of respondents had non-risk parity (<3 deliveries), leaving only three participants in the at-risk group. This severely limited the statistical power to detect any potential association. In case-control studies, the ability to identify associations between exposure and outcome depends on sufficient variation in the exposure variable. When a risk factor has very low prevalence in the study population, chi-square tests may yield non-significant results even when a biological association exists.

The near-absence of grand multipara (high-parity) respondents in this sample likely reflects the demographic profile of Bangko's urban population, where family planning programs and shifting reproductive norms have contributed to smaller family sizes. This is an important contextual factor that limits the generalizability of the findings to rural or higher-parity populations.

These results align with the premise that CED in this population is not primarily driven by parity but by other determinants. The discussion data indicate that pre-pregnancy nutritional status and weight gain during pregnancy play a dominant role. Ibu hamil with a pre-pregnancy BMI below 18.5 kg/m² are at significantly elevated risk for CED regardless of parity. Inadequate weight gain during pregnancy — particularly below 9 kg — is also strongly associated with CED. Dietary intake patterns, food insecurity, low income, and limited nutritional knowledge compound this risk.

By contrast, several prior studies have found significant associations between high parity and CED. Faozi et al. (2022) reported a significant association ($p=0.01$) in Sumedang, and Muliani et al. (2024) found a similar result ($p=0.002$) in Aceh Besar, where the sample included a larger proportion of grand multipara respondents. Similarly, Humairoh et al. (2023) confirmed that parity >3 was associated with CED in South Sumatra. These differences underscore the importance of population heterogeneity and the need for locally contextualized studies.

Interventions to address CED in Bangko should therefore be broadened beyond parity-focused screening. Emphasis on comprehensive nutritional assessment from the preconception stage, routine MUAC screening at every ANC visit, and targeted food supplementation (PMT) programs remains essential. Strengthening nutrition education to improve dietary diversity and caloric adequacy in pregnancy, particularly for mothers with low pre-pregnancy BMI, is recommended.

This study has several limitations. The secondary data design precluded the assessment of additional confounders such as dietary intake, gestational age at MUAC measurement, inter-pregnancy interval, and socioeconomic variables. The small proportion of at-risk parity cases significantly limited statistical power. Future studies should employ prospective designs, larger and more heterogeneous samples, and multivariate analyses to control for confounding variables and yield more robust conclusions.

CONCLUSION

This case-control study found no statistically significant relationship between parity and the incidence of Chronic Energy Deficiency (CED) among pregnant women at the Pasar Atas Village Midwife Practice, Bangko, Jambi, Indonesia ($p\text{-value}=0.240$). The predominance of non-risk parity in the study population likely limited the power to detect an association. CED in this setting may be more strongly influenced by pre-pregnancy nutritional status, dietary intake, and weight gain patterns during pregnancy. Healthcare providers at the Bangko Community Health Center and village midwife practices are encouraged to strengthen comprehensive nutritional surveillance and targeted food supplementation programs for pregnant women, irrespective of parity status.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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