



## The Association Between Chronic Energy Deficiency in Pregnant Women and the Incidence of Low Birth Weight Infants

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### ABSTRACT

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Chronic Energy Deficiency (CED) in pregnant women remains a significant public health problem affecting pregnancy outcomes, particularly Low Birth Weight (LBW). Inadequate maternal energy and protein intake can impair fetal growth and increase the risk of LBW. This study aimed to analyze the association between CED and the incidence of LBW in the working area of Cigeureung Health Center. A quantitative analytical study with a cross-sectional design was conducted involving 170 pregnant women selected through total sampling. Data were obtained from maternal nutritional status records and infant birth weight documentation. Univariate analysis described the distribution of CED and LBW, while bivariate analysis using the Chi-square test assessed the association at a significance level of  $p < 0.05$ . The results showed that 15.88% of pregnant women experienced CED and 5.88% of infants were born with LBW. All LBW cases occurred among mothers with CED, with a statistically significant association ( $p = 0.000$ ). These findings provide context-specific evidence highlighting a complete overlap between maternal CED and LBW, emphasizing the urgent need for early mid-upper arm circumference (MUAC) based screening and targeted nutritional interventions in primary healthcare settings.

### INTRODUCTION

Maternal and neonatal health remain critical public health concerns globally and nationally, particularly in developing countries. One of the key indicators reflecting the quality of maternal and neonatal health is the incidence of low birth weight (LBW), defined as a birth weight of less than 2.500 grams regardless of gestational age. LBW represents the cumulative impact of various risk factors, including maternal nutritional status, maternal disease conditions, infections, and socioeconomic and environmental determinants. Globally, LBW continues to contribute significantly to neonatal morbidity and mortality, and it remains a persistent public health challenge requiring comprehensive and evidence-based interventions <sup>[1]</sup>.

In Indonesia, LBW remains a significant concern in maternal and child health programs. Based on the 2018 Basic Health Research (Riskesdas), the prevalence of LBW was reported at 6.2%, and it continues to be one of the leading causes of neonatal mortality as highlighted in national health reports <sup>[2]</sup>. Although these data provide an overview of the magnitude of the problem, more recent local data



are needed to reflect current conditions, particularly considering changes in maternal health services and nutritional programs up to 2025. LBW not only contributes to short-term complications such as infection and neonatal death but also has long-term consequences, including impaired growth and increased risk of chronic diseases in adulthood<sup>[3]</sup>.

Among the various determinants of LBW, maternal nutritional status plays a crucial role. One of the most common nutritional problems in pregnant women is chronic energy deficiency (CED), which reflects long-term inadequate intake of energy and protein. CED is commonly assessed using mid-upper arm circumference (MUAC), with a cutoff value of less than 23.5 cm<sup>[4]</sup>. Pregnant women with CED have limited nutritional reserves and are more vulnerable to complications such as anemia, preterm birth, and impaired fetal growth, which may ultimately result in LBW<sup>[5]</sup>.

From a pathophysiological perspective, chronic energy deficiency during pregnancy leads to reduced maternal energy and protein stores, resulting in suboptimal nutrient transfer to the fetus through the placenta. This condition may impair uteroplacental blood flow and disrupt the transport of essential nutrients, ultimately causing intrauterine growth restriction (IUGR). Prolonged growth restriction during fetal development significantly increases the likelihood of low birth weight at birth<sup>[6]</sup>. These mechanisms demonstrate that maternal nutritional deficiencies directly affect fetal growth and birth outcomes

Although LBW is a multifactorial condition, this study specifically focuses on CED as the primary independent variable due to its strong biological plausibility and its modifiable nature. From a pathophysiological perspective, CED leads to reduced maternal energy stores and impaired placental nutrient transfer, which directly affects fetal growth and increases the risk of intrauterine growth restriction (IUGR)<sup>[6]</sup>. Furthermore, previous studies have consistently demonstrated that maternal CED is strongly associated with LBW incidence, making it a key target for preventive interventions at the primary healthcare level<sup>[7][8][9][10]</sup>. Therefore, focusing on CED provides a strategic and actionable approach for early detection and intervention in maternal health programs.

At the regional level, this issue is particularly relevant in West Java Province, which has a relatively high prevalence of low birth weight. The 2022 West Java Health Profile reported an LBW prevalence of 7.4%, with most cases occurring among mothers with inadequate nutritional status, including CED. Tasikmalaya City faces similar challenges due to socioeconomic disparities and limited access to nutrition-related information. In the working area of Cigeureung Health Center, cases of chronic energy deficiency among pregnant women and low birth weight infants remain prevalent despite ongoing government nutrition programs<sup>[6][11]</sup>.

Despite the importance of this issue, studies specifically examining the association between chronic energy deficiency in pregnant women and the incidence of low birth weight in the working area of Cigeureung Health Center are still limited. Local evidence is essential to develop targeted and context-specific interventions that consider regional characteristics, dietary patterns, education levels, and access to healthcare services. Therefore, this study aims to examine the association between chronic energy deficiency in pregnant women and the incidence of low birth weight infants in the working area of Cigeureung Health Center, Nagarasari.

## METHOD

The study population consisted of all pregnant women who gave birth in Kelurahan Nagarasari, the working area of Cigeureung Health Center, in 2024. A total of 170 mothers met the population criteria. Total sampling was applied, in which all eligible population members were included as research subjects to ensure comprehensive data coverage. This study employed an analytical observational design with a cross-sectional approach, as the data were obtained from secondary sources without follow-up or direct subject tracing. The study aimed to examine the association between chronic energy deficiency (CED) in pregnant women and the incidence of low birth weight (LBW) infants .





The independent variable in this study was chronic energy deficiency, defined as a mid-upper arm circumference (MUAC) of <23.5 cm, while the dependent variable was low birth weight, defined as a birth weight of <2.500 grams regardless of gestational age. Data were collected using a documentation technique by reviewing maternal and neonatal medical records. The research instrument used was a structured data extraction sheet designed to systematically record relevant variables from medical records.

Data collection was conducted from September to October 2025. Data analysis was performed using computerized statistical software. Univariate analysis was conducted to describe the frequency distribution of CED and LBW. Bivariate analysis was performed using the Fisher Exact Test, considering that the expected cell counts in the contingency table were less than five. Statistical significance was determined at a 95% confidence level with  $\alpha = 0.05$ .

Ethical approval for this study was obtained from the Health Research Ethics Committee of Poltekkes Kemenkes Tasikmalaya. All data were anonymized, and confidentiality of respondents was maintained throughout the research process.

## RESULT AND DISCUSSION

This study involved a total of 170 pregnant women in the working area of Puskesmas Cigeureung. The results are presented descriptively and analytically to illustrate the distribution of Chronic Energy Deficiency (CED) among pregnant women, the incidence of Low Birth Weight (LBW), and the relationship between maternal CED and LBW incidence.

Table 1. Frequency distribution of chronic energy deficiency (CED) among pregnant women

CED Occurrence	Frequency (n)	Percentage (%)
CED	27	15.88
Non CED	143	84.12
Total	170	100

Based on Table 1, most pregnant women did not experience Chronic Energy Deficiency (CED), with 143 respondents (84.12%), while 27 respondents (15.88%) were categorized as having CED. This finding indicates that the majority of pregnant women had relatively good nutritional status. However, the proportion of CED cases remains clinically important, as maternal undernutrition poses risks to both pregnancy outcomes and fetal growth.

Chronic Energy Deficiency reflects a prolonged inadequacy of energy and protein intake, leading to reduced maternal energy reserves. According to the Ministry of Health of the Republic of Indonesia (2022), CED in pregnant women is identified by a mid-upper arm circumference (MUAC) of less than 23.5 cm and is associated with adverse outcomes such as preterm birth and low birth weight. The CED prevalence of 15.88% observed in this study exceeds the recommended threshold of less than 10%, suggesting the need for continued nutritional surveillance and intervention <sup>[12]</sup>.

The persistence of CED may be influenced by inadequate dietary intake, limited nutritional knowledge, and socioeconomic constraints. Families with lower income tend to consume foods of lower nutritional quality, which directly affects maternal nutritional status<sup>[12]</sup>. In addition, irregular eating patterns, low consumption of animal protein, and insufficient intake of micronutrients such as iron and folic acid may further contribute to maternal undernutrition.



Table 2. Frequency distribution of low birth weight (LBW) incidence

LBW Occurrence	Frequency(n)	Percentage (%)
LBW	10	5.88
Non-LBW	160	94.12
Total	170	100

Table 2 shows that most infants were born with normal birth weight, accounting for 160 babies (94.12%), while 10 infants (5.88%) were classified as Low Birth Weight (LBW). Although the prevalence of LBW in this study is relatively low, it remains a public health concern due to its association with increased neonatal morbidity and mortality.

Low Birth Weight, defined as a birth weight of less than 2.500 grams regardless of gestational age, is a key indicator of maternal and neonatal health (Ministry of Health of the Republic of Indonesia, 2022). The relatively low LBW prevalence may reflect adequate antenatal care coverage and nutritional monitoring in the study area. Nevertheless, the presence of LBW cases suggests that certain maternal risk factors, including CED, anemia, and short birth spacing, may still affect pregnancy outcomes.

Previous studies have shown that maternal nutritional status plays a crucial role in fetal growth. Salam (2021) reported that poor maternal nutrition limits nutrient and oxygen supply to the fetus, resulting in impaired intrauterine growth. Similar findings were reported by Sumiati et al. (2021), who identified maternal undernutrition and anemia as dominant contributors to LBW incidence in several regions of West Java [8].

Table 3. Analysis of the Relationship between chronic energy deficiency (CED) in pregnant women and the incidence of low birth weight (LBW)

CED	LBW						<i>p-value*</i>
	LBW		Non-LBW		Total		
	n	%	n	%	n	%	
CED	10	5.88	17	10.00	27	15.88	0,000
Non CED	0	00.0	143	84.12	143	84.12	
Total	10		160		170		

Table 3 presents the analysis of the relationship between Chronic Energy Deficiency (CED) in pregnant women and the incidence of Low Birth Weight (LBW). The results of the Chi-square test indicate a statistically significant association between maternal CED and LBW incidence, with a *p*-value of 0.000, which is lower than the significance level of 0.05. This finding demonstrates that maternal nutritional status, particularly chronic energy deficiency, has a meaningful influence on birth weight outcomes.

Descriptively, all LBW cases identified in this study occurred among mothers who experienced CED during pregnancy. Of the 27 pregnant women classified as having CED, 10 infants (5.88%) were born with low birth weight, while none of the infants born to mothers without CED were categorized as LBW. This distribution indicates a strong and direct relationship between maternal undernutrition and impaired fetal growth, emphasizing that inadequate maternal energy and protein intake substantially increases the risk of delivering an LBW infant.

From a biological perspective, chronic energy deficiency reflects prolonged insufficiency of energy and protein intake, which leads to reduced maternal nutritional reserves. This condition disrupts placental nutrient transfer and limits the supply of essential nutrients and oxygen to the fetus. As a





result, intrauterine growth may be restricted, leading to lower fetal weight at birth. Putri and Salsabila (2023) explained that fetal development is entirely dependent on maternal nutritional status; therefore, chronic deficits in maternal energy intake compromise tissue formation and fetal weight gain [7].

The findings of this study are consistent with previous research demonstrating a strong association between CED and LBW. Sumiati et al. (2021) reported that pregnant women with CED were three times more likely to deliver LBW infants compared to those with adequate nutritional status [8]. Their study highlighted that long-term energy deficiency during pregnancy directly affects placental function and fetal growth. Furthermore, CED may coexist with other conditions such as anemia and metabolic disturbances, which further exacerbate fetal growth restriction and increase the likelihood of LBW.

According to the Ministry of Health of the Republic of Indonesia (2022), CED is one of the primary maternal risk factors contributing to LBW incidence in Indonesia, alongside anemia and low socioeconomic status. CED is frequently observed among pregnant women with unbalanced dietary intake, short interpregnancy intervals, and limited access to regular nutritional monitoring and antenatal care services. These factors collectively increase vulnerability to adverse pregnancy outcomes, particularly LBW.

From a public health and maternal care perspective, the significant association observed in this study underscores the importance of routine nutritional screening for pregnant women. Regular measurement of mid-upper arm circumference (MUAC), monitoring of gestational weight gain, and early identification of women at risk of CED are essential preventive strategies. Promotive and preventive interventions, such as supplementary feeding programs for pregnant women, balanced nutrition education, and increased awareness of adequate energy and protein intake, are crucial in reducing the prevalence of CED.

In addition, family involvement, particularly spousal support, plays an important role in ensuring adequate maternal nutrition during pregnancy. Support from family members can facilitate better dietary practices and adherence to nutritional recommendations, thereby reducing the risk of CED and its adverse effects on fetal outcomes.

In conclusion, this study confirms that Chronic Energy Deficiency in pregnant women is significantly associated with the incidence of Low Birth Weight in the working area of Puskesmas Cigeureung. Pregnant women with CED are at a substantially higher risk of delivering LBW infants compared to those with normal nutritional status. Therefore, strengthening maternal nutrition interventions, enhancing antenatal nutritional monitoring, and implementing community-based preventive programs are essential to improve maternal and neonatal health outcomes and to reduce the incidence of LBW.

## CONCLUSION

Based on the results of this study on the relationship between Chronic Energy Deficiency (CED) in pregnant women and the incidence of Low Birth Weight (LBW) in the working area of Puskesmas Cigeureung, it can be concluded that maternal nutritional status has a significant impact on birth outcomes. The findings demonstrate a statistically significant association between CED and LBW incidence, as indicated by the Chi-square test result with a p-value of 0.000. All cases of LBW occurred among mothers who experienced CED, while no LBW cases were found among mothers with normal nutritional status.

These results indicate that pregnant women with Chronic Energy Deficiency are at a substantially higher risk of delivering infants with low birth weight compared to those with adequate nutritional status. Prolonged insufficiency of energy and protein intake during pregnancy can impair fetal growth through reduced nutrient and oxygen transfer, ultimately affecting birth weight. Therefore,



early detection and management of CED during pregnancy are essential to prevent adverse neonatal outcomes.

This study highlights the importance of strengthening promotive and preventive efforts in maternal nutrition, including routine nutritional screening, nutrition education, and supplementary feeding programs for pregnant women at risk of CED. Improving maternal nutritional status through continuous antenatal care and community-based interventions is expected to contribute to the reduction of Low Birth Weight incidence and to enhance overall maternal and neonatal health outcomes.

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