

DIFFERENCES IN MUAC AND BODY WEIGHT OF CED PREGNANT WOMEN BEFORE AND AFTER PMT

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Abstract

Pregnancy requires special attention to maternal nutrition and health. Chronic Energy Deficiency (CED), a condition caused by prolonged inadequate energy intake, indicate by a Mid-Upper Arm Circumference (MUAC) of less than 23.5 cm. In Indonesia, the prevalence of CED among pregnant women decreased from 17.3% to 9.7% in 2020, and further to 8.7% in 2022, successfully surpassing the national target of 14.5%. This study aimed to evaluate the impact of supplementary feeding (PMT) on the nutritional status of pregnant women suffering from CED using MUAC and body weight as indicators. Conducted in the Sarang 1 Public Health Center, Rembang Regency, this quasi-experimental research employed a one-group pretest-posttest design without a control group. A total of 52 pregnant women with CED participated, selected through purposive sampling. The intervention involved providing PMT according to the Ministry of Health's guidelines, implemented over nine cycles from June to December 2024. Each cycle included ten days of food provision consisting of main meals and snacks. Nutritional measurements were taken before and after the three-month intervention. Results showed a statistically significant increase in average MUAC from 21.71 cm to 23.99 cm ($p \leq 0.0001$) and body weight from 42.86 kg to 50.02 kg ($p \leq 0.0001$). These findings indicate that PMT effectively improves the nutritional status of CED pregnant women. The study supports continued implementation and evaluation of PMT programs in public health settings as a strategy to combat maternal malnutrition and promote fetal development.

***Keywords:** Chronic Energy Deficiency, Mid-Upper Arm Circumference, Body Weight, Pregnancy, Supplementary Feeding*

INTRODUCTION

Pregnancy is a critical period in a woman's life that requires special attention to maternal nutrition and health. A widespread nutritional issue among expectant mothers is Chronic Energy Deficiency (CED), a condition caused by consistently low energy intake over

time, which can lead to various health problems. In pregnant women, CED is typically identified when the Mid-Upper Arm Circumference (MUAC) measures less than 23.5 cm. This condition can harm both the mother and the baby, increasing the risks of preterm birth, low birth weight, anemia, and even maternal and infant death (Novitasari, 2019).

As of 2016, the World Health Organization (WHO) reported that the global prevalence of Chronic Energy Deficiency (CED) among pregnant women was 30.1%, with Bangladesh having the highest rate at 47%. Indonesia ranked fourth among countries with the highest CED prevalence (Mlotshwa et al., 2017). In Indonesia, the 2018 Basic Health Research (Riskesdas) reported that 17.3% of pregnant women were affected by Chronic Energy Deficiency (CED). However, data from the Ministry of Health of the Republic of Indonesia, indicated a decrease to 9.7% in 2020, and further to 8.7% in 2022, which successfully met the national target of 14.5% (MoH RI, 2022).

Despite notable advancements, the prevalence of Chronic Energy Deficiency (CED) among pregnant women continues to represent a substantial public health concern, indicative of suboptimal maternal nutritional status. The etiology of CED is multifaceted, encompassing both direct and indirect factors. The main direct cause is an insufficient intake of foods rich in energy and protein, combined with a higher risk of infectious diseases. Indirect causes involve personal and socioeconomic factors such as maternal age, number of previous pregnancies, education, nutritional awareness, employment status, household income, food spending, access to nutritious food, and how often antenatal care (ANC) services are utilized (Wubie et al., 2020). Together, these factors contribute to the ongoing presence and seriousness of CED among pregnant women (Wati et al., 2024). A primary intervention for enhancing the nutritional status of pregnant women experiencing Chronic Energy Deficiency (CED) is the provision of Supplementary Food, also known as PMT (Pemberian Makanan Tambahan). The type of supplementary food provided is regulated by the Minister of Health Regulation No. 51 of 2016 on the Standards for Nutritional Supplement Products. It consists of biscuits enriched with protein, linoleic acid, carbohydrates, and fortified with 11 vitamins and 7 minerals (MoH RI, 2019).

At the national level, the coverage of PMT provision for pregnant women with CED in 2019 was 90.52%, which fell short of the 2019 Strategic Plan (Renstra) target of 95%. The provinces with the highest PMT coverage were West Kalimantan, South Sumatra, and Gorontalo, while the lowest was West Nusa Tenggara (71.36%). Fourteen provinces failed to meet the 2019 Renstra target, including Central Java, which ranked 22nd with a coverage rate of 93.55% (MoH RI, 2019). Therefore, we are interested in studying the differences in nutritional status among pregnant women with chronic energy deficiency (CED) based on MUAC and body weight measurements before and after the provision of supplementary feeding (PMT) in the working area of Sarang 1 Public Health Center, Central Java.

METHODOLOGY

This study adopted a quasi-experimental design, specifically a one-group pre-test and post-test methodology without a control group, to assess the effects of Supplementary Feeding (PMT) on Mid-Upper Arm Circumference (MUAC) and body weight in pregnant women diagnosed with Chronic Energy Deficiency (CED). The study was conducted in the operational area of Sarang 1 Primary Health Center, Rembang Regency, from May to July 2025, utilizing secondary data. These data were obtained from MUAC and body weight measurements recorded for pregnant women with CED who received PMT during integrated health post (Posyandu) activities or during individual visits to the health center.

The supplementary foods provided complied with the guidelines stipulated in the Decree of the Minister of Health of the Republic of Indonesia No. HK.01.07/Menkes/4631/2021. PMT was implemented over nine cycles between June and December 2024, with each cycle lasting 10 days. During each cycle, participants received two main meals and eight snack portions. The intervention lasted for three months, after which MUAC and body weight were reassessed. The study population comprised pregnant women with CED within the working area of Sarang 1 Primary Health Center. Inclusion criteria include age ≥ 18 years, first or second trimester of pregnancy, willingness to participate in the study, ability to communicate effectively. A purposive sampling technique was employed to select 52 participants who met the eligibility criteria.

The variables in this study included the treatment variable, namely the independent variable, which was PMT intake, and the dependent variables, MUAC and body weight of pregnant women. Data analysis was conducted using IBM SPSS version 20. A normality test using the Kolmogorov-Smirnov method was performed prior to hypothesis testing. Body weight data, showed a normal distribution, were analyzed using the paired t-test. In contrast, the Wilcoxon signed-rank test was used for the MUAC data because it was not normally distributed.

RESULT AND DISCUSSION

RESULT

This study involved 52 pregnant women with CED with a mean age of 23 years, ranging from 19 to 33 years. The average body weight of the participants at baseline was 42.86 kg, which increased to 50.02 kg after receiving the PMT. Meanwhile, the average MUAC before the intervention was 21.71 cm, increasing to 23.99 cm following the PMT.

Table 1. Subject Characteristics (n = 52)

Variable	Mean \pm SD	Median (Min - Max)
Age	24,19 \pm 3,54	23,00 (19,00 - 33,00)
MUAC		
Before PMT	21,7 \pm 1,37	22,00 (17,05 - 23,50)
After PMT	23,99 \pm 1,64	23,50 (20,20 - 30,00)
Body Weight		
Before PMT	42,86 \pm 4,67	42,50 (33,50 - 52,00)
After PMT	50,02 \pm 6,51	50,60 (37,60 - 68,50)

Table 2. Analysis of Mean Differences in Body Weight and MUAC of Subjects Before and After PMT

Variable	Mean difference	SD	95% CI	p value
BW before - after PMT	7,16	5,02	5,76 - 8,56	0,0001*
MUAC before - after PMT	2,28	1,97	1,73 - 2,83	0,0001*

Table 1 shows that the mean initial MUAC of pregnant women with CED was 21.71 cm, while the median was 22.00 cm. After the PMT intervention, both the mean and median MUAC

increased to 23.99 cm and 23.50 cm, respectively. There was an average increase of 2.28 cm in MUAC before and after the provision of PMT, which was statistically significant ($p \leq 0.0001$). The distribution of the analysis results is presented in **Figure 1**.

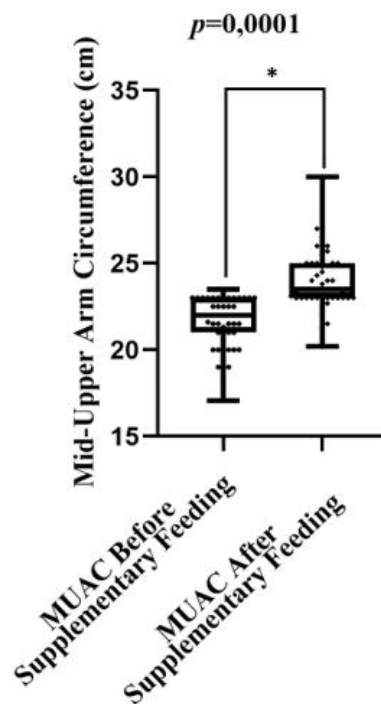


Figure 1. Box Plot Analysis of the Difference in MUAC Before and After PMT

Table 1 also shows that the median initial body weight of pregnant women with CED was 42.50 kg, while the mean was 42.86 kg. After receiving the PMT intervention, the median and mean body weights increased to 50.60 kg and 50.02 kg, respectively. The mean difference in body weight before and after PMT was an increase of 7.16 kg, which was statistically significant ($p \leq 0.0001$). The complete analysis results are presented in **Figure 2**.

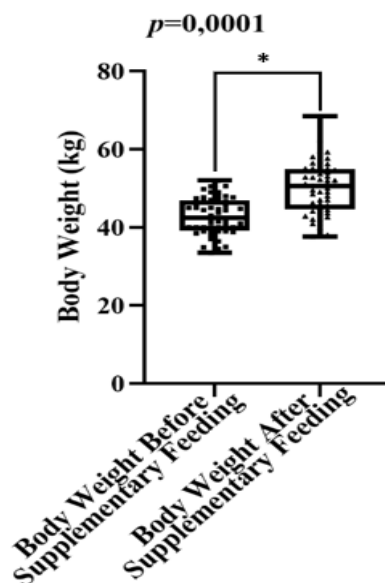


Figure 2. Box Plot Analysis of the Difference in Body Weight Before and After PMT

DISCUSSION

This study's findings demonstrate a significant correlation between three months of Supplementary Food (PMT) provision and an improvement in the nutritional status of pregnant women with Chronic Energy Deficiency (CED), as evidenced by their Mid-Upper Arm Circumference (MUAC) measurements ($p=0.0001$). These findings align with Utami's (2018) research, which found an influence of PMT provision on increasing MUAC in CED pregnant women in Sleman Regency. Similar research by Pertiwi et al. (2020) also showed a significant increase in MUAC ($p=0.000$) in CED pregnant women who received PMT at Puskesmas Plupuh. However, this contrasts with cross-tabulation data from Nusa Tenggara Province, which found no effect of PMT on the incidence of CED in pregnant women (Selamet et al., 2024).

Mid-Upper Arm Circumference (MUAC) is used as an indicator to evaluate a mother's nutritional status, particularly during pregnancy. This measurement reflects the body's fat reserves and is closely linked to long-term nutrition. Pregnant women diagnosed with Chronic Energy Deficiency (CED) are classified as high-risk, given that this condition can disrupt crucial physiological functions vital for optimal fetal development. One major consequence of CED is impaired placental development and function. Structural changes in the placenta can limit the transfer of nutrients, oxygen, and maternal hormones to the fetus. Additionally, reduced blood volume may force the heart to work harder to maintain circulation, including to the placenta. As a result, placental blood flow may be insufficient, negatively affecting fetal growth (Mulyono et al., 2024).

The results of this study also demonstrate a significant relationship between 3 months of PMT provision and an increase in body weight among pregnant women with CED ($p=0.000$). These findings are consistent with Tirtasari et al. (2025) research, which reported an influence of PMT provision on body weight gain in CED pregnant women in the working area of Puskesmas Kronjo, Tangerang Regency. Similar studies by Bakri (2021) also showed significant results ($p=0.000$), as did research by Juliasari and Ana (2022) with a p-value of 0.001. Weight gain is a crucial indicator during pregnancy. Pregnant women require optimal energy and nutrient intake because the fetus absorbs nutrients from the food consumed by the mother to support its growth and development in the womb. In the first trimester, micronutrient intake is vital for the formation of the fetal central nervous system and vital organs (Rahmaniar et al., 2012). Theoretically, pregnant women experience more significant weight gain in the second and third trimesters compared to the first trimester.

Total weight gain during pregnancy typically ranges from 10 to 12 kg. Specifically, this includes less than 1 kg in the first trimester, approximately 3 kg in the second trimester, and about 6 kg in the third trimester (Kemenkes RI, 2019). Pregnancy increases energy metabolism, consequently increasing the demand for energy and other nutrients. This increase is necessary for fetal growth and development, enlargement of uterine organs, and changes in maternal body composition and metabolism. Therefore, a deficiency in certain nutrients during pregnancy can hinder fetal growth and even lead to premature birth (Alifka, 2020).

CONCLUSION

From this study, it can be concluded that there was an improvement in the nutritional status of pregnant women with CED based on MUAC and body weight measurements before and after the provision of supplementary feeding (PMT) for two weeks. Therefore, the intervention program of providing PMT can be continued through the community health center as one way to address the issue of pregnant women with CED, so that their calorie and energy needs are met and fetal development can proceed optimally. The researchers acknowledge that there are many confounding factors in the provision of PMT, and we recommend enhancing supervision during PMT distribution as well as conducting regular measurements as a basis for evaluation.

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CONFLICT OF INTEREST

The researcher confirms that there are no conflicts of interest associated with the publication of this study's findings.

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