
ABDIMAS

Jurnal Pengabdian kepada Masyarakat
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Community Empowerment in Providing Local Supplementary Feeding for Pregnant Women With CED at Puskesmas Bengkuring, Samarinda

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Abstract

Chronic Energy Deficiency (CED) in pregnant women remains a pressing nutritional issue in Indonesia, particularly in Samarinda City. This community program aimed to improve the nutritional status of pregnant women with or at risk of CED through the provision of local food-based supplementary feeding (PMT) and the empowerment of community health cadres. The intervention took place at Bengkuring Health Center from April to December 2024, targeting 40 pregnant women. Activities included cadre training, preparation of nutritious local meals, and monitoring of Body Mass Index (BMI) before and after the intervention. Results indicated a significant increase in average BMI ($p < 0.05$), although the duration of PMT was not significantly associated with BMI improvement. The program successfully engaged the community in health-focused food preparation and raised awareness among pregnant women about the importance of maternal nutrition. These findings support the effectiveness of local PMT as a tool for both nutritional intervention and sustainable community empowerment. In the long term, such initiatives can help reduce the prevalence of CED and contribute to healthier pregnancy outcomes. Continued collaboration across sectors is essential to ensure the sustainability of this program.

Keywords: body mass index, chronic energy deficiency, community empowerment, local supplementary feeding, maternal nutrition, public health center

INTRODUCTION

Good nutritional status is one of the key determinants of successful human resource development. Nutritional issues in Indonesia remain prevalent, particularly among pregnant women, who are considered a nutritionally vulnerable group. Chronic Energy Deficiency (CED) is a persistent nutritional problem among pregnant women (Ministry of Health, 2023). According to the World Health Organization (2023), undernourished pregnant women face a significantly higher risk of adverse pregnancy outcomes, including delivering low birth weight babies. Based on data from the 2018 Basic Health Research (Riskesdas), the prevalence of pregnant women at risk of CED was 17.3%. Furthermore, more than half of pregnant women had severely inadequate energy intake ($<70\%$ of recommended daily allowance), and approximately half also experienced insufficient protein intake ($<80\%$ of recommended intake). In East Kalimantan Province, there were 5,948 pregnant women with CED (MUAC < 23.5 cm) in 2024, distributed across various areas including Samarinda City. Bengkuring Health Center is among the health centers in Samarinda City that reported CED prevalence rates of 20% in North Sempaja Subdistrict and 21% in East Sempaja Subdistrict in early 2024.

Nutritional problems in pregnant women are influenced by multiple factors. Inadequate intake of nutritious foods and frequent infections are among the direct causes. Improper parenting practices, limited nutritional knowledge, restricted access to health services, and poor socioeconomic conditions

also indirectly affect access to nutritious food and healthcare (Ministry of Health, 2023). Dietary habits, maternal knowledge, and infections are closely associated with the occurrence of CED. Better maternal knowledge tends to correlate with improved dietary intake. Infections can contribute to CED through reduced appetite and impaired nutrient absorption in the digestive tract (Fitrianingtyas, Pertiwi, & Rachmania, 2018). Research by Wati et al. (2024) found that maternal age, pregnancy interval, education level, antenatal care (ANC) visits, and protein intake were significantly associated with the incidence of CED. The study emphasized the importance of improving dietary intake, increasing ANC visits, and optimizing pregnancy spacing to reduce the risk and health impacts of CED (Wati et al., 2024).

Efforts to improve maternal health and nutrition have been carried out through Integrated Antenatal Care (ANC), which includes assessments of nutritional status (body weight, height, and MUAC), provision of iron-folic acid tablets, and nutritional counseling and education regarding the importance of balanced nutrition during pregnancy (Ministry of Health, 2023). According to Riskesdas 2013 and 2018, coverage of ANC services (K4) has shown an upward trend from 70% to 74.1% (Ministry of Health, 2023). The use of locally-sourced supplementary feeding (PMT) has been promoted as one of the strategies to tackle maternal malnutrition (Ministry of Health, 2023). Similar interventions have also been implemented in other countries, such as Nepal. Prakash et al. (2021) found that the diets of pregnant women in Nepal were not adequately balanced and recommended community-based nutrition education and structured dietary plans supervised by nutritionists. Nutrition programs in Nepal reportedly reduced the prevalence of underweight among pregnant women by 8.43%, reflecting improvements in both maternal and fetal conditions (Frongillo et al., 2024).

In Indonesia, the Ministry of Health launched the PMT biscuit program for pregnant women with CED in 2010. This program targeted undernourished pregnant women to prevent low birth weight and improve maternal nutrition. However, challenges remain, such as suboptimal distribution, low awareness among pregnant women to seek healthcare, and refusal to consume the biscuits due to their overly sweet taste (Gelora et al., 2019). In 2023, the Ministry issued updated technical guidelines promoting the use of locally sourced foods in PMT, replacing factory-made biscuits. A literature review by Erna et al. (2023) found that local PMT improved total energy intake, nutritional status, body weight, MUAC, reduced levels of malondialdehyde and vitamin A deficiency, and helped mothers with CED deliver babies with normal birth weight. Another study reported significant differences in MUAC before and after the intervention, indicating that PMT had a measurable impact on improving MUAC in pregnant women with CED (Pujiastuti, Sudiman, & Ulfa, 2023). Research by Nurhayati & Dewi (2021) and Novianti et al. (2022) further affirmed that supplementary feeding is an effective intervention to improve the nutritional status of pregnant women with CED. Despite differences in duration and location, consistent results support PMT as a valuable nutritional intervention.

Local supplementary feeding for pregnant women with CED is recommended for a minimum of 120 days, delivered in the form of complete meals or snacks provided daily, with at least one complete meal per week (Ministry of Health, 2023). According to Ministry of Health Regulation No. 42 of 2022, the central government is responsible for preparing technical guidelines, conducting socialization and orientation at provincial and district health offices, providing technical assistance, and carrying out monitoring and evaluation. Provincial and district governments are responsible for coordinating with health centers, socializing the PMT program, and supporting monitoring and evaluation efforts. Health centers coordinate with local health offices, village governments, and community health posts (Posyandu) to plan and implement the local PMT program, including forming implementation teams, verifying target recipients, determining locations, developing meal cycles and budgets, and conducting orientation for food preparers and cadres. Villages assist in community meetings, support implementation, and monitor and evaluate the program. Posyandu plays a role in coordinating with health centers, conducting early detection of growth and development issues, delivering health and nutrition education, maintaining records, and referring at-risk individuals to health workers. Families are responsible for practicing recommended feeding behaviors, maintaining environmental hygiene, and monitoring the health and development of both toddlers and pregnant women (Ministry of Health, 2023).

In Samarinda City, the local PMT program for pregnant women was implemented in 2024 under the technical oversight of the Bengkuring Health Center, supervised by the Samarinda City Health Office. The implementation was divided into planning, preparation and implementation, and recording and reporting stages. Planning included the appointment of an implementation team,

location selection, recipient verification, and menu cycle development. The preparation and implementation phase involved socialization, training of involved personnel, and safe food preparation. The recording and reporting stage included systematic documentation from target identification to post-intervention evaluation (Ministry of Health, 2023).

At Bengkuring Health Center, the PMT program targeted pregnant women with CED or at risk of CED in North and East Sempaja. Recipients were selected based on their Body Mass Index (BMI). The PMT consisted of ready-to-eat meals made from local food ingredients prepared by trained cadres. Beyond improving nutritional status, the program served as a medium for educating families about balanced nutrition and healthy eating patterns. It also empowered local communities, particularly health cadres and cross-sector stakeholders, through the utilization of local food resources. The program's success needs to be evaluated to provide feedback for policymakers and implementing units to ensure its sustainability in the future.

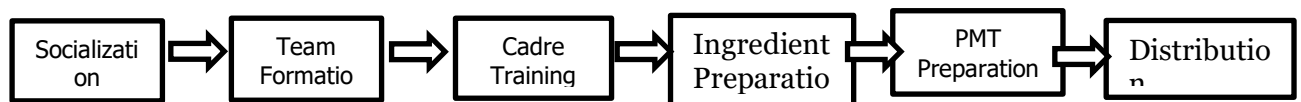


Figure 1. Framework of Local PMT Activities

METHODS

Time and Location

The supplementary feeding (PMT) program for pregnant women was conducted at Bengkuring Health Center from April to December 2024 and was implemented in several phases. The PMT intervention was targeted to be provided for 120 days in the East Sempaja and North Sempaja subdistricts.

Target Participants

The program targeted 40 pregnant women with CED or at risk of CED based on Body Mass Index (BMI) measurements.

Implementers and Collaborators

The Samarinda City Health Office, in collaboration with Bengkuring Health Center, served as the coordinator and designer of the local PMT program. The implementation involved cross-sector stakeholders for area outreach and health cadres as technical executors in the field. The PMT consisted of ready-to-eat meals made from local food ingredients, prepared by community members or trained cadres under the supervision of the health center's nutritionist.

Implementation

The program began with socialization and the formation of the PMT implementation team by the Samarinda City Health Office, involving the health center, village officials, and health cadres. This was followed by cadre training on healthy food preparation conducted by the nutritionist and weekly coordination meetings to manage food distribution and monitoring. In each subdistrict, two teams were formed—one for food preparation and one for distribution and monitoring. Prior to the implementation, the target pregnant women had their weight, height, and BMI measured.

Monitoring and Evaluation

Monitoring was conducted by measuring the body weight of pregnant women after completing the local PMT intervention. Weekly coordination was carried out between the health center and the technical implementers (health cadres) to evaluate any challenges encountered. The success of the PMT program was analyzed by determining whether there was an increase in BMI among participating pregnant women. BMI data before and after receiving local PMT were analyzed using a paired sample t-test to assess whether there was a statistically significant difference before and after the intervention.

RESULTS AND DISCUSSION

The supplementary feeding (PMT) program was implemented for 40 pregnant women in East

Sempaja and North Sempaja. The selection of participants was based on Body Mass Index (BMI) criteria and their willingness to participate in the PMT program.

Local PMT Preparation

The preparation phase included socialization conducted by the Samarinda City Health Office for health centers and cross-sector stakeholders, as well as the formation of local PMT teams. This activity resulted in formal commitments from the health center and subdistrict offices, and the establishment of local PMT teams in East and North Sempaja.

According to Aulia, Simbolon, and Yunita (2023), supplementary feeding has been proven effective in increasing the weight of pregnant women with CED; however, it is recommended that nutritionists be involved in its implementation to ensure program effectiveness. In line with this recommendation, Bengkuring Health Center trained cadres in healthy food preparation, including ingredient selection, weighing, cooking processes, and food packaging.



Figure 2. Training on Healthy Menu Preparation for Health Cadres

PMT Implementation

Food was prepared by trained cadres under the supervision of a health center nutritionist. Locally sourced supplementary feeding is considered an effective strategy for accelerating stunting reduction, especially in resource-limited settings (Meilasari & Adisasmito, 2024). As shown in Figure 3, the menus followed national guidelines, requiring complete and balanced meals that included staple foods, animal and plant-based proteins, vegetables, fruits, and sufficient water (Ministry of Health, 2023). Extremely low protein intake due to inadequate diet during early pregnancy has been associated with developmental delays in children by age three (Miyake et al., 2023). Thus, protein-rich foods were incorporated into the local PMT menu. A healthy diet can reduce pregnancy complications and adverse health outcomes for both mother and child. Recommended diets include whole foods—such as fruits, vegetables, whole grains, and healthy fats—and avoid highly restrictive dietary patterns like ketogenic and paleo diets. Moreover, comprehensive nutritional supplementation, including balanced energy-protein and micronutrients, has been linked to improved birth outcomes, such as a reduction in low birth weight incidence (Marshall et al., 2022).



Figure 3. Local Food-Based PMT Menu Prepared by Cadres

PMT Distribution

Distribution was carried out by local cadres who also provided nutrition education to pregnant women. Nutritional mentoring has been proven to increase nutrient intake, body weight, and MUAC in pregnant women with CED (Iskandar et al., 2022). Research by Akhfar et al. (2025) also reported improved knowledge about CED and PMT among pregnant women following counseling sessions at

Ponre Health Center. PMT activities should include nutritional and health education to support behavioral change, such as breastfeeding support, complementary feeding counseling, and sanitation education for families. The use of local food ingredients in PMT is also expected to foster household food and nutrition self-reliance (Ministry of Health, 2023). These findings also showed that the most contributing factor to the incidence of CED was low educational level, affecting 57% of participants. Therefore, it is recommended that pregnant women enhance their understanding of risk factors that may influence or endanger pregnancy, particularly in efforts to prevent CED (Raehan et al., 2025).



Figure 5. PMT Distribution by Health Cadres

Respondent Characteristics

Table 1. Distribution of Pregnant Women Targeted for PMT by Subdistrict of Residence

Subdistrict	n	%
East Sempaja	24	60
North Sempaja	16	40
Total	40	100

Based on Table 1, the majority of pregnant women who received PMT were from East Sempaja. This was due to the fact that East Sempaja was more accessible compared to North Sempaja, which influenced the frequency of antenatal visits to the health center. The identification of pregnant women who received PMT was conducted through antenatal care contact at the health center. As shown in Table 2, the initial BMI of most pregnant women—58%—fell into the normal category, and 10% were even classified as overweight. According to technical guidelines, these groups are not ideal PMT recipients; however, due to the limited number of CED cases found through the health center network and the difficulty in obtaining participants' willingness, women with normal and overweight BMI were included in the program to ensure optimal budget utilization. Changes in BMI after receiving local PMT are presented in Table 4.

Table 2. Distribution of Pregnant Women's BMI Categories Before and After Local PMT

Variable	IMT				Total n (%)
	Underweight n (%)	Normal n (%)	Overweight n (%)	Obese n (%)	
Before	7 (11,1)	23 (58,3)	10 (27,8)	0 (0)	40 (100)
After	1 (42,9)	23 (35,7)	13 (21,4)	3 (0)	40 (100)

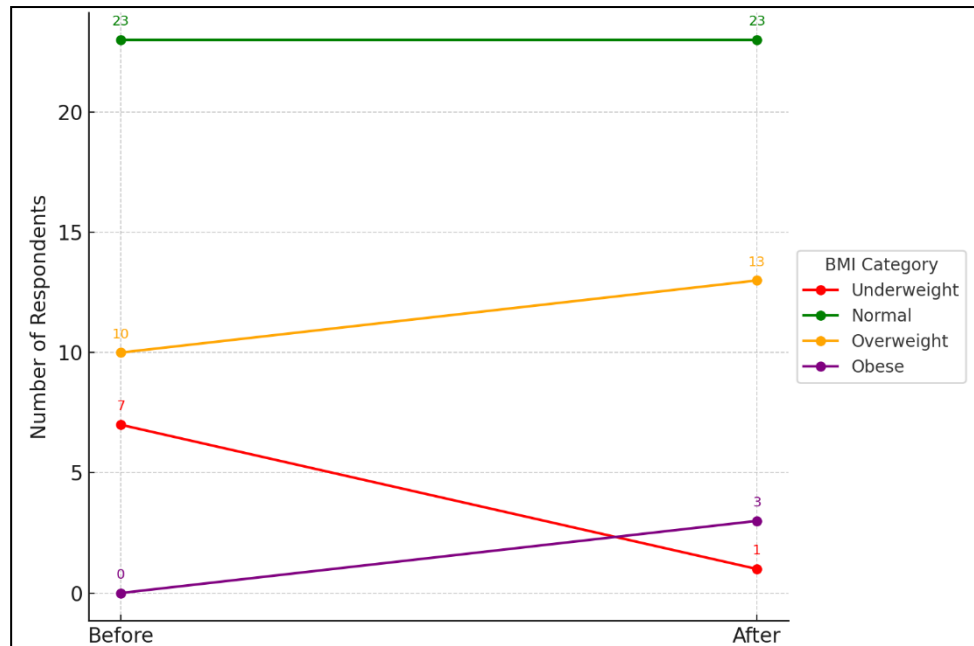


Figure 6. Changes in BMI status before and after the PMT intervention

The line graph illustrates the shift in the distribution of Body Mass Index (BMI) categories among respondents before and after the local supplementary feeding (PMT) intervention. Notably, there was a significant reduction in the number of individuals categorized as underweight, from 7 respondents (17.5%) to only 1 respondent (2.5%). This suggests an improvement in nutritional intake following the intervention. The number of individuals in the normal BMI category remained stable at 23 respondents (57.5%), indicating that the intervention was effective in maintaining healthy weight status among the majority of participants. However, a slight increase was observed in the overweight category, rising from 10 respondents (25.0%) to 13 respondents (32.5%), and the obese category emerged with 3 respondents (7.5%) post-intervention. This may reflect a shift from undernutrition to better nutritional status, although it also signals the importance of monitoring to prevent excessive weight gain.

Table 3. Normality Test for BMI Before and After PMT

Variable	Shapiro-Wilk Sig.
Before	0,142
After	0,746

The results of the normality test showed that the significance values (Sig.) for both variables (BMI before and after PMT) were greater than 0.05. This indicated that the data were normally distributed and therefore eligible for further analysis using a paired t-test to determine the effect of PMT on the BMI of pregnant women.

Table 4. Paired t-Test on BMI Before and After PMT

Variable	Mean	Sig. (2-tailed)
BMI Before-After	-2.4325	1.4516E-8

Based on Table 4, the p-value from the paired t-test was less than 0.05, indicating that the difference in BMI before and after PMT was statistically significant. On average, the post-intervention BMI was 2.43 points higher than the pre-intervention BMI (as indicated by the negative mean difference, where the post-BMI was greater). Subsequently, a simple linear regression analysis was conducted to examine whether the number of days of supplementary feeding (PMT) had an effect on the increase in Body Mass Index (BMI) of the pregnant women.

Table 5. Description of PMT Duration Variation Among Pregnant Women

n	Minimum	Maximum	Mean	Median	Std. Dev
40	27	120	76,28	66,50	34,12

The descriptive analysis of the variable days of PMT provision, as shown in Table 5, indicated a substantial variation in the duration of PMT received by pregnant women. Among the 40 participants, the number of PMT days ranged from 27 to 120. The mean duration was 76.28 days with a standard deviation of 34.12, reflecting a relatively wide distribution from the average. The median duration was 66.5 days, meaning that half of the pregnant women received PMT for fewer than 66.5 days, while the other half received it for more. The frequency distribution revealed that most pregnant women received PMT for a relatively short duration, with only one or two individuals falling within the range of 27 to 107 days. However, a notable spike was observed at the value of 120 days, reported by 10 pregnant women (25%). This made 120 days the most frequent value (mode), which significantly influenced the average duration. This condition suggests that a small subset of pregnant women received PMT for a much longer period compared to the majority of respondents. A study by Novianti et al. reported an average weight gain of 1.62 kg following a three-week PMT intervention. Similarly, research by Nurhayati & Dewi documented an increase in the average Mid-Upper Arm Circumference (MUAC) from 23.1 cm to 23.7 cm after 30 days of PMT provision.

According to the technical guidelines, PMT for pregnant women should be provided for a minimum of 120 days (Ministry of Health, 2023). However, in practice at Bengkuring Health Center, the duration of PMT varied, as shown in Table 5. This variation occurred due to several factors, including the unwillingness of some pregnant women to continue the program, changes in their place of residence, and internal challenges among cadres serving as field implementers. These issues highlight the need for evaluation to improve the implementation of PMT for pregnant women in future periods. In addition, a standardized assessment is needed in determining the eligibility of pregnant women to receive PMT. Based on the guidelines, local PMT is intended for pregnant women with CED, defined as having a pre-pregnancy or first trimester (less than 12 weeks) Body Mass Index (BMI) of less than 18.5 kg/m², and those at risk of CED, identified by a Mid-Upper Arm Circumference (MUAC) below 23.5 cm. At Bengkuring Health Center, PMT eligibility was determined using MUAC measurements taken during antenatal visits. However, MUAC was not monitored regularly during the PMT distribution period, making it impossible to assess changes over time. As a result, MUAC could not be used as an outcome variable to evaluate program effectiveness.

Table 6. ANOVA Results of Simple Linear Regression Analysis

Model	Mean Square	R Square	Sig.
Regression	1,875	0,010	0,533

The analysis results in Table 6 showed that the coefficient of determination (R^2) was 0.010, indicating that only 1% of the variation in BMI increase could be explained by the number of days of PMT intervention. The ANOVA test produced a significance value of $p = 0.533$, suggesting that there was no statistically significant relationship between the number of days of PMT provision and the increase in BMI ($p > 0.05$). These results indicate that the duration of PMT alone did not significantly affect the nutritional status change of pregnant women based on BMI. Therefore, the length of PMT administration was not sufficient to predict or explain the extent of BMI improvement. It is likely that other factors played a more dominant role, such as the type of food provided, frequency of consumption, or the initial health status of the pregnant women. According to Hano and Kau (2024), the PMT program for pregnant women with CED at Tilamuta Health Center had been implemented in accordance with technical procedures, although there were still limitations in human resources and inconsistencies in PMT distribution (Hano & Kau, 2024).

CONCLUSION AND RECOMMENDATIONS

Conclusion

The local food-based supplementary feeding (PMT) program for pregnant women aimed to

improve nutritional status, particularly among those at risk of Chronic Energy Deficiency (CED), in order to support healthy fetal growth and development and to prevent the risk of stunting in newborns. In addition, the program was designed to promote sustainable household food and nutrition self-reliance by utilizing the potential of locally available food resources. The outcomes of the program in the working area of Bengkuring Health Center included the empowerment of community members and cadres in preparing and distributing local PMT, as well as the use of local food ingredients. Based on data analysis, the program was shown to significantly improve the Body Mass Index (BMI) of pregnant women. However, the evaluation of the program indicated that only 11% of the beneficiaries met the official target criteria outlined in the Ministry of Health's technical guidelines, which specify that PMT should be provided to pregnant women categorized as underweight (BMI < 18.5 kg/m²). In terms of duration, only 25% of participants completed the full 120 days of PMT as recommended. The variation in PMT duration may have been influenced by several factors, including differences in the initial nutritional status of participants, their willingness to continue the program, relocation during the intervention period, and internal challenges faced by the field cadre team. These findings contribute valuable insights for the health center and related cross-sector stakeholders in evaluating the effectiveness of the local PMT program for pregnant women with CED. The results are expected to support continuous improvement in the implementation of future programs.

Recommendations

Pregnant women with high-risk conditions such as Chronic Energy Deficiency (CED), anemia, or extremely low body weight should be prioritized in the provision of PMT, with specific attention to duration and monitoring. In addition to food supplementation, education on the importance of consuming nutritious food and maintaining regular participation in the PMT program is crucial. Nutrition officers at the health center or community health cadres providing assistance should involve family members in the support process. A study by Puspitasari et al. (2021) emphasized the essential role of healthcare workers and spousal support in the successful consumption of PMT among pregnant women with CED. Family involvement can help raise awareness about the importance of healthy eating and prevent irregular consumption or premature discontinuation of the PMT program before the optimal duration is reached.

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