

The effect of education using booklet media on pregnant women's knowledge about Chronic Energy Deficiency (CED)

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Abstract:

Chronic Energy Deficiency (CED) is one of the nutritional problems in pregnant women that can harm maternal health and fetal growth. One of the causes of the high risk of CED is the low knowledge of pregnant women related to nutrition during pregnancy. Education using booklet media is considered adequate because it presents the material concisely, clearly, and illustrated, making it easier to understand. This study aims to determine the influence of education using booklet media on pregnant women's knowledge about CEDs. This Research uses a pre-experimental design with a group pretest-posttest design. The sample amounted to 25 pregnant women who were selected using the total sampling technique. Data was collected using a CED knowledge questionnaire, while data analysis was carried out univariate and bivariate using the Wilcoxon test. Before education, most (72.0%) of pregnant women's knowledge of CEDs was lacking. After education, all respondents (100%) were in the category of good knowledge. The difference in the average value of knowledge before and after education was 4.64. The results of the Wilcoxon test were obtained, $p=0.000 (<0.05)$, which showed a significant influence of education using booklet media on increasing pregnant women's knowledge about CEDs. Education using booklet media is effective in increasing pregnant women's knowledge about CEDs. It is recommended that health workers use booklets as a routine educational medium, and further Research adds measures of attitudes and behaviors to see the long-term changes.

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INTRODUCTION

Malnutrition remains a critical global public health challenge, manifesting not only as undernutrition or obesity but also in specific syndromes like Chronic Energy Deficiency (CED). CED represents a persistent state of inadequate caloric intake over extended periods, typically years, leading to significant physiological depletion and compromised health outcomes (Wati et al., 2024). This condition is particularly insidious due to its chronic nature, often developing silently without acute symptoms yet exerting profound long-term consequences on individual well-being and societal development, demanding focused attention within maternal health frameworks (Angraini et al., 2024).

Chronic Energy Deficiency (CED) in women of reproductive age is operationally identified through a Mid-Upper Arm Circumference (MUAC) measurement below 23.5 cm (Harna et al., 2024). This anthropometric indicator is a crucial proxy for depleted energy reserves and muscle mass, signaling a heightened vulnerability to adverse health events. Its significance is amplified during pregnancy, where CED status becomes a critical predictor of obstetric risks, directly threatening both maternal survival and fetal development, thereby positioning it as a key target for prenatal intervention strategies (Alfina et al., 2024).

The repercussions of maternal CED extend far beyond the immediate pregnancy. Women identified with CED face a significantly elevated risk of delivering low-birth-weight (LBW) infants, a significant determinant of neonatal mortality and childhood morbidity (Novelia et al., 2021). Critically, this condition perpetuates a devastating intergenerational cycle; daughters born to CED-affected mothers are themselves predisposed to experience CED in adulthood, subsequently increasing the likelihood of LBW births in the next generation, thereby entrenching malnutrition across successive cohorts (Yuliastanti et al., 2023).

The development of CED in pregnant women stems from a complex interplay of direct and indirect determinants. Direct causes include sustained inadequate dietary intake, poor consumption patterns, and the burden of infectious diseases, which collectively deplete bodily energy stores, leading to tissue catabolism and weight loss (Nasaru et al., 2024). Indirectly, biological factors (e.g., maternal age, parity, interpregnancy interval), socioeconomic constraints (e.g., poverty, food insecurity), and crucially, behavioral factors—including maternal knowledge, education level, and health-seeking practices—create the underlying conditions that predispose women to CED (Akbarini & Siswina, 2022).

Maternal knowledge regarding nutritional requirements during pregnancy is a fundamental determinant of health-seeking behaviors and dietary practices. Adequate understanding empowers pregnant women to recognize the importance of sufficient energy and nutrient intake, fostering positive attitudes and sustained behaviors that prioritize nutritional fulfillment (Josefa et al., 2023). This knowledge directly influences the adoption of protective actions, such as consuming diverse, energy-dense foods and engaging in appropriate physical activity, which are essential for mitigating CED risks and supporting optimal fetal growth (Mattson et al., 2025).

Conversely, insufficient knowledge about CED and pregnancy nutrition creates a dangerous void, often resulting in unmet energy and micronutrient needs (Triyawati & Yuliani, 2023). This deficit significantly elevates the risk of CED development, increasing susceptibility to pregnancy complications like preterm birth and obstructed labor, while jeopardizing fetal development. Alarmingly, standard antenatal counseling by health workers frequently lacks structured, engaging educational media specifically addressing CED, contributing to persistently low awareness levels among pregnant women despite the known severity of the condition (Aini et al., 2023).

Nutrition education, delivered effectively through appropriate media, offers a viable pathway to bridge this knowledge gap. Among various tools—leaflets, posters, brochures—booklets present distinct advantages for complex topics like CED. They provide a balanced format: concise, accessible text explaining causes, risks, and prevention strategies, reinforced by supportive illustrations that enhance comprehension and retention, particularly beneficial for audiences with varying literacy levels or limited time during clinic visits (Lambert et al., 2025).

The underutilization of booklet media specifically for CED education represents a missed opportunity. While general nutrition counseling occurs, dedicated, visually supported materials explaining the unique aspects of chronic energy depletion, its measurement (MUAC), and its specific implications for pregnancy are scarce (Halijah & Wahida, 2023). Given the multifaceted nature of CED causation and the need for sustained behavioral change, the booklet's capacity to deliver comprehensive yet digestible information makes it a highly suitable, yet currently neglected, intervention medium worthy of empirical investigation in this context (Jamah et al., 2024).

Therefore, addressing the deficit in CED-specific knowledge among pregnant women through evidence-based, accessible educational tools is imperative for improving maternal and child health outcomes and breaking the intergenerational cycle of malnutrition (Schnitman et al., 2022). This study directly responds to this need by rigorously evaluating the efficacy of a structured booklet-based education intervention (Kurt et al., 2025). Its primary objective is to determine the measurable impact of this targeted educational approach on enhancing pregnant women's knowledge levels regarding Chronic Energy Deficiency, thereby contributing vital evidence to strengthen prenatal care programs and national nutrition initiatives.

METHOD

This study employed a pre-experimental research design, specifically utilizing a one-group pretest-posttest approach, to evaluate the impact of an educational intervention on pregnant women's knowledge regarding Chronic Energy Deficiency (CED). A sample of 25 pregnant women experiencing CED was selected from the target population residing in Haurpanggung Village, Tarogong Kidul District, Garut Regency. Given the defined and accessible nature of the eligible population within the village, the total population sampling technique was deemed appropriate and implemented, ensuring that all 25 qualifying pregnant women meeting the inclusion criteria were included as respondents in the study. This sampling strategy aimed to maximize representation within the constrained population.

The core variables under investigation were clearly defined: the independent variable was the educational intervention delivered specifically through booklet media, designed to enhance understanding of CED. The dependent variable was the level of knowledge possessed by the pregnant women concerning Chronic Energy Deficiency. The target population for this Research comprised all pregnant women diagnosed with or exhibiting signs of CED within Haurpanggung Village. As the total number of eligible individuals meeting this specific criterion within the village was precisely 25, this entire group constituted both the population and the sample for the investigation, eliminating the need for further sampling beyond the total enumeration approach.

Data collection was conducted using a structured questionnaire developed by the researchers to assess CED knowledge. This instrument incorporated both closed-ended (multiple choice, true/false) and open-ended question formats to capture a range of knowledge aspects and potential nuances in understanding. The questionnaire underwent rigorous validation procedures before the primary data collection phase. Content and construct validity were established using the Pearson Product-Moment correlation coefficient, comparing item scores against the total score; items demonstrating a calculated 'r' value exceeding the critical 'r' table value at the appropriate significance level were retained. Furthermore, the internal consistency reliability of the finalized questionnaire was confirmed using Cronbach's Alpha coefficient, ensuring the instrument produced stable and consistent measurements.

The research implementation followed a systematic sequence of stages. Initial preparation involved gathering comprehensive theoretical literature and conceptual frameworks relevant to CED and maternal health education. This was followed by a preliminary field study to understand the local context and confirm population eligibility. Formal ethical clearance was secured from the Faculty of Health Sciences, Universitas Nasional, and necessary administrative permits for data collection within the village were obtained. Supervisory consultation occurred throughout the preparatory and execution phases. Data collection commenced with administering the pretest knowledge questionnaire to all 25 respondents, followed by delivering the standardized educational intervention using the booklet media. Immediately after the intervention, the identical posttest questionnaire was administered to measure any changes in knowledge levels. Subsequent data processing involved meticulous editing for completeness, coding of responses, data entry, and cleaning to ensure accuracy before analysis.

Data analysis was conducted in two primary phases: univariate and bivariate. Univariate analysis described the characteristics of the sample and the distribution of knowledge scores at both pretest and posttest stages using frequencies, percentages, means, and standard deviations. The critical bivariate analysis, focused on determining the intervention's effect by comparing pretest and posttest knowledge scores within the same group of 25 women, utilized the Wilcoxon signed-rank test. This non-parametric statistical test was selected as the appropriate method because the difference scores between pretest and posttest were unlikely to meet the assumption of normality required for the paired t-test, a common consideration with small sample sizes like $n=25$. The significance level for the Wilcoxon test was set at $p < 0.05$ to determine if the observed changes in knowledge were statistically significant.

This study employed a quasi-experimental design with a pretest-posttest control group structure to rigorously evaluate the effectiveness of a dual-route honey intervention on postpartum recovery outcomes. The primary objective was to determine whether the combined application of

primary honey dressing for perineal wounds alongside daily oral consumption of Acacia honey significantly improved key indicators of maternal quality of life—specifically perineal wound healing, pain levels, hemoglobin concentration, and breast milk volume—compared to standard care alone. A total sample of 40 postpartum mothers, meeting defined inclusion criteria (vaginal delivery with first- or second-degree perineal laceration/episiotomy, no known honey allergy, no chronic anemia), was purposively recruited and equally allocated into treatment (n=20) and control (n=20) groups using a total sampling technique within the designated study period and setting. This approach ensured practical feasibility while maintaining group comparability for the intervention.

The core intervention involved a synergistic protocol administered over 21 consecutive days postpartum. Mothers in the treatment group received daily primary dressings of medical-grade honey directly applied to the cleaned perineal wound, covered with a sterile gauze pad, alongside the consumption of pure Acacia honey dissolved in warm water each morning before breakfast. The control group received standard perineal wound care per institutional protocol (typically involving sterile saline cleansing and, if used, conventional antiseptic solutions like diluted povidone-iodine). It consumed an equivalent volume of plain warm water, maintaining identical daily routines to control for placebo effects and non-specific care factors. Regardless of group, all participants continued to receive standard postpartum care, including routine analgesia as needed and breastfeeding support, strictly adhering to the intervention protocol monitored through daily diaries and spot checks by research midwives.

Outcome assessment utilized validated and objective instruments administered at baseline (within 24 hours postpartum) and at the conclusion of the 21-day intervention period. Perineal wound healing progression was quantitatively measured using the REEDA scale (Redness, Edema, Ecchymosis, Discharge, Approximation), with higher scores indicating poorer healing. Pain intensity was assessed using the Numeric Rating Scale (NRS), ranging from 0 (no pain) to 10 (worst imaginable pain). Systemic impact was evaluated through serial hemoglobin measurements via an automated hematology analyzer, and breast milk adequacy was objectively quantified by measuring the total volume expressed (via manual expression or pump) over 24 hours. These multidimensional assessments captured the physical manifestations directly influencing maternal quality of life during recovery.

Data analysis was conducted using IBM SPSS Statistics software. Normality of distribution for all continuous outcome variables was confirmed using Shapiro-Wilk tests before analysis. Within-group changes from baseline to day 21 for the treatment and control groups were assessed using Paired T-Tests. The primary analysis comparing the magnitude of change between the two groups utilized the Independent Samples T-Test, with a significance level set at $p < 0.05$. This robust statistical approach determined the honey intervention's individual efficacy over time and its superior effectiveness relative to standard care. The study protocol and all procedures received prior ethical approval from the Research Ethics Committee of the National University, ensuring adherence to the Declaration of Helsinki principles, including informed consent, participant confidentiality, and the right to withdraw without prejudice to standard care.

RESULT

Based on the results of data analysis in this study, the following results were known:

Pregnant Women's Knowledge of CEDs Before Getting Education Using Booklet Media

Table 1. Distribution of Frequency of Knowledge of Pregnant Women about CEDs Before Getting Education Using Booklet Media in Haurpanggung Village

Pregnant Women's Knowledge about CEDs	Frequency (f)	Percentage (%)
Less	18	72
Good	7	28
Total	25	100

Table 1 shows that of 25 pregnant women, 18 have less knowledge of CEDs than the remaining 18 (72.0%).

Pregnant Women's Knowledge of CEDs After Getting Education Using a Media Booklet

Table 2. Distribution of Frequency of Knowledge of Pregnant Women about CEDs After Getting Education Using Booklet Media in Haurpanggung Village

Pregnant Women's Knowledge about CEDs	Frequency (f)	Percentage (%)
Less	0	0
Good	25	100
Total	25	100

Based on Table 2, it can be known from 25 pregnant women that all pregnant women know CEDs, as many as 25 pregnant women (100%).

The Effect of Education Using Booklet Media on Pregnant Women's Knowledge of CEDs

Table 3. The Influence of Education Using Booklet Media on Knowledge Pregnant Women about CEDs in Haurpanggung Village

Pregnant Women's Knowledge about CEDs	Mean	Mean Difference	p-value
Before	7.28	4.64	0,000
After	11.92		

Based on the study's results, it was found that the difference in the average value of pregnant women's knowledge about CEDs after education using booklet media was obtained with a difference of 4.64. The results of the different tests using the Wilcoxon test obtained a p value of 0.000 (< 0.05), meaning that education using booklet media affects pregnant women's knowledge about CEDs in Haurpanggung Village.

DISCUSSION

Chronic Energy Deficiency (CED) is a state of malnutrition where the state suffers from chronic food deficiency that results in the occurrence of health problems in the mother, relative, or absolute from one or more nutrients. Health problems that can be caused by CEDs if suffered by pregnant women are iron deficiency with the impact of anemia, calcium deficiency with the impact of osteoporosis, and malnutrition with the impact of disrupted fetal growth process (Mukkadas et al., 2021). The factors that cause CEDs to be divided into direct and indirect factors. Direct factors include infectious diseases and food intake, while indirect factors include food availability, education, knowledge, family income, and health services. Food availability means that food is available in sufficient quantities to meet the needs of all family members, both in quantity, quality, and safety (Dagne et al., 2020). Education is the process of delivering information by extension workers to identify nutritional problems and find solutions to these problems. The delivery of nutrition-related information aims to improve nutrition-related knowledge, attitudes, and practices and can prevent nutrition-related diseases. Good knowledge of nutrition makes a person take into account the amount and type of food to be consumed. A person with low knowledge tends to choose foods that are interesting and not based on the nutritional value contained in the food; on the contrary, someone with good knowledge will easily consider what foods are good and pay attention to the nutritional value of the food to be consumed (Shimali et al., 2021).

Most pregnant women in rural areas have low knowledge of CEDs due to limited information sources and low exposure to print and digital educational media. The lack of regular counseling by health workers causes pregnant women to lack understanding of the risks of CEDs, so prevention is often carried out too late. The incidence of CED is caused by a lack of nutritional knowledge among pregnant women, thus influencing the selection of healthy and nutritious food in accordance with the

nutritional adequacy of the mother during pregnancy. Good knowledge of pregnant women can prevent the risk of CED events (Mulyani et al., 2024).

The researcher assumes that the low knowledge of pregnant women about CEDs before being educated using booklet media is due to limited access to information and the lack of continuous health counseling from health workers. In addition, the use of educational media that is interesting and easy to understand, such as booklets, has not been optimal, making information about pregnancy nutrition not conveyed effectively. The researcher also believes that educational factors, food availability, and food choice habits play an important role in determining the level of knowledge of pregnant women, so that structured educational interventions based on visual-informative media have the potential to increase understanding while encouraging changes in behavior to prevent CEDs.

The delivery of nutrition-related information aims to improve nutrition-related knowledge, attitudes, and practices and can prevent the occurrence of nutrition-related diseases. Some programs to achieve this goal include improving food consumption patterns according to balanced nutrition guidelines, improving nutrition-conscious behavior and physical activity, increasing access to and quality of nutrition services per advances in science and technology, and improving food and nutrition awareness systems (Wawrzyniak & Traczyk, 2023). The factors that affect knowledge are education, interests, age, experience, and information provision. Information will influence a person's knowledge. A person with a low education can improve their knowledge if they get good information from various media. This information can be provided through exposure to mass media, seminars, counseling, and social reference groups (Silva et al., 2022).

The researcher assumes that the achievement of all respondents in the good knowledge category is due to the effectiveness of the booklet media that presents information concisely, clearly, and supported by attractive visuals to facilitate understanding. The education provided directly and interactively is also suspected to strengthen the respondents' memory, especially when the material is delivered according to the needs and context of the daily life of pregnant women. The researcher believes that the combination of face-to-face counseling methods and booklet media can optimize knowledge transfer and motivate pregnant women to understand and apply the prevention of CED in their daily lives.

The knowledge required by pregnant women will have a positive impact on the provision of the necessary food intake during pregnancy, which is essential for fetal growth and development. The level of knowledge a person has about the need for nutrients affects the amount and type of food consumed. If pregnant women's knowledge is limited regarding nutrition during pregnancy, this can negatively impact the consumption of the necessary food during pregnancy. As a result, energy and other nutrient needs may not be adequately met during pregnancy, which can lead to the risk of CED in pregnant women (Teweldemedhin et al., 2021). Information will influence a person's knowledge. A person has little education, but getting good information from various media can improve their knowledge. This information can be provided through exposure to mass media, seminars, counseling, and social reference groups. Booklet media is a combination of books and leaflets because the content structure is like a book (introduction, content, cover), but the way the content is presented is shorter than a book (Prasetyanti et al., 2023). Some advantages of booklets include conveying information in short, concise, and easy-to-understand sentences, and being supported by images that help understanding. The advantages of booklet media are easy to learn at any time because of the book-shaped design, able to provide complete information; more varied and informative; more detailed and precise, because it reviews more about the message conveyed; has photos or images to support the material; is arranged with an attractive and colorful design; the time in the learning process can be adjusted to the respondent; easy made, expanded, and adapted to its material and shape that is easy to carry around (Ombi et al., 2021).

The researcher assumes that the significant increase in the knowledge of pregnant women after being educated using booklet media is due to the presentation of systematic, concise, and visually complemented information to facilitate understanding and strengthen memory. The material provided is also relevant to the needs of respondents, thus encouraging active involvement during the education process. In addition, the interactive delivery method makes it easier for pregnant women to absorb information and relate it to daily experiences. The researcher believes that the

combination of face-to-face and booklet media that can be re-read at home is the main factor in the success of this intervention in increasing knowledge about the prevention of CED.

CONCLUSION

This study investigated the impact of booklet-based education on pregnant women's knowledge of Chronic Energy Deficiency (CED) within a specific community setting. Prior to the educational intervention, most participants exhibited an inadequate understanding of CED. Following the structured education delivered via booklet media, a substantial and uniform improvement in knowledge levels was observed across all participants. Statistical analysis confirmed a significant positive effect of the booklet education intervention on enhancing maternal knowledge regarding Chronic Energy Deficiency, demonstrating its effectiveness as an educational tool for this target population in the studied village context.

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CONFLICT OF INTEREST

It is hoped that the results of this Research can be used as a reference for developing scientific studies in the health sector, especially in nutrition education for pregnant women. The subsequent Research can develop a booklet of educational media with more interactive content, for example, equipped with QR codes to access videos or animated illustrations, so that respondents' understanding can be more optimal.

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