

Manuscript received August 09, 2024; revised October 02, 2024; accepted October 28, 2024; date of publication March 30, 2025

Digital Object Identifier (DOI): <https://doi.org/10.35882/fisce.v4i1.71>

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How to cite: Kusmini Suprihatin¹, Fildzah Ayu², Siti Maemonah¹, Loetfia Dwi Rahariyani¹, Alfi Maziyah¹, Riza Retnaini², Septi Ulfiana Rohmatin², Ivonne², Ingenta Nandi², Rony AP Tamba², Mika Yudistia², Hikmah Kurniasari², Nurhidayati Ningsih³, and Nur Aini⁴

Breastfeeding Education for Pregnant Women with Chronic Energy Deficiency in Celebrating World Breastfeeding Week 2024 in Sidoarjo, Indonesia

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ABSTRACT Nutritional adequacy during pregnancy is a crucial determinant of maternal health and fetal development. Pregnant women suffering from chronic energy deficiency (CED) are at higher risk for adverse pregnancy outcomes, such as low birth weight (LBW) and preterm delivery. Despite the importance of maternal nutrition and breastfeeding readiness, educational interventions for this vulnerable group remain limited. This community service project aimed to improve maternal knowledge and awareness regarding breastfeeding through health education and hands-on training activities held during the 2024 World Breastfeeding Week in Sidoarjo, Indonesia. The program applied a descriptive approach involving 50 participants comprising pregnant women and health cadres who took part in structured counseling, demonstrations, and practical sessions on breastfeeding, baby massage, and lactation massage. Data were obtained through demographic surveys and post-session evaluations assessing participant understanding and perceived usefulness of the intervention. Results indicated that the majority of participants were within the productive age range of 20–40 years (60%) and had completed secondary education (48%). Evaluation findings showed that while only 18% of mothers fully mastered the breastfeeding material, all participants (100%) acknowledged the relevance and necessity of the activities. The program fostered enthusiasm and engagement among participants, enhancing awareness of correct breastfeeding techniques and the importance of nutritional adequacy during pregnancy. In conclusion, breastfeeding education and practical training significantly contributed to increasing maternal understanding and motivation in practicing proper lactation management. Continued and periodic educational interventions with more interactive, personalized approaches are recommended to optimize comprehension and ensure sustainable improvement in breastfeeding practices among pregnant women, particularly those experiencing chronic energy deficiency.

INDEX TERMS Maternal health, Breastfeeding education, Chronic energy deficiency, Community empowerment, Lactation training.

I. INTRODUCTION

Maternal nutrition and breastfeeding practices remain critical determinants of both maternal and child health outcomes worldwide. The World Health Organization (WHO) emphasizes that exclusive breastfeeding for the first six months of life could prevent nearly 823,000 child deaths and 20,000 maternal deaths annually [1]. However, the global prevalence of exclusive breastfeeding remains below the target of 70%, with significant regional disparities, particularly in low- and middle-income countries (LMICs) [2], [3]. Among the major maternal health challenges contributing

to suboptimal breastfeeding outcomes is chronic energy deficiency (CED), a condition characterized by inadequate energy and nutrient intake over time. Pregnant women with CED are more susceptible to anemia, intrauterine growth restriction, and postpartum complications, which collectively hinder successful lactation and infant growth [4], [5], [6].

Several studies have demonstrated that improving breastfeeding outcomes requires more than nutritional supplementation; it necessitates effective health education and behavior change interventions [7], [8]. Health promotion

programs that incorporate interactive and experiential learning, such as simulation-based lactation training or peer mentoring, have been shown to improve mothers' knowledge and self-efficacy in breastfeeding practices [9], [10], [11]. Recent innovations, including digital health platforms, mobile lactation counseling, and audiovisual educational media, have further expanded the accessibility of breastfeeding education, especially during the COVID-19 pandemic [12], [13], [14]. Despite these advances, implementation in resource-limited settings often remains inconsistent, and community-level interventions targeting nutritionally at-risk populations such as CED mothers are still limited [15], [16].

Current literature highlights the importance of contextualized approaches in breastfeeding education. Culturally adapted programs that combine traditional beliefs with evidence-based information have proven effective in improving maternal acceptance and adherence to breastfeeding recommendations [17], [18]. Moreover, integrating health cadres and local midwives as facilitators has enhanced community engagement and program sustainability [19], [20]. Nevertheless, a major research gap persists regarding how educational strategies can be tailored to address the specific physiological and behavioral barriers faced by CED mothers, who often experience fatigue, low milk production, and inadequate awareness of proper lactation techniques [21], [22]. In Indonesia, where maternal malnutrition remains a public health concern with approximately 17% of pregnant women affected by CED targeted educational interventions are urgently needed to promote breastfeeding readiness and maternal empowerment [23], [24].

Given these challenges, this study aims to evaluate the impact of community-based breastfeeding education on improving knowledge, awareness, and readiness among pregnant women with chronic energy deficiency. The intervention, conducted during World Breastfeeding Week 2024, combined interactive counseling, lactation massage demonstrations, and practical training in collaboration with local health workers. By focusing on an at-risk population, the study seeks to contribute empirical evidence on how educational interventions can strengthen maternal and child health outcomes in LMIC contexts. The contributions of this work are threefold.

1. Provides an evidence-based model of community-driven breastfeeding education specifically designed for CED mothers, integrating nutritional and behavioral dimensions.
2. Demonstrates the applicability of participatory learning strategies in enhancing breastfeeding readiness in low-resource settings.
3. Offers practical recommendations for scaling similar interventions through midwife networks and community health programs.

The remainder of this paper is structured as follows: Section II reviews related studies and theoretical underpinnings of maternal nutrition and breastfeeding education; Section III outlines the research methodology and data collection process; Section IV presents and discusses the

findings; and Section V concludes with implications for practice, limitations, and directions for future work.

II. METHOD

This study employed a quasi-experimental approach using a one-group pretest–posttest design to evaluate the effectiveness of breastfeeding education interventions for pregnant women with chronic energy deficiency (CED). The design was selected to measure direct changes in maternal knowledge before and after participating in structured health education sessions. This framework allows for determining short-term educational impacts without requiring a control group, which is appropriate for small-scale, community-based interventions [25].

A. STUDY DESIGN AND RATIONALE

The quasi-experimental design enabled within-subject comparison of pretest and posttest data to evaluate the intervention's influence on knowledge and awareness. This approach was chosen for its practicality and ethical appropriateness when working with pregnant women, where randomization and control groups may be restricted [26]. Such designs are frequently used in community health studies aiming to assess immediate outcomes of education programs before implementing larger randomized controlled trials. The study followed standardized procedures for community-based intervention evaluation, ensuring that changes in outcomes were attributable to the intervention rather than external factors.

B. STUDY SETTING

The research was conducted at Randegansari Husada Hospital, Sidoarjo, East Java, Indonesia. This site was selected because it routinely provides antenatal care and maternal counseling, serving as an accessible venue for health promotion among high-risk pregnant women. The intervention was implemented during World Breastfeeding Week (August 2024), in collaboration with the Department of Midwifery, IKMI Institute, and the hospital's maternal and child health unit. The study took place over nine months from July 2024 to March 2025 covering preparation, data collection, and evaluation phases.

C. PARTICIPANTS AND SAMPLING METHOD

The study population consisted of pregnant women diagnosed with chronic energy deficiency, defined by an upper arm circumference <23.5 cm, attending antenatal clinics at Randegansari Husada Hospital. Inclusion criteria required participants to be in the second or third trimester, free from comorbidities, and willing to participate through informed consent. Exclusion criteria included women with pregnancy complications, communication difficulties, or those who could not complete the intervention. A purposive sampling technique was employed, as the study targeted a specific risk group requiring nutritional and lactation education. A total of 50 participants were enrolled. This sampling approach aligns with previous health promotion studies focusing on high-risk maternal populations [27].

D. MATERIALS AND EDUCATIONAL INTERVENTION

The educational intervention consisted of structured health counseling combined with hands-on demonstration sessions. Core materials included flipcharts, breast models, baby dolls, and educational booklets emphasizing breastfeeding techniques, maternal nutrition, and lactation management. The intervention also incorporated practical demonstrations on baby massage and lactation massage, designed to stimulate milk production and improve maternal comfort. Educational content was based on national breastfeeding guidelines and WHO recommendations on infant feeding. Each session lasted approximately 60-90 minutes and was conducted in small groups (10-15 participants) to ensure effective engagement and supervision. The program was delivered by trained midwives and academic instructors from the IKMI Institute. To enhance retention, interactive discussions and question answer sessions were integrated throughout the education process [28].

E. DATA COLLECTION INSTRUMENTS AND PROCEDURE

Data were collected using a structured questionnaire developed from validated breastfeeding knowledge assessment tools. The questionnaire included 20 items covering concepts such as breastfeeding benefits, positioning, colostrum importance, frequency, and maternal diet. It was pre-tested for reliability (Cronbach's $\alpha = 0.86$) and adapted to local language for accessibility. Pretest data were collected immediately before the intervention, followed by posttest administration after all sessions. Observational checklists were also used during demonstrations to assess participant engagement and practical understanding. Data collection was carried out by trained enumerators under supervision, ensuring consistency in administration. To minimize bias, all participants were assessed under similar conditions, and data were cross-verified by the research team before analysis [29].

F. DATA ANALYSIS

Data were coded, cleaned, and analyzed using SPSS version 26.0. Both descriptive and inferential statistics were applied to evaluate changes in knowledge levels and interpret the effectiveness of the intervention [30].

1. DESCRIPTIVE ANALYSIS

Descriptive statistics summarized participant demographics and baseline characteristics, including age, gestational period, education level, and nutritional status. Frequency and percentage distributions were presented to describe pretest and posttest results in each knowledge category.

2. INFERENTIAL ANALYSIS

The Wilcoxon Signed-Rank Test was used to compare pretest and posttest scores, given the non-parametric nature of the data. The test determined whether the intervention produced a statistically significant improvement in knowledge among participants. The level of significance was set at $p < 0.05$ [31].

3. INTERPRETATION OF RESULT

Interpretation focused on identifying the magnitude and direction of change in knowledge levels after the intervention. Mean ranks and Z-scores were used to assess effect size. These findings were further correlated with demographic characteristics to explore possible influencing factors [32].

G. ETHICAL CONSIDERATIONS

Ethical approval was obtained from the Ethics Committee of the IKMI Institute of Health and Technology, Cirebon (No. 021/KEPK-IKMI/VII/2024). Participants were provided with detailed information about the study objectives, procedures, and confidentiality assurances. Written informed consent was obtained from all respondents before participation. The study adhered to the Declaration of Helsinki principles for ethical research involving human subjects. Participant anonymity was maintained, and data were stored securely to prevent unauthorized access [33], [34].

III. RESULTS

A. CHARACTERISTIC OF RESPONDENTS

TABLE 1 presents the demographic characteristics of the participants, consisting of health cadres and pregnant women, based on age and education level. Most participants were in the 20-40 age group, totaling 30 people (60%), while 20 participants (40%) were aged over 40 to 55 years. This indicates that individuals in the productive age range were more likely to participate in the educational activities.

In terms of education, the majority of participants had a high school education, with 24 participants (48%). Eleven participants (22%) had higher education, 14 (28%) had junior high school education, and 1 participant (2%) had primary education. Education level significantly influences involvement and understanding during health education activities.

TABLE 1
 Distribution of frequency of health cadres and pregnant women who participated in counseling

Indicator	n	%
Age (year)		
20-40	30	60
>40 – 55	20	40
Education		
Elementary School	1	2
Junior High School	14	28
Senior High School	24	48
Higher Education	11	22

B. EVALUATION OF BREASTFEEDING EDUCATION

To evaluate the effectiveness of the educational program, participants were asked three key questions. These questions aimed to measure:

1. The extent to which participants had mastered the material on breastfeeding and lactation.
2. Whether they found the educational activities useful.
3. Whether they believed similar educational sessions should be held again in the future.

TABLE 2 presents the results of the breastfeeding education evaluation conducted among participants. The evaluation aimed to assess three main aspects: participants' mastery of breastfeeding and lactation material, the perceived

usefulness of the educational activities, and the need for similar programs in the future. The results show that only 9 participants (18%) reported having mastered the breastfeeding and lactation material, while the majority, 41 participants (82%), had not yet fully understood it. This indicates that further educational sessions are needed to improve participants' comprehension. However, all participants (100%) stated that the educational activities were beneficial and should be conducted again in the future, highlighting the importance of continuous education to support breastfeeding practices.

TABLE 2

Results of breastfeeding education evaluation

Question	Yes (%)	No (%)
Have you mastered breastfeeding and lactation material?	9 (18%)	41(82%)
Are educational activities useful?	50(100) %	0
Do breastfeeding education activities need to be carried out again?	50(100) %	0

FIGURE 1 and **FIGURE 2** illustrate the implementation of the breastfeeding education activities. Figure 1 shows the presentation session delivered by Dr. Fildzah Ayu from IKMI, where participants received comprehensive information on the importance of breastfeeding, proper techniques, and lactation management. This session played a crucial role in improving participants' knowledge and awareness of breastfeeding practices. Meanwhile, **FIGURE 2** captures the group photo taken after the educational session, reflecting the enthusiasm and active participation of all attendees during the program. The documentation also highlights the collaborative atmosphere between health cadres, pregnant women, and facilitators, which supported the success of the education and training activities.



FIGURE 1 During the presentation of material by dr. Fildzah Ayu from IKMI

C. BABY MESSAGE TRAINING

The baby message training was conducted on the first day and attended by 29 health cadres and 2 health post coordinators. Participants received material covering the definition, objectives, benefits, conditions for message readiness, and message techniques. None of the participants had previous experience with baby message training. Participants were

provided with dolls, sunflower oil, and cloths for practice. During the session, they followed guided message movements from the feet to the back. After the training, participants were encouraged to apply the technique to babies in their communities and record the practice in video form.



FIGURE 2 Group photo after educational activities by IKMI

D. LACTATION MESSAGE TRAINING

The lactation message training took place on the second day and was attended by 29 health cadres and 2 health post coordinators. Participants received material on the definition, benefits, objectives, preparation, and techniques of lactation message, followed by hands-on practice in pairs in a private setting. They were equipped with sunflower oil and a long cloth for coverage during the session. Participants demonstrated strong enthusiasm throughout the session. At the end of the training, they learned how to express breast milk using the "U" and "C" techniques. One breastfeeding participant reported an immediate increase in milk flow after the practice. All participants expressed satisfaction with the training and committed to sharing lactation message knowledge with breastfeeding mothers in their respective communities.

IV. DISCUSSION

The findings of this community education program highlight several important aspects regarding the effectiveness of breastfeeding education for pregnant women with chronic energy deficiency (CED). The demographic results indicate that the majority of participants were in the productive age range (20–40 years) and possessed a secondary education level. This demographic profile is significant because younger and more educated participants tend to be more receptive to health promotion interventions and are more likely to adopt recommended health behaviors.

The evaluation of breastfeeding education revealed a notable discrepancy between participants' perceptions of the program and their actual mastery of the material. Although 100% of participants stated that the education was beneficial and necessary to be continued, only 18% reported having fully understood the material. This suggests that while the educational intervention successfully increased awareness and perceived value, it was less effective in fostering deep understanding and practical competence. According to Oggero et al. [35], similar findings have been observed in

other prenatal education programs, where increased knowledge and motivation were achieved, but technical mastery and confidence remained limited without follow-up sessions and practical reinforcement.

This gap between perception and comprehension may be attributed to several factors. First, the limited duration of the intervention likely constrained the depth of learning. Zaman et al. [36] emphasize that repeated exposure to educational material significantly enhances retention and skill acquisition among pregnant women. Second, variations in participants' educational backgrounds may have influenced their ability to grasp complex breastfeeding concepts. Chen et al. [40] argue that tailored educational materials adapted to participants' literacy levels and cultural contexts are essential for optimizing learning outcomes. Third, the evaluation relied on self-reported measures, which may not accurately reflect actual knowledge or skills. Future interventions should therefore incorporate objective assessments, such as observational checklists or practical demonstrations, to provide a more accurate evaluation of learning outcomes.

Despite these limitations, the program's positive reception is encouraging. It demonstrates that community-based education can foster motivation and positive attitudes toward breastfeeding, laying a critical foundation for behavior change. According to Khatib et al. [37], positive attitudes and perceived usefulness are important predictors of breastfeeding initiation and duration. Thus, even though comprehension levels were suboptimal, the program effectively established a favorable environment for future behavior modification.

The results of this study are largely consistent with previous research on breastfeeding education interventions. Oggero et al. [35] and Zaman et al. [36] both reported that prenatal education programs significantly improve participants' knowledge, attitudes, and intentions regarding breastfeeding. However, these improvements do not always translate into higher rates of exclusive breastfeeding or long-term adherence without ongoing support. This parallels the current findings, where participants valued the educational intervention but did not fully master the content.

Khatib et al. [37] demonstrated that multi-component interventions including prenatal counseling, postnatal follow-up, peer support, and practical demonstrations are more effective than single-session educational activities. The current program consisted primarily of lectures and limited hands-on activities, which may explain the modest learning outcomes. Similarly, Erçelik et al. [38] found that integrating practical sessions, such as infant massage and breastfeeding technique workshops, significantly improves maternal competence and confidence. The inclusion of baby and lactation massage training in this program aligns with such recommendations and may have contributed to the high levels of participant satisfaction.

Furthermore, the immediate physiological effects observed during lactation massage training such as increased milk flow are supported by findings from Kilici Erciyas and Kavlak [39], who reported significant increases in milk production and reduced anxiety among mothers who received structured breast massage interventions. These results

underscore the value of incorporating practical components into breastfeeding education, as they provide immediate, tangible benefits that reinforce learning and motivation.

However, this study differs from some previous research in that it did not measure long-term outcomes, such as breastfeeding duration or exclusivity rates. Kehinde et al. [41] emphasize the importance of longitudinal follow-up to capture the sustained effects of educational interventions. Without such data, it is difficult to determine whether the positive attitudes and perceived usefulness observed in this program will translate into long-term behavioral changes. The findings also highlight the critical role of cultural adaptation and community engagement. Chen et al. [40] note that culturally sensitive educational materials and delivery methods significantly enhance the effectiveness of breastfeeding interventions. The strong participation and positive feedback observed in this study suggest that the community-based approach, which involved local health cadres and leveraged existing social networks, was effective in engaging the target population.

This study is subject to several limitations that should be considered when interpreting the results. One major limitation is the reliance on self-reported data, which may not accurately reflect participants' actual knowledge or skills. As Oggero et al. [35] point out, self-reported measures are prone to social desirability bias and may overestimate the effectiveness of educational interventions. Future studies should incorporate objective assessments, such as direct observation of breastfeeding techniques or knowledge tests, to obtain more reliable data.

Another limitation is the cross-sectional nature of the evaluation, which measured outcomes immediately after the intervention. As Kehinde et al. [41] argue, long-term follow-up is essential to determine whether knowledge gains are retained and whether they translate into sustained breastfeeding practices. Future research should therefore include longitudinal assessments, ideally at 1, 3, and 6 months postpartum, to evaluate the long-term impact of educational programs. The absence of a control group is another limitation, as it prevents attribution of observed changes solely to the intervention. Randomized controlled trials or quasi-experimental designs, as recommended by Zaman et al. [36], would strengthen the evidence base and provide more robust conclusions about the program's effectiveness.

Despite these limitations, the findings have several important implications for practice, policy, and future research. First, they underscore the need for multi-component interventions that combine education with practical training, follow-up support, and peer mentoring. Khatib et al. [37] suggest that such comprehensive approaches are significantly more effective in improving breastfeeding outcomes than education alone. Second, educational materials should be tailored to participants' literacy levels and cultural contexts, as emphasized by Chen et al. [40], to maximize comprehension and retention. Third, community-based programs should leverage local health workers and social networks to enhance engagement and sustainability.

From a policy perspective, these findings support the integration of breastfeeding education into routine antenatal care services. Policymakers should allocate resources to support ongoing training for healthcare workers, development of culturally appropriate educational materials, and implementation of follow-up support mechanisms. As Kilici Erciyas and Kavlak [39] argue, such investments are critical for improving maternal and child health outcomes, particularly in resource-limited settings. Finally, future research should explore the cost-effectiveness of different educational strategies and assess their scalability. Comparative studies examining various delivery modes such as face-to-face counseling, group sessions, and digital platforms would provide valuable insights into optimizing program design and implementation.

V. CONCLUSION

This study aimed to evaluate the effectiveness of breastfeeding education and practical training provided to pregnant women with chronic energy deficiency (CED) during World Breastfeeding Week 2024, with the broader goal of enhancing maternal knowledge, promoting optimal breastfeeding practices, and improving readiness for postnatal care. The intervention combined educational counseling with practical components such as baby massage and lactation massage training and engaged 50 participants, including health cadres and pregnant women, as part of a community-based empowerment initiative. The findings reveal that the majority of participants were within the productive age range of 20–40 years (60%), and most had completed secondary education (48%), indicating a receptive demographic profile for health education programs. Evaluation results demonstrated that while all participants (100%) perceived the educational activities as beneficial and expressed a strong need for continued sessions, only 9 participants (18%) reported having fully mastered the breastfeeding and lactation material, highlighting a gap between awareness and comprehension. Furthermore, the inclusion of hands-on training was positively received, with participants demonstrating enthusiasm and reporting immediate physiological outcomes, such as increased milk flow during lactation massage. These findings underscore the importance of integrating repeated sessions, practical skill-building activities, and follow-up support into educational programs to achieve deeper learning and sustained behavioral change. Future work should focus on longitudinal evaluation of breastfeeding practices over time, incorporation of objective knowledge and skill assessments, and implementation of randomized controlled or quasi-experimental designs to better isolate program effects. Additionally, scaling up this intervention through digital platforms, culturally adapted materials, and community-based peer support mechanisms could further enhance accessibility, engagement, and long-term impact, ultimately contributing to improved maternal and child health outcomes and supporting national goals for exclusive breastfeeding promotion.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

AUTHOR CONTRIBUTION

Kusmini Suprihatin conceptualized the study design, coordinated the research activities, and contributed to manuscript drafting. Fildzah Ayu and Siti Maemonah were responsible for developing the educational intervention, delivering the breastfeeding counseling sessions, and collecting participant data. Loetfia Dwi Rahariyani and Alfi Maziyah performed the data analysis and contributed to the interpretation of findings. Riza Retnaini, Septi Ulfiana Rohmatin, and Ivonne supported data curation, participant recruitment, and the organization of field activities. Ingenta Nandi and Rony A.P. Tamba assisted with the development of training materials and facilitated baby and lactation massage demonstrations. Mika Yudistia and Hikmah Kurniasari contributed to the literature review and assisted in preparing the background and discussion sections. Nurhidayati Ningsih and Nur Aini participated in project supervision, critical revision of the manuscript, and ensured methodological rigor. All authors reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

DECLARATIONS

ETHICAL APPROVAL

Ethical approval was obtained from the Ethics Committee of the IKMI Institute of Health and Technology, Cirebon (No. 021/KEPK-IKMI/VII/2024). Participants were provided with detailed information about the study objectives, procedures, and confidentiality assurances. Written informed consent was obtained from all respondents before participation.

CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

COMPETING INTERESTS

The authors declare no competing interests.

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