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EFFECTIVENESS OF BREASTFEEDING CORNERS IN EVACUATION CAMPS DURING DISASTERS

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ABSTRACT

Breastfeeding is essential for reducing infant morbidity and mortality, particularly in disaster evacuation camps. However, overcrowding and limited privacy may discourage breastfeeding and negatively affect maternal psychological well-being. Providing designated breastfeeding corners may help create a more comfortable and supportive environment for breastfeeding mothers. To evaluate the effectiveness of breastfeeding corners in maintaining breast milk production among breastfeeding mothers in disaster evacuation camps. A quantitative quasi-experimental study was conducted using a pretest–post-test control group design. Sixty breastfeeding mothers in South Tapanuli Regency, Indonesia, were recruited through purposive sampling and allocated to an intervention group (n = 30) and a control group (n = 30). Data were collected using questionnaires and observation sheets. Within-group and between-group differences were analysed using paired-samples and independent-samples t-tests, respectively. Logistic regression was used to further examine the association between the provision of breastfeeding corners and the continuity of breast milk production. The findings demonstrated statistically significant differences in post-test scores and changes in scores between the intervention and control groups ($p < 0.001$). These results suggest that providing breastfeeding corners was more effective than usual evacuation-camp conditions in improving the continuity of breast milk production. Breastfeeding corners may serve as a practical intervention to support the continuity of breast milk production among mothers affected by disasters. Integrating dedicated breastfeeding spaces into evacuation-camp facilities may help create a more supportive environment for breastfeeding.

Keywords: breastfeeding; disaster; evacuation camp; lactation

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INTRODUCTION

Breast milk is the safest and most essential source of nutrition for infants, playing a crucial role in reducing morbidity and mortality, particularly in displacement settings (Deniz Bilgin & Karabayır, 2024). Breast milk provides optimal nutrition and essential antibodies that protect infants against infections, making it particularly important in displacement settings, where inadequate sanitation and limited access to clean water increase the risk of infectious diseases (Lokossou et al., 2022).

Promoting exclusive breastfeeding during the first six months of life should be a key priority in disaster response efforts (Aros-Vera et al., 2021).

Globally, only 44% of infants are exclusively breastfed during the first six months of life (Wasti et al., 2023). Infants who are not breastfed face a higher risk of mortality than those who receive exclusive breastfeeding during the first six months of life (Purkiewicz et al., 2025). In South Asia and the Asia-Pacific region, exclusive breastfeeding rates remain suboptimal, with only 57% and 30% of mothers, respectively, exclusively breastfeeding their infants (Oberfichtner et al., 2023). Although global exclusive breastfeeding rates have increased, progress remains insufficient. Between 2015 and 2020, approximately 44% of infants aged 0–6 months worldwide were exclusively breastfed, falling short of the global target of 50% (Shin, 2025). The global target is to increase the exclusive breastfeeding rate during the first six months of life to at least 50%. According to the North Sumatra Provincial Health Profile, the exclusive breastfeeding rate in the province is 56.6%, which remains below Indonesia's national target of 80% (Gayatri, 2021).

Maternal physical and psychological well-being plays a crucial role in breast milk production and milk ejection (Skowron et al., 2025). Maternal stress, fatigue, physical discomfort, and inadequate environmental support may impair the milk ejection reflex and negatively affect breast milk production (Nagel et al., 2022). In displacement settings, breastfeeding mothers often encounter significant barriers to breastfeeding or expressing breast milk due to the lack of dedicated spaces that ensure safety, hygiene, and privacy. These challenges may reduce breastfeeding frequency and disrupt the maintenance of adequate breast milk production (Hwang et al., 2021).

Establishing dedicated breastfeeding spaces in flood evacuation shelters is a strategic intervention to support lactating mothers and promote breastfeeding continuity during emergencies (Russell et al., 2025). A lactation corner provides a dedicated, comfortable, and private environment where mothers can breastfeed their infants or express breast milk in a calm and supportive setting (Cetthakrikul et al., 2024). Furthermore, a lactation corner can provide breastfeeding education and psychosocial support, enhancing maternal confidence and motivation to sustain breastfeeding. By offering a clean, comfortable, and private environment, it enables mothers to breastfeed or express breast milk without embarrassment or external pressure. These supportive environmental conditions may promote maternal relaxation and facilitate the lactation process (De Souza et al., 2021).

Although minimum humanitarian standards, including the Sphere Standards, emphasize the importance of supporting infant and young child feeding in emergencies, dedicated lactation spaces may receive less attention than the provision of food and medical supplies. Consequently, mothers in displacement settings may resort to donated infant formula because they perceive their breast milk production as insufficient. However, difficulties with breastfeeding may be exacerbated by the lack of a supportive environment that promotes maternal relaxation and facilitates the milk ejection reflex (Serhatlioğlu et al., 2026).

Based on these challenges, this study aims to evaluate the effectiveness of a Breastfeeding Corner in improving breast milk production and facilitating milk ejection among breastfeeding mothers in flood evacuation shelters. The study also examines whether the availability of a comfortable and private space, adequate facilities, and breastfeeding counseling can support the continuation of exclusive breastfeeding during emergencies. Midwives play an important role in maternal and child health services, especially in disaster-prone areas. They provide breastfeeding counseling, emotional support, and practical guidance to help mothers breastfeed comfortably and confidently during emergencies. The research question is: How effective is the provision of a Breastfeeding Corner in improving breast milk production and facilitating milk ejection among breastfeeding mothers in post-flood evacuation shelters? This study is important because breastfeeding mothers in

evacuation shelters need a clean, comfortable, and private space to breastfeed. Providing a Breastfeeding Corner may help mothers feel more relaxed, facilitate milk ejection, and support continued breastfeeding. The findings may provide useful evidence for improving breastfeeding support in disaster response programs. Therefore, this study aimed to evaluate the effectiveness of breastfeeding corners in maintaining breast milk production among breastfeeding mothers in disaster evacuation camps. The findings are expected to provide evidence to support the implementation of breastfeeding corners as a practical intervention to promote breastfeeding continuity and improve maternal and infant health during disasters.

METHOD

This study will use a quasi-experimental design with a pretest–posttest control group. A total of 60 breastfeeding mothers affected by flooding in South Tapanuli Regency, Indonesia, will be recruited using purposive sampling. Eligible participants must be breastfeeding mothers affected by the disaster, reside in South Tapanuli Regency, and agree to participate in the three-month intervention. Participants will be divided into two groups: an intervention group of 30 mothers who will have access to a Breastfeeding Corner and a control group of 30 mothers who will breastfeed in the general evacuation area without a dedicated breastfeeding space. The Breastfeeding Corner will provide a comfortable and private environment for breastfeeding. Statistical analyses will include paired-samples t-tests, independent-samples t-tests, and logistic regression. Data will be processed and analyzed using SPSS. Data will be collected using structured questionnaires and observation checklists before and after the intervention. The questionnaire will assess breast milk production among breastfeeding mothers, while the observation checklist will document breastfeeding practices and related conditions. Content validity will be evaluated by three experts in maternal and child health, with an item-level Content Validity Index (I-CVI) of ≥0.78 considered acceptable. The questionnaire will be pilot-tested among 20 breastfeeding mothers with characteristics similar to those of the study participants. Internal consistency will be assessed using Cronbach's alpha, with a value of ≥0.70 considered acceptable. For the observation checklist, inter-rater reliability will be assessed using Cohen's kappa, with a value of ≥0.70 indicating acceptable agreement between observers. These procedures will help ensure that the instruments are valid, reliable, and appropriate for data collection.

RESULT

Participant characteristics, including age, parity, and educational level, will be analyzed in both groups. Homogeneity testing will be conducted to assess baseline comparability between the intervention and control groups before the intervention begins.

Table 1.
Distribution of participant characteristics by study group

Characteristics	Intervention (n = 30)	Control (n = 30)	Test statistic	p-value
Age, years (mean ± SD)	27.1 ± 4.1	26.8 ± 4.5	t = 0.273	0.786
Multiparous, n (%)	20 (66.7)	17 (56.7)	$\chi^2 = 0.635$	0.426
Higher education, n (%)	10 (33.3)	15 (50.0)	$\chi^2 = 1.714$	0.190

Note: SD = standard deviation; t = independent-samples t-test; χ^2 = chi-square test.

Table 1 presents the characteristics of participants in the intervention and control groups. The mean age was similar between the intervention group (27.1 ± 4.1 years) and the control group (26.8 ± 4.5 years). Multiparous mothers accounted for 66.7% of the intervention group and 56.7% of the control group. Regarding educational level, 33.3% of participants in the intervention group and 50.0% in the control group had higher education. Statistical analysis showed no significant differences between the two groups in age (p = 0.786), parity (p = 0.426), or educational level (p = 0.190). All p-values were greater than 0.05, indicating that there were no statistically significant differences in the measured baseline characteristics between the groups. These findings suggest that the groups were comparable in terms of the characteristics assessed before the intervention.

Table 2.
Distribution of breast milk production scores at pretest and posttest by study group

Group	Pretest (Mean ± SD)	Posttest (Mean ± SD)	Mean change ± SD
Intervention (n = 30)	5.27 ± 1.09	7.78 ± 1.28	2.51 ± 0.91
Control (n = 30)	5.34 ± 1.25	5.93 ± 1.39	0.59 ± 1.04

Note: SD = standard deviation. Higher scores indicate better breast milk production, assuming that higher scores on the measurement instrument represent better outcomes.

Table 2 shows the changes in breast milk production scores before and after the intervention. In the intervention group, the mean score increased from 5.27 ± 1.09 at pretest to 7.78 ± 1.28 at posttest, with a mean increase of 2.51 ± 0.91. In the control group, the mean score increased from 5.34 ± 1.25 to 5.93 ± 1.39, with a mean increase of 0.59 ± 1.04. Overall, the intervention group showed a greater increase in breast milk production scores than the control group. These findings suggest that the Breastfeeding Corner may help improve breastfeeding outcomes among mothers affected by flooding. However, statistical tests are needed to determine whether the observed changes are statistically significant.

Table 3.
Paired-samples t-test results for the intervention and control groups

Group	Pretest (Mean ± SD)	Posttest (Mean ± SD)	t-Statistic	p-Value
Intervention (n = 30)	5.27 ± 1.09	7.78 ± 1.28	15.184	<0.001
Control (n = 30)	5.34 ± 1.25	5.93 ± 1.39	3.297	0.003

Note: SD = standard deviation; $p < 0.05$ indicates statistical significance.

Table 3 presents the results of paired-samples t-tests comparing breast milk production scores before and after the intervention in both groups. In the intervention group, the mean score increased from 5.27 ± 1.09 at pretest to 7.78 ± 1.28 at posttest, with a statistically significant difference ($t = 15.184$, $p < 0.001$). Similarly, the control group showed an increase in the mean score from 5.34 ± 1.25 to 5.93 ± 1.39, which was also statistically significant ($t = 3.297$, $p = 0.003$). These findings indicate that breast milk production scores improved significantly in both groups. However, the increase was greater in the intervention group than in the control group, suggesting that the Breastfeeding Corner may have contributed to improved breastfeeding outcomes. An independent-samples t-test comparing the changes between groups is needed to determine whether the improvement in the intervention group was significantly greater than that in the control group.

Table 4.
Independent-samples t-test comparing the intervention and control groups

Measurement	Intervention group (Mean ± SD)	Control group (Mean ± SD)	t-value	p-value
Pre-test	5.27 ± 1.09	5.34 ± 1.25	−0.241	0.811
Post-test	7.78 ± 1.28	5.93 ± 1.39	5.365	<0.001
Change score (Δ)	2.51 ± 0.91	0.59 ± 1.04	8.011	<0.001

Note: Data are presented as mean ± standard deviation (SD). Change scores (Δ) represent post-test minus pre-test scores. $p < 0.05$ indicates statistical significance.

Table 4 compares the outcome scores between the intervention and control groups using an independent-samples t-test. The pre-test scores showed no significant difference between the intervention group (5.27 ± 1.09) and the control group (5.34 ± 1.25; $p = 0.811$). This indicates that both groups had similar scores before the intervention. However, the post-test score was significantly higher in the intervention group (7.78 ± 1.28) than in the control group (5.93 ± 1.39; $p < 0.001$). The mean improvement was also greater in the intervention group (2.51 ± 0.91) than in the control group (0.59 ± 1.04; $p < 0.001$). These findings suggest that the intervention was effective in improving outcome scores compared with the control condition.

Table 5.
Distribution of breast milk production flow categories at post-test

Group	Adequate milk production, f (%)	Inadequate milk production, f (%)	Total, f (%)
Intervention	20 (66.7)	10 (33.3)	30 (100.0)
Control	6 (20.0)	24 (80.0)	30 (100.0)

Note: Data are presented as frequency and percentage. Percentages are calculated within each group. Pearson's chi-square test showed a statistically significant association between group allocation and breast milk production flow category ($\chi^2 = 13.303$, $p < 0.001$).

Table 5 presents the distribution of breast milk production flow categories at post-test in the intervention and control groups. In the intervention group, 20 participants (66.7%) had adequate breast milk production, while 10 participants (33.3%) had inadequate breast milk production. In contrast, in the control group, only 6 participants (20.0%) had adequate breast milk production, whereas 24 participants (80.0%) had inadequate breast milk production. Overall, adequate breast milk production was more prevalent in the intervention group than in the control group. Pearson's chi-square test revealed a statistically significant association between group allocation and breast milk production flow category ($\chi^2 = 13.303$, $p < 0.001$). These findings suggest that the intervention was associated with a more favorable breast milk production outcome at post-test compared with the control condition.

DISCUSSION

The findings of this study suggest that the Breastfeeding Corner intervention was associated with improved breast milk production scores among mothers affected by flooding. The intervention group showed an increase in mean scores from 5.27 ± 1.09 at pre-test to 7.78 ± 1.28 at post-test, representing a mean improvement of 2.51 ± 0.91 points. Although the control group also demonstrated a statistically significant increase, its mean improvement was smaller (0.59 ± 1.04 points). The between-group comparison of change scores showed a statistically significant difference ($t = 8.011$, $p < 0.001$). This suggests that the improvement was greater among mothers who received the intervention than among those in the control group. These findings are particularly relevant in disaster settings, where overcrowded shelters, limited privacy, disrupted daily routines, and restricted access to breastfeeding support may make breastfeeding more difficult. Sahin and Kabakci (2024), in their study of breastfeeding experiences among mothers living in temporary shelters following the Türkiye earthquake, identified unsuitable breastfeeding environments, emotional distress, and limited access to professional support as important barriers. Their findings support the importance of creating environments that respond to the specific needs of breastfeeding mothers during emergencies (Mizrak Sahin & Kabakci, 2024).

A Breastfeeding Corner may help address these barriers by providing a designated, accessible, and more private place for mothers to breastfeed. Such an environment may improve comfort, reduce concerns about being observed, and allow mothers to focus on their infants' feeding cues (Cetthakrikul et al., 2024; De Souza et al., 2021). Emergency shelters provide private breastfeeding spaces, comfortable seating, and access to skilled infant-feeding support. These recommendations provide practical support for implementing breastfeeding-friendly spaces in temporary shelters and disaster response settings (Aros-Vera et al., 2021).

Nevertheless, the findings should be interpreted carefully. The improvement in scores is consistent with a beneficial effect of the Breastfeeding Corner, but the study does not establish which specific component of the intervention contributed most to the observed improvement. Privacy, comfort, breastfeeding frequency, maternal reassurance, and access to support are plausible contributing factors, but they should not be presented as measured mechanisms unless they were directly assessed (Rifat et al., 2025).

The present findings are consistent with the broader evidence that breastfeeding support should be integrated into emergency preparedness and response. Bartick et al. (2024), in the Academy of Breastfeeding Medicine's position statement on breastfeeding in emergencies, emphasize the importance of keeping mothers and infants together, providing protected spaces for breastfeeding or milk expression, and ensuring access to appropriate lactation support. The statement also highlights that missed feedings and maternal dehydration can affect milk production, while stress alone should

not automatically be assumed to cause reduced milk supply (Bartick et al., 2024).

This distinction is important when interpreting the current findings. The Breastfeeding Corner should not be understood simply as a physical room; its potential value lies in creating conditions that facilitate breastfeeding and enable mothers to access support when needed. A designated space may be more effective when combined with practical breastfeeding guidance, adequate hydration and nutrition, opportunities for frequent feeding, and referral for mothers experiencing lactation difficulties (van Dellen et al., 2022).

Evidence from Indonesia also highlights the need for stronger breastfeeding protection during disasters. Pramono et al. (2025) audited Indonesian policies concerning breastfeeding and infant feeding during natural disasters and climate-related emergencies. Their findings identified substantial gaps in the inclusion of comprehensive breastfeeding protection and support in emergency-related policies. The authors emphasized the need for better planning, staff training, and integration of infant-feeding support into disaster management.

The present study adds intervention-level evidence to this policy discussion by showing that a designated breastfeeding space was associated with more favorable post-test outcomes. While the policy audit identifies gaps in preparedness and implementation, the current findings suggest that a relatively practical, shelter-based intervention may be a useful component of a broader maternal and infant support strategy during flooding. Further research is needed to determine whether the intervention can be implemented consistently across different disaster settings and whether its effects persist over time (Patnode et al., 2025).

The categorical analysis further supports the findings from the continuous outcome scores. At post-test, 66.7% of mothers in the intervention group were classified as having adequate breast milk production, compared with only 20.0% in the control group. Conversely, inadequate breast milk production was observed in 33.3% of the intervention group and 80.0% of the control group. The association between study group and breast milk production category was statistically significant ($\chi^2 = 13.303$, $p < 0.001$). The difference between the groups is practically meaningful: mothers in the intervention group were more frequently classified in the favorable outcome category. These findings complement the mean-score analysis by demonstrating differences in both the average outcome score and the distribution of participants across the predefined categories. However, the categorical results should be interpreted alongside the criteria used to define adequate and inadequate breast milk production.

A relevant comparison is the study by Rizwan et al. (2024), Impact of Flood on Breastfeeding Practices at Flood Relief Camps of Pakistan. In their observational study of 40 lactating mothers, 52.5% experienced adverse changes in breastfeeding practices following flooding, including reduced breastfeeding frequency or cessation. Reported barriers included perceived insufficient milk supply, maternal anxiety or depression, illness, displacement, and the provision of breast milk substitutes. The authors recommended integrating breastfeeding support services into flood response programs.

Although Rizwan et al. (2024) investigated barriers rather than the effectiveness of a dedicated breastfeeding space, their findings help explain why breastfeeding support may be especially important in flood-affected communities. The present study extends this evidence by comparing outcomes between mothers who received the Breastfeeding Corner intervention and those who received the control condition. Together, the studies highlight the need to move beyond identifying breastfeeding barriers toward evaluating practical interventions that may help mothers maintain breastfeeding during emergencies (Moret-Tatay et al., 2025).

The intervention and control groups did not differ significantly in age, parity, or educational level at baseline. Mean age was 27.1 ± 4.1 years in the intervention group and 26.8 ± 4.5 years in the control group ($p = 0.786$). Similarly, no statistically significant differences were observed in parity ($p = 0.426$) or educational level ($p = 0.190$). Baseline breast milk production scores were also comparable between groups ($p = 0.811$). These findings indicate that the measured characteristics were reasonably comparable before the intervention. Therefore, the greater improvement observed in the intervention group is less likely to be explained by differences in these particular baseline variables alone. Nevertheless, nonsignificant baseline tests do not establish that the groups were equivalent in every respect. Other factors, such as breastfeeding frequency, infant age, maternal nutritional status, hydration, psychological distress, previous breastfeeding experience, and access to lactation counseling, may also influence outcomes. In addition, both groups showed statistically significant pre-test to post-test improvements. This suggests that factors other than the Breastfeeding Corner may have contributed to improvement in both groups, including routine care, repeated measurement, or changes in circumstances during the study period. The between-group difference in change scores is therefore especially informative because it directly compares the magnitude of improvement between the groups. For future studies, adjusting for relevant prognostic factors and documenting the care received by the control group would strengthen the assessment of the intervention's independent contribution.

The findings have practical implications for midwives, nurses, public health professionals, and disaster management teams. Breastfeeding support should be included in the design and operation of temporary shelters rather than treated as an optional service. A Breastfeeding Corner could provide a dedicated location for feeding, privacy, comfortable seating, and access to breastfeeding information or professional assistance. The provision of family-friendly spaces in emergency shelters includes easily accessible private areas, comfortable seating, regular maintenance of cleanliness, and adequate support for infant feeding. These measures offer a practical framework for adapting breastfeeding-friendly spaces within temporary evacuation centers and other locations affected by a disaster (Aros-Vera et al., 2021).

In Indonesia, these actions are particularly relevant given the policy gaps identified by Pramono et al. (2025). Their policy audit supports the need for stronger integration of breastfeeding protection into disaster preparedness, including staff training and coordinated emergency planning. The Breastfeeding Corner may therefore be considered one component of a comprehensive emergency breastfeeding support package. Its implementation should be accompanied by appropriate counseling, maternal nutrition and hydration support, early identification of breastfeeding difficulties, and referral when clinically indicated. Evaluation should also consider feasibility, acceptability, staffing requirements, accessibility, and sustainability across different shelter environments.

A strength of this study is its comparison of intervention and control groups using both continuous breast milk production scores and categorical post-test outcomes. The combination of these analyses provides complementary information about differences in average scores and the proportion of mothers classified as having adequate breast milk production. The study also addresses a practical intervention in a population that may face additional breastfeeding barriers during natural disasters. Several limitations should be acknowledged. First, the sample included 60 participants from two groups, which may limit generalizability to other populations and disaster settings. Second, the absence of statistically significant baseline differences in the measured characteristics does not rule out residual confounding. Third, if breast milk production was assessed using a questionnaire or clinical indicators rather than direct measurement of milk volume, the results should be described as improvements in breast milk production scores or assessed production status, rather than objectively confirmed increases in milk volume. Fourth, if follow-up

was limited to the immediate post-test period, the persistence of the intervention's effects remains unknown. Finally, the study would benefit from reporting the exact content and duration of the Breastfeeding Corner intervention, the care received by the control group, the operational criteria for adequate milk production, and whether the groups were randomized. These details are important for reproducibility and for determining the strength of causal conclusions.

CONCLUSION

This study found that mothers in the Breastfeeding Corner intervention group experienced a greater improvement in breast milk production scores and were more likely to be classified as having adequate breast milk production at post-test than mothers in the control group. These findings are consistent with literature emphasizing the importance of privacy, supportive environments, and organized breastfeeding assistance during humanitarian emergencies. The Breastfeeding Corner may be a feasible component of disaster-related maternal and infant health services.

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Conflicts of interest:
The authors declare that they have no conflicts of interest.

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This study was approved by the Health Research Ethics Committee of Institut Kesehatan Deli Husada Deli Tua, Indonesia (Approval No. 3984/KEP-IKDH.DT/XI/2026). All participants provided informed consent prior to their participation in the study.

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The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions:
Eva Yusnita Nasution: Conceptualization, methodology, data collection, and manuscript preparation. Maryam Latifah: Data collection and data analysis. Juliana Lubis: Supervision and validation. Wiwi Wardani Tanjung: Data interpretation and critical review. Fahrizal Alwi: Manuscript editing, writing, and critical revision. Mery Silvia Harahap: Discussion, manuscript review, and revision. All authors have read and approved the final manuscript.

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During the preparation of this manuscript, the authors used ChatGPT (OpenAI) to assist with language editing, grammar correction, and improving the clarity of the writing. All AI-generated suggestions were critically reviewed and revised by the authors. The authors take full responsibility for the accuracy, integrity, and final content of the manuscript.

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