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Effectiveness of a LATCH-Based Training Program for Midwives on Maternal Breastfeeding Attachment and Mastitis Risk: A Randomized Controlled Trial

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ABSTRACT

Background: Breastfeeding outcomes are improved by direct breastfeeding support from healthcare professionals, but repeated face-to-face contact is often needed, so its scalability is limited by time and workforce constraints. A sustainable provider-level strategy may be offered by training midwives to use the LATCH breastfeeding assessment tool, although evidence of its effectiveness on maternal breastfeeding outcomes is still limited. **Objective:** The effectiveness of a LATCH-based training program for midwives in improving breastfeeding attachment and reducing the risk of mastitis among postpartum mothers was evaluated. **Methods:** A randomized controlled trial was conducted, in which 130 postpartum mothers and 12 midwives at Sembiring Hospital, North Sumatra, Indonesia, were involved. LATCH-based training was given to six midwives, while six served as controls. Postpartum mothers were randomly allocated to be given care by either trained or untrained midwives using sealed envelopes (65 per group). Breastfeeding attachment was assessed at 24–48 hours (T0), 3 days (T1), and 6 weeks (T6) postpartum, while mastitis symptoms/risk were assessed at T1 and T6. Longitudinal changes in LATCH scores were analyzed by generalized estimating equations (GEE), and categorical outcomes were compared by the Chi-square test. **Results:** Higher mean LATCH scores than those receiving usual care were consistently reached by mothers who were cared for by trained midwives across all follow-up assessments. A significant intervention effect on breastfeeding attachment was shown by the GEE analysis ($\beta = 0.60$, 95% CI: 0.038–1.163, $p = 0.037$), independent of gravida status. A significant association between study group and mastitis symptoms/risk was found at T1 ($p = 0.035$), which shows that fewer mothers with mastitis symptoms/risk were in the intervention group, whereas no significant association was found at T6 ($p = 0.479$). **Conclusion:** Breastfeeding attachment was improved and early postpartum mastitis risk was reduced by LATCH-based training for midwives. However, the benefit was not maintained at six weeks, which shows that continued breastfeeding support after hospital discharge is needed.

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INTRODUCTION

Exclusive breastfeeding is an essential strategy by which maternal and child health is improved. Besides giving optimal nutrition for infants, immune protection is supported by breastfeeding, healthy growth and development are supported, and the emotional bond between mother and child is strengthened. Even though these benefits are well established, successful exclusive breastfeeding is still hard to achieve in many settings [1]. Among the factors that influence breastfeeding success, an important role is played by effective breastfeeding technique, especially appropriate attachment between the infant and the mother (latch). Effective milk transfer is helped by proper attachment, while breastfeeding may be disturbed by poor attachment, and a range of breastfeeding-related complications may be caused by it [2], [3].

Lactational mastitis is one of the most common breastfeeding complications, and it is known as an important reason for the early stopping of exclusive breastfeeding. It was reported by Ouedraogo et al. that exclusive breastfeeding was later stopped by nearly 17.0% of mothers who had mastitis [4]. In general, mastitis is related to ineffective milk removal, which may be caused by several factors, such as poor attachment, nipple injury, excessive milk production, the use of nipple shields, and irregular breastfeeding patterns [2], [3], [5]. Although poor attachment is an important cause of ineffective milk drainage, it is not the only cause of mastitis. Therefore, appropriate prevention and management of mastitis are still essential, because maternal health is not only affected by persistent mastitis, but the continuation of breastfeeding for the infant may also be disturbed by it [5], [6].

Several approaches have been developed so that breastfeeding practices are improved and breastfeeding-related complications, including mastitis, are reduced. It has been shown by previous studies that breastfeeding outcomes can be improved and breastfeeding problems can be reduced by biological nurturing, breastfeeding counselling, and continuous breastfeeding education [5], [7], [8]. However, the reported effectiveness of these interventions has been varied across studies, and repeated face-to-face support for postpartum mothers is needed by many of them. In addition, it was emphasized by Mitchell et al. that many cases of mastitis can be handled without antibiotics when appropriate breastfeeding management is given, and the importance of improving the competence of health care providers in breastfeeding assessment and management was highlighted [3]. Together, these findings show that effective breastfeeding support depends not only on maternal education but also on the ability of health care providers to give appropriate and evidence-based breastfeeding care.

It has been consistently reported by previous studies that breastfeeding outcomes are influenced by the knowledge and competence of health care providers. Better breastfeeding techniques are usually shown by mothers who are given counselling by health care providers, and exclusive breastfeeding is more likely to be maintained by them [5], [8], [9]. However, adequate knowledge or enough opportunity to give standardized breastfeeding education is not held by all health care providers who are involved in maternity care. As reported by [10], knowledge about lactational mastitis management among general practitioners and nurses was still relatively low. In the same way, [11] found that low-to-moderate knowledge about the early initiation of breastfeeding was held by almost half of the participating health care providers. These findings show that a gap still exists between the clinical needs of breastfeeding mothers and the ability of health care providers to give consistent breastfeeding support. Therefore, the strengthening of provider competence may be a practical strategy by which breastfeeding care within routine maternal health services is improved.

One approach that has been widely used to evaluate breastfeeding technique is the LATCH scoring system. The LATCH scoring system, which was first introduced by [12], evaluates five essential components of breastfeeding, namely latch, audible swallowing, type of nipple, comfort, and hold positioning, by which the quality of breastfeeding practice is reflected [13]. It has been shown by previous studies that the LATCH score is useful for the identification of breastfeeding difficulties [14], for improving the accuracy of breastfeeding attachment through education [15], for assessing breastfeeding success and milk intake [16], and for evaluating differences in breastfeeding outcomes after counselling interventions [17]. These findings show that the LATCH scoring system is not only an assessment instrument, but it can also be used as a structured framework for breastfeeding education and clinical skills training.

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Although positive effects of breastfeeding counselling and LATCH-based education have been shown by previous studies, the available evidence is still limited in several ways. In most interventions, education has been given directly to postpartum mothers, or the LATCH score has been used mainly as an assessment tool [15], [17], [18], [19], [20]. In contrast, whether maternal breastfeeding attachment can be improved and breastfeeding-related complications can be reduced by structured LATCH-based training for midwives during routine postpartum care has been examined by relatively little evidence. In addition, previous findings are still inconsistent. While beneficial effects of counselling interventions on breastfeeding outcomes were reported by several studies [17], [18], [19], [20], no significant improvements in LATCH scores or breast engorgement, which is considered a risk factor for mastitis, were found by other studies [21]. These inconsistencies show that further investigation with a rigorous study design is needed, so that whether maternal breastfeeding outcomes can be improved by the strengthening of provider competence through structured LATCH-based training can be evaluated.

As frontline health care professionals, a central role in supporting mothers throughout the postpartum and breastfeeding periods is held by midwives in Indonesia. According to [22], subjective clinical judgment is still relied on by many midwives when breastfeeding care is given. Although clinical experience is still valuable, the improvement of practical competence through structured training is still needed [23], [24]. A standardized approach to breastfeeding assessment and counselling that can be integrated into routine midwifery practice may be given by a LATCH-based training program. Therefore, this randomized controlled trial was aimed to evaluate whether breastfeeding attachment is improved and early postpartum mastitis risk is reduced among postpartum mothers by a LATCH-based training program for midwives, compared with usual practice.

METHOD

Design of Study

A single-center, parallel-group randomized controlled trial (RCT) with a 1:1 allocation ratio was used in this study, so that the effectiveness of a LATCH-based training program for midwives on maternal breastfeeding attachment and early postpartum mastitis risk could be evaluated. The intervention was given to midwives, while the study outcomes were assessed among postpartum mothers who were given breastfeeding care by the participating midwives. The study was carried out at Sembiring Hospital, Deli Serdang Regency, North Sumatra Province, Indonesia, from June to August 2025.

Sample and Eligibility Criteria

A total of 167 postpartum mothers who were admitted to the delivery and postpartum wards of Sembiring Hospital were screened for eligibility during the study period. The mothers were recruited consecutively according to the order of admission until the required number of eligible participants was reached. Of the 167 mothers who were screened, 130 met the eligibility criteria, gave written informed consent, and were enrolled in the study. No participant withdrew during follow-up, and the study was completed by all enrolled mothers through the sixth week postpartum. The eligibility criteria for the mothers who were included in this study were as follows:

1. A live infant with a gestational age of 37 weeks or more was delivered by the mother.
2. The mother and her infant were in a healthy or stable condition.
3. Exclusive breastfeeding was given directly to her infant by the mother.
4. Willingness to take part in the study until the sixth week postpartum intervention.
5. The mother did not have medical problems that disturb breastfeeding.
6. The infant did not have serious problems or disorders related to breastfeeding.

The final study population was made up of 130 postpartum mothers, who were then allocated into either the intervention group (n = 65) or the control group (n = 65). The breastfeeding care for these mothers was given by 12 participating midwives who worked in the maternity and postpartum units of Sembiring Hospital. LATCH-based training was received by six midwives before participant recruitment, while six continued to give breastfeeding support according to usual practice. Because all eligible postpartum

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mothers who met the predefined eligibility criteria during the study period were recruited in this study, a formal a priori sample size calculation was not done.

Randomization and Allocation

Before participant recruitment, the 12 participating midwives were assigned to either the intervention group (n = 6) or the control group (n = 6). The LATCH-based training program was received by the midwives in the intervention group, while their routine breastfeeding support without additional LATCH training was continued by those in the control group.

After recruitment, the eligible postpartum mothers were individually randomized by a simple randomization procedure with a 1:1 allocation ratio. The random allocation sequence was generated by the principal investigator before participant enrollment. Each allocation assignment was placed in a sealed envelope and was opened only after written informed consent had been given by an eligible mother. Mothers who were assigned to the intervention group were given breastfeeding care by a trained midwife, while those who were assigned to the control group were given care by a midwife who provided usual practice. Randomization was done at the individual participant level rather than at the provider level, so that selection bias was reduced while the predetermined allocation of trained and untrained midwives was kept throughout the study period. The generation of the allocation sequence, the enrollment of participants, and their assignment to the intervention or control group were done by the principal investigator.

Description of the Intervention Group

The intervention group was made up of postpartum mothers who were given breastfeeding care by midwives who had completed a LATCH-based training program before participant recruitment. The training was developed based on the LATCH breastfeeding assessment system that was introduced by Jensen and Kelsay [12] and was completed with current evidence on effective breastfeeding techniques and lactational mastitis prevention. The training was carried out over two days in a row, with a total of eight effective training hours. The trainers were two of the study authors, who are both midwifery lecturers with experience in lactation management and the use of the LATCH scoring system. The same training materials and learning module were given to all participating midwives so that consistency was kept throughout the intervention.

Interactive lectures, case discussions, demonstrations, simulations, role-playing, supervised clinical practice, and structured feedback were combined in the training. The learning activities were focused on the improvement of the midwives' knowledge and practical skills in breastfeeding assessment and counselling using the LATCH framework. In summary, the training that was given included:

1. Theory of lactation physiology, effective breastfeeding techniques, and knowledge of lactational mastitis.
2. Introduction to and practice of the LATCH breastfeeding assessment tool, including explanation of the components of latch, audible swallowing, type of nipple, comfort, and hold, as well as scoring procedures.
3. Clinical practice of assessing breastfeeding attachment using the LATCH system through demonstrations, simulations, and direct observation of breastfeeding mothers.
4. Guided feedback to improve consistency in applying the LATCH scoring system during routine breastfeeding care.

Description of the Control Group

The control group was made up of postpartum mothers who were given breastfeeding care by midwives who did not take part in the LATCH-based training program. Breastfeeding education and support according to the usual practice at Sembiring Hospital were continued to be given by these midwives throughout the study period. Although the participating midwives had different lengths of professional experience, all had experience in working in the maternity and postpartum units and routinely gave breastfeeding support as part of standard clinical care. Apart from the LATCH-based training that was

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received by the intervention group, both groups worked within the same hospital environment and followed the existing clinical procedures for postpartum care.

A total of 12 midwives took part in the study, with six assigned to the intervention group and six to the control group. All participating midwives were employed at Sembiring Hospital and routinely gave delivery and postpartum care in one of three maternity units (Verloskamer, Gardenia, and Hibrida). Although their lengths of professional experience were different, all had experience in giving breastfeeding support as part of routine maternal care.

Data Collection and Measurement Time Points

Data collection was done prospectively by the research team through direct interviews and clinical observations of postpartum mothers. After randomization, the participants were followed from the first 24–48 hours postpartum until the sixth week after delivery. Information that was collected from each participant was recorded according to the group assignment that was generated during the randomization process. Outcome assessments were done at three predefined time points. The baseline assessment (T0) was done between 24 and 48 hours postpartum, before continued breastfeeding support from the assigned midwives was received by the mothers. The second assessment (T1) was done on the third postpartum day or right before hospital discharge. The final assessment (T6) was done at the sixth week postpartum, so that the persistence of breastfeeding outcomes and mastitis status after the intervention period could be evaluated.

Outcome Measures

The primary outcome of this study was breastfeeding attachment, which was assessed by the LATCH scoring system at baseline (T0), the third postpartum day (T1), and the sixth week postpartum (T6). The LATCH score ranges from 0–10, and higher scores show better breastfeeding attachment and breastfeeding technique. The LATCH assessments were done by the study authors, who had experience in the use of the LATCH scoring system and also served as trainers during the intervention. Because of the nature of the intervention, the participants' group allocation was known by the assessors, so blinding was not feasible. Formal inter-rater reliability testing was not done. So that measurement variability was reduced, all assessments were done by the same standardized LATCH scoring criteria throughout the study period.

The secondary outcome was early postpartum mastitis risk, which was assessed up to the sixth week postpartum. Mastitis risk was identified based on maternal reports of breast pain together with redness and/or breast induration, with or without fever, as well as clinical information that was documented by health care providers when available. Maternal characteristics that could affect breastfeeding outcomes were also recorded, including occupation, gravida status, previous history of lactational mastitis, use of a breast pump, use of a nipple shield, and breastfeeding frequency.

Data Analysis

Data analysis was done by SPSS software. First, descriptive statistics were used to summarize the participant characteristics and breastfeeding profiles. Categorical variables, including mode of delivery, previous history of mastitis, early initiation of breastfeeding, preferred breastfeeding position, use of a breast pump, use of a nipple shield, and mastitis risk at T1 and T6, were shown as frequencies and percentages. Continuous variables, including gravida, breastfeeding frequency per 24 hours, and LATCH scores at each assessment point, were shown as means and standard deviations. In the primary analysis, changes in breastfeeding attachment over time were evaluated by Generalized Estimating Equations (GEE). This approach was chosen because the LATCH scores were measured repeatedly within the same participants, and the correlation among repeated observations is accounted for by GEE while robust population-averaged estimates are given. Group assignment and gravida status were entered into the model as independent variables.

For descriptive comparisons between the intervention and control groups at each assessment time point (T0, T1, and T6), the Mann–Whitney U test was also performed, because the LATCH scores were

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not normally distributed, as shown by both the Kolmogorov–Smirnov and Shapiro–Wilk tests ($p < 0.05$) [25]. Categorical variables, including mastitis risk at T1 and T6, were compared by the Chi-square test. Statistical significance was defined as a two-sided p-value < 0.05. Where appropriate, effect estimates with 95% confidence intervals were also reported.

Ethical Considerations

This study was not prospectively registered in a clinical trial registry. Approval for this study was given by the Health Research Ethics Committee of the Institut Kesehatan Deli Husada, Deli Tua (No. 1269/KEP-IKDH.DT/VIII/2025). All participants were informed about the study objectives, confidentiality, and the voluntary nature of participation before the informed consent form was signed.

RESULT AND DISCUSSION

Participant Flow

During the research period, 167 postpartum mothers who would be involved in the research were obtained, and then they were assessed for eligibility. Thirty-seven women were excluded because the criteria were not met. The remaining 130 eligible participants were randomly allocated in a 1:1 ratio to be given breastfeeding care by either LATCH-trained midwives (n = 65) or midwives who provided usual practice (n = 65). The scheduled follow-up assessments at 24–48 hours postpartum (T0), day 3 postpartum (T1), and week 6 postpartum (T6) were completed by all participants. No participants were lost to follow-up, and all randomized participants were included in the final analysis.

Description of Participants' Characteristics

A total of 130 postpartum mothers were included in the baseline analysis, with 65 mothers assigned to the intervention group and 65 to the control group. The baseline maternal and breastfeeding characteristics by study group are shown in Table 1.

Table 1. Participants' Characteristics

Characteristic	Intervention (n=65)	Control (n=65)	p-value
Maternal characteristics			
Gravida	2.32 ±1.21	2.60 ±0.98	0.079
Mode of delivery			
- Caesarean section	36 (55.4%)	35 (53.8%)	
- Vaginal delivery	29 (44.6%)	30 (46.2%)	0.860
Previous history of mastitis			
- Yes	29 (44.6%)	24 (36.9%)	
- No	36 (55.4%)	41 (63.1%)	0.372
Breastfeeding characteristics			
Early initiation of breastfeeding			
- Yes	40 (61.5%)	31 (47.7%)	
- No	25 (38.5%)	34 (52.3%)	0.113
Breast pump use			
- Yes	31 (47.7%)	32 (49.2%)	
- No	34 (52.3%)	33 (50.8%)	0.861
Nipple shield use			
- Yes	20 (30.8%)	32 (49.2%)	
- No	45 (69.2%)	33 (50.8%)	0.048
Breastfeeding position			
- Football	10 (15.4%)	18 (27.7%)	

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Table 1. Participants' Characteristics

Characteristic	Intervention (n=65)	Control (n=65)	p-value
- Cross-cradle	18 (27.7%)	16 (24.6%)	
- Side-lying	14 (21.5%)	12 (18.5%)	
- Cradle	23 (35.4%)	19 (29.2%)	0.401
Breastfeeding frequency (times/day)	9.91 ±1.82	9.26 ±2.31	0.051
Baseline LATCH score (T0)	6.52 ±1.61	5.80 ±1.72	0.014

Source: Primary data processed by Authors, 2025

Overall, the intervention and control groups were comparable across most baseline characteristics. No statistically significant differences were found in mode of delivery (p = 0.860), previous history of mastitis (p = 0.372), early initiation of breastfeeding (p = 0.113), breast pump use (p = 0.861), breastfeeding position (p = 0.401), maternal employment status (p = 0.286), gravida (p = 0.079), or breastfeeding frequency (p = 0.051). However, the proportion of mothers who used a nipple shield was significantly different between the groups (p = 0.048). The baseline breastfeeding attachment, which was measured by the LATCH assessment, was also significantly different between the groups. A higher baseline LATCH score than those allocated to the control group was had by the mothers who were allocated to the intervention group (6.52 ± 1.61 vs. 5.80 ± 1.72, p = 0.014).

Effect of the LATCH-Based Training Program on Breastfeeding Attachment

So that the longitudinal effect of the intervention could be evaluated, Generalized Estimating Equations (GEE) were performed with repeated LATCH measurements as the dependent variable while gravida was adjusted for. It was shown by the GEE analysis that group assignment was still a significant predictor of breastfeeding attachment throughout the follow-up period. Significantly higher LATCH scores than those receiving usual practice were reached by mothers who were given breastfeeding care by LATCH-trained midwives (β = 0.600, 95% CI: 0.038–1.163, p = 0.037). Gravida was not significantly associated with the LATCH score after adjustment (β = −0.258, 95% CI: −0.517 to 0.001, p = 0.051).

Table 2. Ouput of GEE Analysis

Variable	β	95% CI	p
Group	0.600	0.038-1.163	0.037
Gravida	-0.258	-0.517-0.001	0.051

Source: Primary data processed by Authors, 2025

The adjusted GEE model showed that, on average, a 0.60-point higher LATCH score than mothers receiving usual care was reached by mothers who were cared for by LATCH-trained midwives. Although the absolute magnitude was modest, this difference was consistently seen across the repeated assessments, which suggests a sustained improvement in breastfeeding attachment during the early postpartum period. In line with the longitudinal analysis, higher LATCH scores than those in the control group were reached by the mothers in the intervention group at every assessment, as shown in Table 3.

Table 3. Mean LATCH Scores According to Study Group

Time Measures	Intervention n=65	Control n= 65	Mean Difference	95% CI	p-value
T0	6.52 ± 1.611	5.80 ± 1.715	0.72308	0.145–1.300	0.014
T1	7.75 ± 1.630	7.18 ± 1.722	0.56923	0.012–1.115	0.015
T6	7.49 ± 1.630	6.76 ± 1.720	0.72308	0.141–1.304	0.040

Source: Primary data processed by Authors, 2025

At baseline (T0), a higher mean LATCH score than the control group was had by the intervention group (6.52 ± 1.611 vs. 5.80 ± 1.715), which corresponds to a mean difference of 0.72308 points (95% CI:

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0.15–1.30). A statistically significant difference was shown by the between-group comparison using the Mann–Whitney U test (p = 0.014). In the T1 period, breastfeeding attachment was improved in both groups. However, higher LATCH scores than mothers receiving usual care were still shown by mothers who were given breastfeeding support by LATCH-trained midwives (7.75 ± 1.630 vs. 7.18 ± 1.722), with a mean difference of 0.56923 points (95% CI: 0.01–1.15). The between-group difference was still statistically significant according to the Mann–Whitney U test (p = 0.015). By week 6 postpartum (T6), breastfeeding attachment scores were still higher in the intervention group than in the control group (7.49 ± 1.630 vs. 6.76 ± 1.720), which corresponds to a mean difference of 0.72308 points (95% CI: 0.14–1.30). The difference between the groups was still statistically significant (p = 0.040).

Effect of the Intervention on Early Postpartum Mastitis Risk

The results of the analysis for this section can be seen in Table 4.

Table 4. Mastitis risk according to study group

Time Measures	Intervention	Control	Odd Ratio	95% CI	p-value
T1	26 (40.0%)	38 (58.5%)	2.111	2.111 (1.049-4.250)	0.035
T6	26 (40.0%)	30 (46.2%)	1.268	1.268 (0.641-2.578)	0.479

Source: Primary data processed by Authors, 2025

From the table, it can be seen that in the T1 period, the proportion of mothers who experienced mastitis risk was significantly lower in the intervention group than in the control group (40.0% vs. 58.5%, p = 0.035). The odds of mastitis risk were about two times higher among mothers who were given usual care than among those who were given breastfeeding support by LATCH-trained midwives (OR = 2.111, 95% CI: 1.049–4.250). Meanwhile, at six weeks postpartum, the incidence of mastitis risk was still lower among mothers in the intervention group than among those who were given usual care (40.0% vs. 46.2%). However, statistical significance was not reached by this difference (OR = 1.268, 95% CI: 0.641–2.578, p = 0.479). These findings suggest that although a significant reduction in mastitis risk during the early postpartum period was associated with the LATCH-based breastfeeding support, its effect was not maintained throughout the six-week follow-up.

Based on the findings of this randomized controlled trial, breastfeeding attachment among postpartum mothers was improved by the LATCH-based training program for midwives. As shown in Table 1, the longitudinal analysis with the Generalized Estimating Equation (GEE), in which repeated measurements from baseline (T0) through day 3 (T1) and week 6 postpartum (T6) were accounted for while gravida was adjusted for as a potential confounder, showed that higher LATCH scores throughout the follow-up period were consistently reached by mothers who were given breastfeeding support by LATCH-trained midwives than by those who were given usual practice. Although the estimated treatment effect was moderate (β = 0.600), the lasting improvement in LATCH scores across all follow-up assessments suggests that optimal breastfeeding attachment during the early postpartum period was effectively maintained by the breastfeeding support that was given by trained midwives. These findings show that lasting improvements in breastfeeding practices may be produced by the strengthening of healthcare providers' competencies through structured LATCH training, rather than only short-term benefits right after childbirth. This finding strengthens the conclusions of [26], [27]

In addition to the improvement of breastfeeding attachment, a reduced risk of mastitis during the first three days postpartum was associated with the intervention. However, although the proportion of mothers at risk of mastitis was still lower in the intervention group through six weeks postpartum, the difference was no longer statistically significant at the end of the follow-up period.

The findings of the present study suggest that the effectiveness of the intervention depended not only on the breastfeeding education that was received by mothers, but also on the strengthening of the competencies of the healthcare providers who gave breastfeeding support. By the improvement of the midwives' ability to assess breastfeeding, give individualized guidance, and correct breastfeeding techniques, more effective support was able to be given by them, so that optimal breastfeeding attachment

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among postpartum mothers was facilitated. By this provider-focused approach, the present study is set apart from most previous interventions, in which mothers were mainly targeted without the competencies of the healthcare professionals responsible for breastfeeding support being addressed. These findings are in line with previous studies in which it was reported that maternal positioning, infant attachment, and overall breastfeeding effectiveness are improved by breastfeeding counseling that is given by skilled healthcare providers[17], [23]. However, the existing evidence is extended by the present study through the use of a randomized controlled trial design, by which stronger evidence is given that measurable improvements in breastfeeding attachment among postpartum mothers can be produced by the improvement of midwives' competencies through structured LATCH-based training.

Taken together, these findings show the importance of investment in the development of healthcare providers' competencies as a key strategy by which the quality of breastfeeding support within healthcare facilities is improved. A reduced risk of mastitis during the early postpartum period was also associated with the intervention. This finding can be explained by the physiological mechanisms of breastfeeding, in which adequate breast emptying is helped by correct maternal positioning and effective infant attachment. Milk stasis, which is a well-established risk factor for mastitis, is reduced by efficient milk removal. Therefore, the lower proportion of mothers at risk of mastitis during the first three days postpartum may have been contributed to by the improvements in breastfeeding techniques that were achieved through the support that was given by LATCH-trained midwives.

However, statistical significance was no longer shown by this protective effect at six weeks postpartum. This suggests that long-term breastfeeding success is not determined only by the quality of the support that is given right after delivery. Over time, breastfeeding practices are influenced by various factors, such as family support, increased maternal confidence in breastfeeding, infant feeding patterns, the mother's return to daily activities and work, and continued access to lactation counseling or services. The impact of early intervention by health workers may be reduced by these factors, so that a smaller difference in mastitis risk between the two groups was seen at the end of the follow-up period. These findings suggest that although the improvement of breastfeeding attachment is an important part of mastitis prevention, it may not be enough to give sustained protection throughout the postpartum period. Therefore, breastfeeding support that is started right after childbirth should be completed by regular postpartum follow-up, ongoing lactation counseling, and strengthened family- and community-based support. Successful breastfeeding practices may be kept and the long-term risk of mastitis may be reduced by such a comprehensive approach.

Strengths and Limitations

This study has several strengths. First, selection bias was reduced and causal inference was strengthened by the randomized controlled design. Second, the evaluation of breastfeeding attachment trajectories rather than a single postpartum measurement was enabled by the repeated assessments. Third, within-subject correlations over time were appropriately accounted for by the longitudinal analysis using GEE, so that more robust estimates of the intervention effect were given.

Several limitations should also be noted. The study was carried out in a single hospital, so the generalizability of the findings may be limited. Follow-up was limited to six weeks postpartum, so longer-term breastfeeding outcomes, including exclusive breastfeeding duration and recurrent mastitis, could not be evaluated. Because the intervention and control midwives worked within the same institution, contamination between the study groups cannot be completely excluded. The outcome assessors were not blinded, so the possibility of measurement bias was introduced. In addition, no formal sample size calculation or trial registration was done before the study was started. Future multicentre randomized controlled trials with longer follow-up periods, blinded outcome assessment, and larger sample sizes are needed, so that the effectiveness of provider-based LATCH training across different healthcare settings can be confirmed.

Clinical Implications

The present findings suggest that the midwives' ability to support effective breastfeeding attachment during the early postpartum period may be strengthened by structured LATCH-based training. However,

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the reduction in mastitis risk that was seen was limited to the early postpartum phase and was not maintained through six weeks. Therefore, these findings support the possible inclusion of structured breastfeeding training into postpartum care, while the need for continued breastfeeding support beyond hospital discharge is highlighted. Further multicentre studies are needed before widespread implementation across different healthcare settings is recommended.

CONCLUSION

In this randomized controlled trial, it was shown that maternal breastfeeding attachment during the early postpartum period was significantly improved by a LATCH-based training program for midwives. It was confirmed by the longitudinal analysis using Generalized Estimating Equations that higher LATCH scores than those receiving routine care were reached by mothers who were given breastfeeding support by LATCH-trained midwives throughout the follow-up period. A lower risk of mastitis during the first three postpartum days was also associated with the intervention; however, this effect was not maintained at the six-week follow-up. These findings suggest that the quality of breastfeeding support that is given during the early postpartum period may be improved by the strengthening of midwives' competencies through structured LATCH-based training. However, additional breastfeeding support strategies that extend into the community or home setting may be needed so that the benefits are maintained beyond hospital discharge. Future studies with longer follow-up periods and multicenter settings are needed, so that the long-term effectiveness and generalizability of provider-focused breastfeeding interventions can be evaluated.

AUTHOR CONTRIBUTIONS

The authors consisted of five individuals: MDY, NAS, TJP, DTB, and KL. MDY served as the team leader and, together with NAS, TJP, and DTB, developed the study design. MDY, TJP and KL collected the data, then conducted the data analysis and interpretation. MDY, NAS, TJP, and DTB conducted the literature review and drafted the manuscript, after which MDY revised it and aligned it with the article template. All authors have read and approved the final version of the manuscript.

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