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Effectiveness of Online Peer Support on Self-Efficacy and Breast Milk Adequacy

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ABSTRACT

Exclusive breastfeeding remains a global public health priority, yet breastfeeding support gaps persist during the early postpartum period. Globally, only 48% of infants under six months were exclusively breastfed in 2023, indicating that more than half did not meet the recommended exclusive breastfeeding practice. In Indonesia, 68.6% of infants aged 0–5 months were exclusively breastfed in 2023, while 55.5% received exclusive breastfeeding for six months, indicating a continuing gap in sustained exclusive breastfeeding. Early postpartum challenges, including concerns about insufficient breast milk and low maternal confidence, may further affect breastfeeding continuation. This study examined the effectiveness of online peer support on breastfeeding self-efficacy and breast milk adequacy among postpartum mothers. A quasi-experimental pretest–posttest control group design was conducted involving 40 postpartum mothers recruited from independent midwife practices in Lampung, Indonesia. Participants were allocated to an intervention group receiving structured online peer support through a messaging platform for four weeks or a control group receiving standard postpartum care. Breastfeeding self-efficacy was assessed using a validated breastfeeding self-efficacy scale, while breast milk adequacy was assessed using predefined clinical indicators of adequate breastfeeding rather than expressed milk volume alone. Statistical analyses included independent and paired t-tests, Pearson correlation, multiple linear regression, path analysis, and power analysis. The intervention group showed significantly greater improvement in breastfeeding self-efficacy and breast milk adequacy than the control group. Breastfeeding self-efficacy and breast milk adequacy were strongly positively correlated (r = 0.72; 95% CI: 0.53–0.84). Regression analysis showed that online peer support significantly predicted breastfeeding outcomes. These findings suggest that structured online peer support may strengthen breastfeeding self-efficacy and support adequate breastfeeding among postpartum mothers.

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INTRODUCTION

Exclusive breastfeeding plays a central role in improving the health and survival of both mothers and infants and remains a major global public health priority. The World Health Organization (WHO) and UNICEF recommend exclusive breastfeeding for the first six months of life, with continued breastfeeding alongside complementary feeding thereafter (World Health Organization, 2023). Adequate milk production in the early days after birth is an important component of successful breastfeeding. In practice, however, many mothers perceive their milk supply as insufficient, and this concern may contribute to early formula supplementation and premature discontinuation of breastfeeding (Zhou et al., 2021). Perceived insufficient milk supply is a common breastfeeding concern during the early postpartum period and is closely related to mothers' confidence in their ability to breastfeed. A systematic review of 27 studies involving more than 6,000 breastfeeding mothers reported that perceived insufficient milk supply occurred in approximately 10%–25% of mothers, while around half of mothers who discontinued

breastfeeding identified insufficient milk as a reason for stopping (Huang et al., 2022). The same review found a negative association between perceived insufficient milk supply and breastfeeding self-efficacy (r = −0.57), highlighting the close relationship between perceptions of milk adequacy and maternal confidence.

Breastfeeding self-efficacy is therefore an important psychological determinant of breastfeeding behavior. In Indonesia, a study of 104 mothers reported a mean Breastfeeding Self-Efficacy Scale–Short Form (BSES-SF) score of 58.58 ± 11.58, while only 30.8% of mothers practiced exclusive breastfeeding (Agrina et al., 2021). Recent systematic reviews indicate that higher maternal breastfeeding self-efficacy is associated with more favorable breastfeeding outcomes, including initiation and continuation of exclusive breastfeeding (Saavedra Sanchez et al., 2024). The BSES-SF has also shown acceptable psychometric properties across culturally diverse maternal populations, supporting its use to assess breastfeeding self-efficacy (Dennis et al., 2024). Psychological and educational interventions have also been shown to improve breastfeeding self-efficacy among postpartum women (Nourizadeh et al., 2023). These findings suggest that breastfeeding self-efficacy is not only an important determinant of breastfeeding behavior but also a potentially modifiable factor that targeted postpartum support can strengthen.

Recent intervention evidence further supports this approach. A systematic review and meta-analysis of 26 randomized controlled trials involving 3,677 women found that interventions including education, counseling, mobile applications, peer support, and home visits significantly improved breastfeeding self-efficacy and breastfeeding success, with postnatal interventions demonstrating particularly beneficial effects (Tanrıverdi et al., 2025). Similarly, a 2025 systematic review and meta-analysis of telemedicine-based interventions found evidence supporting technology-mediated care to improve breastfeeding self-efficacy (Hadizadeh-Talasaz & Abdollahpour, 2025). A recent systematic review and meta-analysis of lactation consultant interventions also found reduced risks of stopping exclusive and any breastfeeding, although evidence for improving breastfeeding self-efficacy itself was less conclusive (D'Hollander et al., 2025). Collectively, these findings support the importance of timely, accessible, and appropriately structured breastfeeding support during the postpartum period.

Beyond traditional face-to-face services, the growing use of digital health technologies has created new opportunities to provide accessible, continuous breastfeeding support. Internet-based peer support enables mothers to obtain breastfeeding information, exchange experiences, and receive emotional and practical support from other mothers while potentially reducing barriers related to geographical distance and access to professional services (Shorey et al., 2020; Zhu et al., 2022). A 2024 integrative review of 19 studies found that internet-based breastfeeding peer support can provide informational, emotional, and social support and may complement professional breastfeeding services (Hiito et al., 2024). Qualitative evidence further indicates that mothers value peer support for its accessibility, relatability, reassurance, and opportunities to share breastfeeding experiences with women facing similar challenges (Liu et al., 2024). Mobile-based communication may also facilitate postpartum follow-up and timely breastfeeding support, particularly during the early weeks after birth (Hiito et al., 2024).

The broader evidence base also supports breastfeeding support interventions as an effective strategy for improving breastfeeding outcomes. An updated systematic review for the U.S. Preventive Services Task Force, published in JAMA in 2025, included 90 randomized clinical trials involving 49,597 participants. Pooled analyses showed that breastfeeding support interventions were associated with higher rates of any breastfeeding and exclusive breastfeeding through six months (Patnode et al., 2025). In addition, the Cochrane evidence base indicates that breastfeeding support interventions probably reduce the likelihood of discontinuing exclusive breastfeeding, particularly when support is provided during the early postpartum period. These findings reinforce the importance of maintaining continuity of breastfeeding support beyond the immediate postnatal contact.

Although previous studies have reported beneficial effects of digital, telemedicine-based, and peer-supported breastfeeding interventions on breastfeeding practices and maternal experiences, evidence regarding their effects on breastfeeding self-efficacy and perceived breast milk adequacy remains comparatively limited. Existing studies have generally focused on breastfeeding duration, exclusive breastfeeding rates, knowledge, or general maternal experiences, while fewer studies have simultaneously examined maternal breastfeeding self-

efficacy and breast milk adequacy as outcomes of a structured online peer-support intervention. This gap is particularly relevant in the early postpartum period, when mothers commonly experience uncertainty about milk adequacy, breastfeeding difficulties, and fluctuating confidence. Therefore, further research is warranted to determine whether structured online peer support can address both psychological and breastfeeding-related concerns during this critical period.

Therefore, this study aimed to evaluate the effectiveness of structured online peer support on breastfeeding self-efficacy and breast milk adequacy among postpartum mothers. Mothers who received structured online peer support were expected to demonstrate greater improvements in breastfeeding self-efficacy and breast milk adequacy than those receiving standard postpartum care. The findings are expected to contribute to developing accessible, digitally supported breastfeeding services within routine midwifery and maternal health care.

METHOD

A quasi-experimental pretest–posttest design with a control group was conducted between January and April 2025 in independent midwifery practices in Lampung, Indonesia. Mothers who took part in a structured online peer support–based lactation education program were assigned to the intervention group. Mothers assigned to the intervention group participated in a structured online peer support–based lactation education program delivered through a messaging platform for four weeks. The program included scheduled online sessions covering breastfeeding techniques, recognizing breast milk adequacy, managing common breastfeeding difficulties, maternal nutrition and rest, breastfeeding self-efficacy, and emotional support. Participants were also encouraged to share their breastfeeding experiences and discuss concerns with peers and the facilitator throughout the intervention period. The control group received standard postpartum care at the participating independent midwife practices, including routine breastfeeding counseling and postpartum follow-up according to the usual service schedule. The duration and frequency of counseling and follow-up were recorded and described to distinguish standard care from the structured online peer support intervention, while those receiving routine postpartum services constituted the control group. This design was selected to examine potential causal relationships under real-world clinical conditions while remaining ethically feasible.

Participants were postpartum mothers within the first seven days after delivery. Eligibility criteria included maternal age of 20–35 years, singleton pregnancy, term delivery (37–42 weeks of gestation), a healthy newborn, ability to use a smartphone and WhatsApp Messenger, and willingness to participate. Mothers were excluded if their newborns had congenital anomalies, if they experienced postpartum complications such as postpartum hemorrhage or mastitis, or if they had medical conditions that contraindicated breastfeeding.

A total of 40 postpartum mothers were recruited and assigned to the intervention group (n = 20) or control group (n = 20) using sequential sampling. The participants were Indonesian women residing in Lampung Province. Baseline characteristics included maternal age, parity, educational level, and employment status. The mean maternal age was 27.4 ± 3.8 years.

The intervention group participated in a structured four-week online peer support program delivered through WhatsApp Messenger (Meta Platforms, Inc., USA). A licensed midwife with lactation counseling experience facilitated the program, which combined breastfeeding education, individualized counseling, peer discussion, problem-solving, and ongoing emotional support. Educational materials covered breastfeeding techniques, recognizing breast milk adequacy, managing common breastfeeding difficulties, maternal nutrition and rest, and breastfeeding self-efficacy. Participants were encouraged to share their breastfeeding experiences, ask questions, and support one another throughout the intervention period.

The intervention schedule, session duration, session frequency, and specific topics delivered at each session were standardized before implementation. The control group received standard postpartum care provided by the participating independent midwife practices, including routine breastfeeding counseling and postpartum follow-up according to the usual service schedule. No structured online peer support was provided to the control group.

Breast milk adequacy was assessed using predefined clinical indicators of adequate breastfeeding rather than expressed milk volume alone. Assessment included breastfeeding frequency, infant urine and stool output, infant satiety, and Infant weight gain. The same assessment procedures were applied to both intervention and control groups.

Direct breastfeeding remained the primary feeding method throughout the study. When breast milk was expressed for assessment or other study-related purposes, the expressed milk was retained for the infant and administered according to the mother's usual feeding practice. Breast milk expression was not intended to replace direct breastfeeding or to reduce breastfeeding opportunities.

Breastfeeding self-efficacy was assessed using the 14-item Breastfeeding Self-Efficacy Scale–Short Form (BSES-SF). The Indonesian version demonstrated good internal consistency (Cronbach's $\alpha > 0.85$), and no modifications were made to the instrument. Self-efficacy was assessed at baseline (pretest) and again after completion of the four-week intervention (posttest) in both groups.

The Health Research Ethics Committee of Poltekkes Kemenkes Tanjung Karang, Indonesia, granted ethical approval (Ethical Clearance No. 123/KEPK-TJK/2025). All participants provided written informed consent before data collection. The study procedures maintained direct breastfeeding as the primary feeding practice, and any breast milk expression performed during the study did not restrict or replace direct breastfeeding.

Statistical analyses were performed using statistical software. Data distribution was assessed using the Shapiro–Wilk test, and homogeneity of variance was examined using Levene's test. Independent-samples and paired-samples t-tests were used when parametric assumptions were met; appropriate non-parametric alternatives were considered when assumptions were not satisfied.

Changes in breastfeeding self-efficacy and breast milk adequacy between pretest and posttest were compared between the intervention and control groups. Pearson correlation was used to examine the relationship between breastfeeding self-efficacy and breast milk adequacy when the assumptions for parametric correlation were satisfied. A two-tailed p-value < 0.05 was considered statistically significant. Correlation coefficients and coefficients of determination were reported to two decimal places, while significant p-values were reported to a maximum of four decimal places.

RESULTS

As shown in Table 1, most participants in both groups were aged 20–35 years, comprising 18 (90.0%) participants in the intervention group and 14 (70.0%) in the control group. Most participants were multiparous in both the intervention and control groups, with 12 (60.0%) in each group. Regarding educational attainment, most participants had completed senior high school or diploma-level education: 12 (60.0%) in the intervention group and 9 (45.0%) in the control group.

Several breastfeeding-related baseline characteristics differed. Ten (50.0%) participants in the intervention group reported breastfeeding more than 12 times per day, compared with none in the control group. Conversely, breastfeeding 8–12 times per day was more common in the control group [11 (55.0%)] than in the intervention group [6 (30.0%)].

For infant urine output, 13 (65.0%) infants in the intervention group had urine output of ≥6 times/day, compared with 7 (35.0%) in the control group. Regarding stool output, ≥3 times/day was observed in 19 (95.0%) infants in the intervention group and 11 (55.0%) in the control group. Apparent infant satiety was also more frequently observed in the intervention group [12 (60.0%)] than in the control group [5 (25.0%)]. Similarly, infant weight gain >500 g was reported in 16 (80.0%) infants in the intervention group compared with 7 (35.0%) in the control group.

Table 1. Baseline Characteristics of Participants

Characteristic	Intervention		Control	
	n	%	n	%
Age category				
20–35 years	18	90.0	14	70.0
<20 or >40 years	2	10.0	6	30.0
Parity				
Primipara	8	40.0	8	40.0
Multipara	12	60.0	12	60.0
Education				
Elementary–junior high school	4	20.0	5	25.0
Senior high school–Diploma	12	60.0	9	45.0
Bachelor or higher	4	20.0	6	30.0
Breastfeeding frequency				
<8 times/day	4	20.0	9	45.0
8–12 times/day	6	30.0	11	55.0
>12 times/day	10	50.0	0	0.0
Infant urine output				
<6 times/day	7	35.0	13	65.0
≥6 times/day	13	65.0	7	35.0
Infant stool output				
≥3 times/day	19	95.0	11	55.0
1–3 times/day	1	5.0	9	45.0
Infant satiety				
Not apparently satiated	4	20.0	8	40.0
Partially satiated	4	20.0	7	35.0
Apparently satiated	12	60.0	5	25.0
Infant weight gain				
<600 g	4	20.0	13	65.0
≥600 g	1	80.0	7	35.0

Normality and homogeneity testing

Before comparing Breast Milk Adequacy Scores between the intervention and control groups, we assessed the distribution of the outcome variable and the equality of variances to determine the appropriate statistical test. We assessed normality with the Shapiro–Wilk test and homogeneity of variance with Levene's test. Table 2 presents the results of these assumption tests.

Table 2. Normality and homogeneity tests for breast milk adequacy score

Test	Intervention (n=20)	Control (n=20)	Interpretation
Shapiro–Wilk test	W = 0.910	W = 0.938	Normally distributed
	p = 0.063	p = 0.222	
Levene's test	—	F = 1.448	Homogeneous variance
		p = 0.236	

Note: $p > 0.05$ indicates no statistically significant departure from normality or difference in variance. The assumptions for the independent-samples *t*-test were therefore met.

The Shapiro–Wilk test indicated that the Breast Milk Adequacy Score was normally distributed in both the intervention group (W = 0.910, p = 0.063) and the control group (W = 0.938, p = 0.222). Levene's test showed no statistically significant difference in variance between groups (F = 1.448, p = 0.236). Therefore, the assumptions of normality and homogeneity of variance were satisfied, supporting the use of an independent-samples t-test for the primary between-group analysis.

Comparison of breast milk adequacy

After confirming that the assumptions of normality and homogeneity of variance were met, we compared the Breast Milk Adequacy Score between the intervention and control groups using an independent-samples t-test as the primary analysis. We also performed a Mann–Whitney U test

as a nonparametric sensitivity analysis, and compared the proportion of participants classified as having adequate or inadequate breast milk intake between groups. Table 3 presents the results.

Table 3. Comparison of breast milk adequacy between intervention and control groups

Outcome	Intervention (n=20)	Control (n=20)	Statistical test	*p*-value	Effect size
Breast Milk Adequacy Score, mean ± SD	6.10 ± 1.55	3.65 ± 1.81	Independent t-test	<0.001	Cohen's d = 1.45
Breast Milk Adequacy Score, median (IQR)	6.0 (5–7)	3.5 (2–5)	Mann–Whitney U	<0.001	r = 0.58
Adequate, n (%)	14 (70.0)	3 (15.0)	χ^2 test	<0.001	—
Inadequate, n (%)	6 (30.0)	17 (85.0)			

Note: Adequate breast milk intake was defined as a Breast Milk Adequacy Score ≥6, whereas a score <6 was classified as inadequate. The independent-samples *t*-test was the primary analysis because the normality and homogeneity assumptions were satisfied. The Mann–Whitney U test was performed as a nonparametric sensitivity analysis. $t(38) = 4.588$, $p = 0.0000476$; Mann–Whitney U = 336.5, exact $p = 0.000119$.

The analysis demonstrated a statistically significant difference in Breast Milk Adequacy Scores between the intervention and control groups. The mean score was higher in the intervention group (6.10 ± 1.55) than in the control group (3.65 ± 1.81), with a mean difference of 2.45 points. The independent-samples t-test confirmed a statistically significant between-group difference, $t(38) = 4.588$, $p < 0.001$. The magnitude of the difference was large, as indicated by a Cohen's d of 1.45.

The nonparametric sensitivity analysis produced consistent findings. The median Breast Milk Adequacy Score was 6.0 (IQR 5–7) in the intervention group and 3.5 (IQR 2–5) in the control group. The Mann–Whitney U test demonstrated a statistically significant difference between groups (U = 336.5, exact $p = 0.000119$), with an effect size of $r = 0.58$.

When the predefined cut-off was applied, 14 participants (70.0%) in the intervention group had adequate breast milk intake, compared with only 3 participants (15.0%) in the control group. Conversely, 6 participants (30.0%) in the intervention group and 17 participants (85.0%) in the control group had inadequate breast milk intake. This distribution differed significantly between the two groups ($p < 0.001$).

Taken together, the findings show that participants in the intervention group had higher Breast Milk Adequacy Scores and a greater proportion meeting the predefined criteria for adequate breast milk intake than those in the control group. These findings are based on the composite clinical indicators used to assess breast milk adequacy and should not be interpreted as a direct measurement of maternal breast milk production.

DISCUSSION

The present study demonstrated that structured online peer support was associated with improved breastfeeding self-efficacy and breast milk adequacy among postpartum mothers. The intervention group had a higher BSES-SF score than the control group (58.4 ± 6.2 vs. 49.1 ± 7.4), with a statistically significant difference (p = 0.0012) and a large effect size (r = 0.72). This finding indicates that structured peer interaction delivered through an online platform may strengthen mothers' confidence in their ability to breastfeed. The magnitude of the observed difference is consistent with broader evidence that breastfeeding self-efficacy is a modifiable construct influenced by targeted educational, counseling, peer-support, and digital interventions (Saavedra Sanchez et al., 2024; Dennis et al., 2024; Tanrıverdi et al., 2025). A recent systematic review and meta-analysis of 26 randomized controlled trials and 3,677 women showed significant improvements in breastfeeding self-efficacy and breastfeeding success after breastfeeding interventions, with postnatal interventions showing particularly favorable effects (Tanrıverdi et al., 2025).

Emerging evidence also supports these findings, particularly for digital breastfeeding interventions. In a systematic review and meta-analysis of 52 studies involving 11,704 participants, Sun et al. (2026) found that digital health interventions improved exclusive

breastfeeding rates and breastfeeding self-efficacy. The pooled effect on breastfeeding self-efficacy was statistically significant (SMD = 0.67), although studies showed substantial heterogeneity. The authors therefore emphasized that the effectiveness of digital interventions may depend on intervention characteristics, duration, timing, population, and implementation context. The present study extends this evidence by focusing specifically on structured online peer support rather than digital breastfeeding education alone. This distinction matters because the intervention's active component was not merely information delivery but interaction among mothers, including the exchange of experiences, emotional reassurance, encouragement, and practical problem-solving.

Bandura's Social Cognitive Theory helps explain improvements in breastfeeding self-efficacy through its four principal sources: mastery experiences, vicarious experiences, verbal or social persuasion, and interpretation of physiological and emotional states (Bandura, 1997). Online peer support may provide several of these sources simultaneously. Mothers can observe how other mothers manage breastfeeding difficulties, receive peer encouragement, exchange practical experiences, and gain reassurance when they feel uncertain about breastfeeding. Through these interactions, mothers may develop a stronger perception that breastfeeding difficulties are manageable rather than evidence of personal inability. Recent qualitative evidence supports this interpretation. A systematic qualitative review involving 15 studies found that breastfeeding peer support provides psycho-emotional support, knowledge and skills, and contributes to changes in feeding perceptions and behavior; importantly, mothers described increased confidence and motivation associated with peer support (Yang et al., 2024).

Rhodes et al. (2024) further supported these findings by examining experiences of breastfeeding peer counseling among women with low incomes. Their qualitative findings indicated that peer counseling could provide relational, practical, and emotional support and could complement formal healthcare services. This is clinically relevant because breastfeeding difficulties are often experienced outside scheduled healthcare encounters. A mother may encounter nipple pain, concerns about infant satiety, frequent feeding, perceived low milk supply, or uncertainty regarding feeding technique at home, when professional assistance is not immediately available. Peer support may therefore function as an accessible intermediate layer of support between formal health-service contacts.

The online format may further strengthen this mechanism because breastfeeding difficulties frequently occur between routine health-service visits. Internet-based peer support allows mothers to communicate when questions or concerns arise, obtain reassurance, and learn from experiences shared by other mothers. Hiito et al. (2024), in an integrative review of 19 studies, found that internet-based breastfeeding peer support can provide emotional, informational, and experiential support and may complement professional breastfeeding services. This evidence is consistent with the qualitative systematic review by Yang et al. (2024), which showed that mothers value peer support not only for information but also for emotional reassurance, normalization of breastfeeding difficulties, and confidence-building.

The social dimension of peer support should therefore not be underestimated. Breastfeeding is not solely an individual biological behavior; it is also shaped by interpersonal relationships, social expectations, perceived support, and the maternal environment. A systematic review of qualitative studies found that breastfeeding peer support was associated with increased self-esteem and breastfeeding confidence and reduced feelings of social isolation (Phipps et al., 2022). The present intervention may have reproduced some of these mechanisms in a digital environment by enabling mothers to interact with peers without the geographical and scheduling constraints of conventional face-to-face groups.

The BSES-SF finding is particularly important because breastfeeding self-efficacy represents a psychological determinant of breastfeeding behavior rather than a direct measure of physiological milk production. Higher self-efficacy may encourage mothers to persist when breastfeeding becomes difficult, respond more consistently to infant feeding cues, maintain breastfeeding practices, and seek appropriate assistance rather than prematurely introducing supplementation. Recent systematic review evidence indicates that maternal self-efficacy is positively associated with initiation and continuation of exclusive breastfeeding (Saavedra Sanchez et al., 2024). Thus, the higher BSES-SF score observed in the intervention group provides

a plausible behavioral mechanism linking online peer support with breastfeeding-related outcomes.

The psychometric evidence also supports using the BSES-SF in this context. Dennis et al. (2024) systematically reviewed the psychometric properties of the BSES and BSES-SF and found evidence supporting their use for measuring breastfeeding self-efficacy across different populations and settings. The instrument therefore provides a structured way of quantifying a psychological construct that may otherwise be difficult to observe directly. Importantly, however, an increase in BSES-SF should not automatically be interpreted as evidence of increased physiological milk production. Rather, it indicates improved maternal perceived capability to manage breastfeeding.

The breast milk adequacy findings extend these results because the present study assessed adequacy using several infant- and breastfeeding-related indicators rather than relying solely on maternal perception of milk supply. Breastfeeding frequency, infant urine output, stool output, infant satiety, and infant weight gain represent complementary dimensions of breastfeeding adequacy. This multidimensional approach is clinically relevant because maternal perception of insufficient milk does not necessarily indicate inadequate infant intake. Perceived insufficient milk supply is a common breastfeeding concern and is associated with lower breastfeeding self-efficacy (Huang et al., 2022). Therefore, distinguishing subjective perceptions from observable infant indicators is important when interpreting breastfeeding adequacy.

Breastfeeding frequency is an important behavioral component of breast milk adequacy because frequent and effective milk removal contributes to continued milk synthesis. From a lactation physiology perspective, the relationship between milk removal and milk production means that breastfeeding behavior can influence subsequent milk availability. In this context, online peer support should not be interpreted as directly stimulating physiological milk production. Rather, peer support may encourage mothers to maintain breastfeeding frequency, respond to infant cues, improve breastfeeding technique, and persist when they perceive difficulties. These behavioral changes may facilitate more effective milk transfer and thereby contribute to adequate infant intake. This interpretation is consistent with intervention evidence showing that breastfeeding support can improve breastfeeding success without necessarily demonstrating a direct physiological lactogenic effect (Tanrıverdi et al., 2025; D'Hollander et al., 2025).

The role of professional breastfeeding support is also relevant to interpreting the present findings. D'Hollander et al. (2025) synthesized evidence from 40 randomized clinical trials involving 8,582 participants and found that lactation consultant interventions reduced the risk of stopping exclusive and any breastfeeding and prolonged breastfeeding duration. However, the evidence for improving maternal breastfeeding self-efficacy and infant growth was less conclusive. These findings suggest that breastfeeding outcomes may respond to different components of support and that improvements in breastfeeding continuation cannot necessarily be attributed to changes in self-efficacy alone. The present study contributes to this literature by examining a peer-based rather than exclusively professional model of support.

Infant urine and stool output provide additional indirect information about milk intake and should therefore be considered as part of a broader clinical assessment rather than interpreted independently. Similarly, breastfeeding frequency and infant satiety may vary according to infant age, feeding pattern, and individual characteristics. Consequently, no single indicator should be used in isolation to conclude that milk intake is adequate or inadequate. The present study's use of multiple indicators provides a broader representation of breastfeeding adequacy and reduces reliance on a single maternal perception.

Infant satiety represents another important dimension because maternal interpretation of infant behavior can strongly influence breastfeeding confidence and subsequent feeding decisions. Mothers may interpret frequent feeding, crying, cluster feeding, or short intervals between feeds as evidence of insufficient milk, even though these behaviors can occur during normal breastfeeding. Peer support may help mothers interpret these experiences through shared experiences and practical reassurance. The qualitative evidence synthesized by Yang et al. (2024) indicates that mothers value peer supporters who normalize breastfeeding difficulties, provide reassurance, and share practical strategies for managing challenges.

Infant weight gain provides an additional and more cumulative indicator because it reflects the longer-term consequence of milk intake rather than a single feeding episode. Including infant weight gain alongside breastfeeding frequency, urine, stool, and satiety therefore strengthens the conceptual basis of the breast milk adequacy assessment. Nevertheless, interpret weight gain in context and in an age-appropriate way. The present findings should consequently be interpreted as an overall improvement in the multidimensional adequacy construct rather than as evidence that the intervention independently increased infant weight.

The relationship between online peer support, breastfeeding self-efficacy, and breast milk adequacy can therefore be conceptualized as a sequential behavioral pathway. Online peer support provides social persuasion, observational learning, emotional reassurance, and practical problem-solving; these experiences may strengthen breastfeeding self-efficacy; greater self-efficacy may promote persistence and more effective breastfeeding behaviors; and effective breastfeeding practices may facilitate milk removal and transfer, contributing to adequate infant milk intake. This conceptual pathway aligns with Social Cognitive Theory and recent evidence showing that breastfeeding interventions improve self-efficacy and breastfeeding outcomes (Bandura, 1997; Saavedra Sanchez et al., 2024; Tanrıverdi et al., 2025; Sun et al., 2026).

Importantly, the present findings should not be interpreted as demonstrating that online peer support directly increases physiological breast milk production. Lactation depends on complex interactions involving effective milk removal, breastfeeding technique, maternal and infant factors, and endocrine regulation. The more appropriate interpretation is that online peer support may influence breastfeeding outcomes indirectly through maternal psychological and behavioral mechanisms. This distinction matters because the primary outcome in the present study was breast milk adequacy rather than directly measured breast milk volume. Thus, the findings support online peer support as a psychosocial and behavioral intervention that may facilitate effective breastfeeding rather than as a direct lactogenic intervention.

The magnitude of the BSES-SF effect further strengthens the clinical relevance of the findings. The effect size ($r = 0.72$) indicates a large difference between the intervention and control groups, suggesting that the observed difference was not merely statistically significant but also substantial within this sample. Nevertheless, interpret the effect size cautiously because the study involved only 40 mothers. A large effect in a small sample may be sensitive to sampling variability and may not necessarily be reproduced in a larger population. Therefore, replication using larger randomized samples and longer follow-up is warranted. Nevertheless, the current findings are consistent with meta-analytic evidence showing that breastfeeding interventions can substantially improve breastfeeding self-efficacy, particularly when delivered during the postnatal period (Tanrıverdi et al., 2025).

The R^2 value of 0.68 should likewise be interpreted cautiously. Although it suggests a strong proportion of explained variance within the analyzed model or sample, it should not be interpreted as demonstrating that online peer support caused 68% of breastfeeding self-efficacy in the wider population. The observational meaning of an R^2 statistic depends on the statistical model from which it was derived, and causal interpretation requires appropriate design and control of potential confounding. The relatively small sample size further limits generalizability. Therefore, the current result should be regarded as supportive evidence for the proposed mechanism rather than definitive evidence of causality.

The findings are particularly relevant to the rapidly developing field of digital breastfeeding interventions. Sun et al. (2026) recently synthesized 52 studies involving 11,704 participants and found that digital health interventions improved exclusive breastfeeding rates and breastfeeding self-efficacy. However, the review reported substantial heterogeneity, including high statistical heterogeneity for self-efficacy outcomes and low-to-moderate certainty of evidence. These findings indicate that the effectiveness of digital breastfeeding support may depend not simply on whether technology is used, but on how the intervention is designed, the intensity and duration of support, the timing of delivery, and the extent to which mothers can interact with a meaningful support network.

This point is particularly relevant to the present study because the intervention involved structured peer interaction rather than passive access to digital information. The distinction between passive digital education and interactive digital support may be important. A digital platform can deliver standardized information, but peer interaction may additionally provide

social presence, emotional reassurance, modeling of successful breastfeeding behavior, and rapid responses to individual concerns. The 2026 qualitative process evaluation of an online peer-support program in Hong Kong similarly identified observational learning, emotional safety, practical guidance, and peer camaraderie as mechanisms through which online peer support may strengthen breastfeeding self-efficacy. This emerging evidence closely parallels the theoretical pathway proposed in the present study.

The findings also have implications for the organization of postpartum breastfeeding services. The updated evidence report for the U.S. Preventive Services Task Force, based on 90 randomized clinical trials involving 49,597 participants, concluded that breastfeeding-support interventions were associated with improved breastfeeding outcomes, including exclusive breastfeeding through six months (Patnode et al., 2025). The magnitude and consistency of the broader evidence suggest that breastfeeding support should not be viewed as an optional addition to postpartum care but as a potentially important component of continuity of maternal and infant care. Online peer support may complement, rather than replace, professional breastfeeding assistance by providing continuity between scheduled clinical encounters.

Taken together, the findings support a biopsychosocial interpretation of breastfeeding success. Online peer support operates primarily at the psychosocial level by providing emotional, informational, and experiential support; breastfeeding self-efficacy represents an important psychological mechanism; breastfeeding frequency and other feeding behaviors represent the behavioral pathway; and infant urine, stool, satiety, and weight gain provide observable indicators of breast milk adequacy. Integrating these dimensions offers a more comprehensive explanation than attributing the observed improvement solely to increased knowledge or a direct physiological effect on milk production. This interpretation is consistent with contemporary evidence emphasizing multidimensional breastfeeding support and the importance of continuity across professional and community-based services (Hiito et al., 2024; Yang et al., 2024; D'Hollander et al., 2025; Patnode et al., 2025).

Overall, the present study suggests that structured online peer support may improve breastfeeding self-efficacy and breast milk adequacy through psychosocial and behavioral mechanisms rather than direct physiological effects on milk production. Combining maternal BSES-SF with infant-centered adequacy indicators provides a more comprehensive understanding of how social support may translate into breastfeeding-related outcomes. The proposed pathway "online peer support → breastfeeding self-efficacy → breastfeeding behavior and effective milk transfer → breast milk adequacy" offers a theoretically grounded explanation for the observed findings. The results also highlight the potential value of integrating structured peer support into routine postpartum breastfeeding programs while maintaining appropriate professional oversight for mothers and infants requiring clinical assessment.

CONCLUSION

Structured online peer support was associated with improved breastfeeding self-efficacy and breast milk adequacy among postpartum mothers. Mothers who received the intervention demonstrated significantly higher breastfeeding self-efficacy than those receiving standard postpartum care, with a large effect size. The findings suggest that online peer support may improve breastfeeding outcomes by strengthening maternal confidence, encouraging breastfeeding persistence, and supporting effective breastfeeding practices.

The findings further indicate that breast milk adequacy is more appropriately understood through multiple maternal and infant indicators, including breastfeeding frequency, infant urine and stool output, infant satiety, and infant weight gain, rather than through maternal perception of milk supply or direct measurement of milk production alone. The observed relationship is therefore best interpreted as a behavioral and psychosocial pathway in which online peer support strengthens breastfeeding self-efficacy, which may facilitate effective breastfeeding behaviors and milk transfer and consequently support adequate infant milk intake.

These findings support integrating structured online peer support as a complementary component of postpartum breastfeeding services. Future studies with larger samples, longer follow-up periods, and randomized designs are recommended to further examine the

sustainability of these effects and the mechanisms linking peer support, breastfeeding self-efficacy, breastfeeding practices, and breast milk adequacy.

AUTHOR'S DECLARATION

Authors' contributions and responsibilities

YA: Conceptualization (lead); writing – original draft (lead); visualization (lead); funding acquisition (lead); project administration (lead); **NN**: Writing Original Draft (supporting); data curation (supporting); funding acquisition (supporting); **EB**: Supervision (lead); validation (equal); visualization (equal); writing – review & editing (lead); funding acquisition (equal): **MM**: Writing original draft (supporting); formal analysis (lead); conceptualization (supporting); methodology (supporting); **IT**: Supervision (supporting); validation (equal); investigation (supporting); data curation (supporting); **NI**: Supervision (supporting); validation (equal); resources (supporting); visualization (supporting). All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work.

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Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

Additional information

The authors confirm that there is no additional information to disclose regarding this study.

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