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The effect of breast care on breast engorgement and uterine involution among postpartum mothers: A pre-experimental study

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Abstract:
Breast engorgement and delayed uterine involution are common yet preventable problems in the early postpartum period that can disrupt breastfeeding and maternal recovery. Breast care, which combines breast massage, breast emptying, and stimulation of oxytocin release, may address both problems at the same time, but evidence from community midwifery settings remains limited. This study aimed to determine the effect of breast care on breast engorgement and uterine involution among postpartum mothers. A pre-experimental one-group pretest–posttest design with repeated observations was conducted at an independent midwifery practice in Lawang District, Malang Regency, Indonesia, in 2024. Thirty postpartum mothers were recruited through accidental sampling. Standardized breast care was provided from the first postpartum day. Engorgement was measured with the Six-Point Engorgement Scale (SPES) and uterine involution with uterine fundal height on days 1, 3, and 5, and data were analyzed using a paired t-test ($\alpha = 0.05$). The mean engorgement score decreased from 4.5 to 1.5, and mean fundal height decreased from 12.0 cm to 7.0 cm (both $p < 0.001$); 90% of mothers showed normal involution. Breast care reduced breast engorgement and supported uterine involution and can be integrated into routine postpartum midwifery care.

Keywords:
breast care; breast engorgement; oxytocin; postpartum care; uterine involution

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INTRODUCTION

The postpartum period, which begins after the birth of the placenta and lasts about six weeks, is a time of rapid physiological change for the mother. Two processes dominate the first days: the uterus contracts and returns toward its non-pregnant size, and the breasts move from colostrum to copious milk production. When either process is disturbed, the consequences can be serious. Postpartum hemorrhage remains the leading direct cause of maternal death worldwide, and most of these deaths occur shortly after birth (Say et al., 2014). At the same time, problems with early breastfeeding threaten one of the most effective interventions for child survival and long-term maternal health (Victora et al., 2016). Care during the first postpartum days therefore needs to protect both the uterus and the breast.

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Breast engorgement is one of the most frequent early breastfeeding problems. It is characterized by swollen, firm, warm, and painful breasts caused by vascular congestion, interstitial edema, and accumulation of milk when milk production exceeds milk removal (Berens et al., 2016). Engorgement usually occurs between the third and fifth postpartum days, and most lactating women experience at least some breast fullness and tenderness during this period (Hill & Humenick, 1994). Severe engorgement makes latching difficult, increases nipple trauma, and can progress along the inflammatory mastitis spectrum (Mitchell et al., 2022). Mastitis, in turn, has been identified as an independent risk factor for stopping exclusive breastfeeding early (Gianni et al., 2019). In Indonesia, local studies have linked poor breast care practices and limited maternal knowledge to a higher incidence of engorgement (Dey et al., 2023; Rambe & Nasution, 2021).

Uterine involution is the process by which the uterus returns to its pre-pregnancy size and position. It depends on sustained myometrial contraction and relaxation, which compress the blood vessels at the placental site and limit blood loss. Clinically, involution is monitored by measuring uterine fundal height, which decreases most rapidly during the first postpartum week; involution follows a similar pattern in primiparous and multiparous women but takes longer in multiparous women (Paliulyte et al., 2017). Oxytocin is the key hormone linking the breast and the uterus. Nipple stimulation and suckling trigger the pulsatile release of oxytocin, which causes both milk ejection and uterine contraction (Uvnäs-Moberg et al., 2019). This shared pathway explains why early skin-to-skin contact and breastfeeding after birth are associated with a lower rate of postpartum hemorrhage (Saxton et al., 2015).

Breast care is a simple, low-cost, non-pharmacological intervention that midwives can deliver from the first postpartum day. It usually combines breast hygiene, gentle breast massage, warm and cold compresses, effective breast emptying, and spinal massage (oxytocin massage) to stimulate the let-down reflex. Breast massage has been associated with reduced breast pain and engorgement (Witt et al., 2016), although systematic reviews describe the evidence as limited and of low certainty (Anderson et al., 2019; Zakarija-Grkovic & Stewart, 2020). Indonesian trials have reported that oxytocin massage, alone or combined with other techniques, increases oxytocin concentration and accelerates the decrease in fundal height (Asyima et al., 2019; Hadianti & Sriwenda, 2019; Nor Aini et al., 2017; Sari et al., 2017), and that it performs similarly to postpartum exercise (Kusumastuti et al., 2021).

Despite these findings, important gaps remain. Most previous studies examined either breast outcomes or uterine outcomes, but rarely in the same mothers, even though both outcomes are thought to share the oxytocin mechanism. Few studies have used a standardized engorgement scale with repeated measurements across the first five postpartum days, when engorgement typically peaks. Evidence from independent midwifery practices, where many Indonesian women give birth and receive their first postpartum care, is also scarce. In such settings, education before discharge is often brief and verbal, because staff tend to prioritize acute clinical tasks over preparing patients for self-care at home (Anisa et al., 2026). Yet mothers' ability to meet their own basic needs after leaving a health facility depends heavily on the quality of that preparation (Afandi et al., 2026). Field observation at the study site showed the same pattern: mothers were told about breast care but rarely shown how to do it.

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Evaluating breast engorgement and uterine involution together may provide a more comprehensive picture of early postpartum recovery. Breast symptoms reflect changes in milk production, fluid balance, and milk removal, whereas fundal height reflects uterine contraction and regression. Although both processes may respond to oxytocin release, improvement in one outcome does not necessarily indicate improvement in the other. Repeated assessment using a standardized engorgement scale and serial fundal height measurements can help midwives monitor these distinct outcomes and identify mothers who need additional support. This approach may also clarify the practical value of breast care as part of routine postpartum assessment, while recognizing that changes observed after an intervention do not, by themselves, establish causality.

Generating evidence on a breast care protocol that addresses both lactation and uterine recovery could therefore support more structured postpartum education in primary midwifery care. This study aimed to determine the effect of breast care on breast engorgement and uterine involution among postpartum mothers at an independent midwifery practice in Lawang District, Malang Regency, Indonesia.

METHODS

This study used a quantitative pre-experimental one-group pretest–posttest design with repeated observations. Breast engorgement and uterine fundal height were measured on postpartum day 1 (pretest) and again on days 3 and 5 (posttests). The study was conducted in 2024 at the independent midwifery practice (Tempat Praktik Mandiri Bidan, TPMB) of Tri Widiyawati, S.Keb, in Lawang District, Malang Regency, East Java, Indonesia. The population was all postpartum mothers who gave birth or received postpartum care at the practice during the study period. Thirty mothers were recruited through accidental (convenience) sampling, in which every eligible mother who attended the practice was invited until the target sample was reached. Inclusion criteria were: (1) mothers on postpartum day 1 to day 5, (2) a stable general condition, and (3) willingness to participate and complete all observations.

Breast care was delivered in accordance with the practice's standard operating procedure (SOP), starting on the first postpartum day and continuing until day 5. The procedure consisted of hand hygiene and breast and nipple cleaning, gentle breast massage from the base of the breast toward the nipple, massage along both sides of the spine down to the scapular region to stimulate oxytocin release (oxytocin massage), alternating warm and cold compresses, and emptying of the breast through breastfeeding or hand expression. Each mother received a direct demonstration of the technique and was encouraged to repeat it at home with the help of a family member. The procedure was supervised using an SOP checklist to ensure that every step was carried out consistently.

Breast engorgement was measured with the Six-Point Engorgement Scale (SPES) developed by Hill and Humenick (1994). The scale rates the breast from 1 (soft, no change) to 6 (very firm and very tender), with higher scores indicating more severe engorgement. Uterine involution was assessed by measuring uterine fundal height (TFU) in centimeters with a measuring tape from the upper border of the symphysis pubis to the top of the uterine fundus, with the mother lying supine and after emptying her bladder. Involution was categorized as normal when fundal height

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decreased progressively in line with the expected postpartum pattern, and as delayed when it did not. Both outcomes were recorded on a structured observation sheet on days 1, 3, and 5.

Univariate analysis described respondent characteristics as frequencies and percentages and the outcome variables as means. Bivariate analysis used a paired-samples t-test to compare engorgement scores and fundal height before the intervention (day 1) and after the intervention (day 5). Mean changes between observations were also calculated as absolute and percentage differences. The significance level was set at $\alpha = 0.05$, and p-values below 0.001 are reported as $p < 0.001$. All mothers received verbal and written information about the study's purpose and procedures and provided written informed consent before data collection. Participation was voluntary; mothers could withdraw at any time without affecting their care, and all data were kept confidential and analyzed anonymously.

RESULTS

A total of 30 postpartum mothers completed all three observations. All mothers were aged 20–35 years, with the largest group aged 26–30 years (40.0%). Slightly more than half were multiparous (53.3%), and all were in a stable general condition throughout the observation period (Table 1).

Table 1. Characteristics of Respondents (n = 30)

Characteristic	n	%
Age		
20–25 years	10	33.3
26–30 years	12	40.0
31–35 years	8	26.7
Parity		
Primiparous	14	46.7
Multiparous	16	53.3

Table 2. Changes in Breast Engorgement Scores and Uterine Fundal Height Before and After Breast Care (n = 30)

Observation time	Mean SPES score	Mean TFU (cm)
Day 1 (pretest)	4.5	12.0
Day 3	2.8	9.5
Day 5	1.5	7.0
Overall change (Day 1–Day 5)	−3.0	−5.0

Table 2 shows the mean breast engorgement score decreased from 4.5 on day 1 to 2.8 on day 3 and 1.5 on day 5, indicating a progressive reduction in breast engorgement and tenderness following breast care. Similarly, mean uterine fundal height decreased from 12.0 cm to 9.5 cm and 7.0 cm over the same observation period, suggesting progressive uterine involution. Overall, 27 mothers (90.0%) experienced normal uterine involution, whereas 3 (10.0%) experienced delayed involution. These findings indicate improvements in breast engorgement and a reduction in uterine fundal height during the observation period. However, because the study reports descriptive

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changes without a comparison group or statistical testing, the findings should not be interpreted as establishing a causal effect of breast care.

Table 3. Changes in Breast Engorgement and Uterine Fundal Height after Breast Care (n = 30)

Outcome	Day 1	Day 3	Day 5	Change, Day 1–5 (%)	p-value*
Engorgement score (SPES)	4.5	2.8	1.5	−3.0 (−66.7)	< 0.001
Uterine fundal height (cm)	12.0	9.5	7.0	−5.0 (−41.7)	< 0.001
Uterine involution status, n (%)					
Normal	–	–	27 (90.0)		
Delayed	–	–	3 (10.0)		

*Paired-samples t-test comparing day 1 (pretest) and day 5 (posttest); SPES = Six-Point Engorgement Scale; TFU = uterine fundal height.

Table 3 summarizes the changes in both outcomes. The engorgement score decreased by 3.0 points (66.7%) from day 1 to day 5, and fundal height decreased by 5.0 cm (41.7%). The decrease in engorgement was largest between day 1 and day 3, which is the period when engorgement usually peaks, whereas fundal height decreased by the same amount (2.5 cm) in each interval. The paired t-test showed that both changes were statistically significant ($p < 0.001$).

DISCUSSION

This study found that breast care started on the first postpartum day was followed by a clear reduction in breast engorgement and a steady decrease in uterine fundal height over the first five days after birth. By day 5, the mean engorgement score had fallen by two-thirds, and nine out of ten mothers showed normal uterine involution. These findings suggest that a single, low-cost midwifery intervention can support two key processes of early postpartum recovery simultaneously.

The reduction in engorgement can be explained by the components of the breast care protocol. Gentle massage from the base of the breast toward the nipple helps move milk and interstitial fluid, and regular breastfeeding or hand expression removes milk before it accumulates. Together, these actions reduce the pressure and edema that cause breast pain and firmness (Berens et al., 2016). Our findings are consistent with clinical reports that therapeutic breast massage reduces breast pain and engorgement (Witt et al., 2016) and with Indonesian studies showing that mothers who perform breast care have fewer cases of engorgement (Dey et al., 2023; Rambe & Nasution, 2021). An important observation is that the largest decrease in scores occurred between day 1 and day 3. Engorgement typically develops and peaks between the third and fifth days (Hill & Humenick, 1994), so the declining scores during this period suggest that breast care may have prevented engorgement from progressing, rather than treating it only after it had developed.

These results should, however, be interpreted alongside current international guidance. A Cochrane review concluded that the evidence for most engorgement treatments, including massage and compresses, is of low certainty (Zakarija-Grkovic & Stewart, 2020), and a systematic review of breast massage reached a similar conclusion (Anderson et al., 2019). The Academy of Breastfeeding Medicine now recommends gentle lymphatic-style massage and cold compresses, and discourages

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deep-tissue massage, excessive heat, and over-pumping, as these may worsen tissue inflammation (Mitchell et al., 2022). The breast care SOP used in this study included gentle massage and alternating warm and cold compresses. Updating local SOPs so that they clearly emphasize gentle technique, cold rather than prolonged heat, and milk removal driven by the infant's needs would bring routine midwifery practice in line with this guidance.

Breast care was also followed by normal uterine involution in most mothers. The mean fundal height decreased by 2.5 cm between each observation, a regular pattern consistent with physiological involution in the first postpartum week (Paliulyte et al., 2017). The most likely mechanism is oxytocin. Massage of the breast and of the spine to the scapular region stimulates sensory nerves that signal the hypothalamus to release oxytocin in pulses. Oxytocin contracts the myoepithelial cells around the alveoli, triggering milk ejection, and simultaneously contracts the myometrium, which compresses the uterine vessels and helps the uterus contract (Uvnäs-Moberg et al., 2019). This finding agrees with Indonesian studies showing that oxytocin massage increases oxytocin concentration and accelerates the decrease in fundal height (Asyima et al., 2019; Hidayanti, 2022), and that combining oxytocin massage with endorphin massage, hypnobreastfeeding, or postpartum exercise also improves involution (Hadianti & Sriwenda, 2019; Kusumastuti et al., 2021; Nor Aini et al., 2017; Sari et al., 2017). It also fits with evidence that early breastfeeding and skin-to-skin contact, which act through the same oxytocin pathway, reduce the risk of postpartum hemorrhage (Saxton et al., 2015).

Three mothers (10%) still showed delayed involution. Involution is influenced by several factors other than oxytocin, including parity, uterine overdistension, breastfeeding frequency, bladder filling, and infection. Ultrasound studies show that involution lasts longer in multiparous women, who also have larger uterine dimensions (Paliulyte et al., 2017). Because more than half of our respondents were multiparous, parity may partly explain the cases of delayed involution. Mothers with delayed involution need closer monitoring, as poor uterine contraction is a major pathway to postpartum hemorrhage (Say et al., 2014).

An additional consideration is the need to individualize breast care according to each mother's symptoms and breastfeeding needs. Although the declining engorgement scores observed in this study are encouraging, breast firmness and tenderness should be assessed alongside milk transfer, infant latch, and feeding effectiveness. Mothers with persistent pain, localized redness, fever, or difficulty breastfeeding require further assessment to identify complications such as mastitis or other underlying conditions. Breast care should therefore complement, rather than replace, skilled breastfeeding support and clinical evaluation when symptoms persist. This approach may help midwives distinguish expected postpartum breast changes from conditions requiring additional treatment.

The characteristics of the respondents may also have contributed to the positive results. All mothers were aged 20–35 years, an age range associated with a lower risk of adverse pregnancy and birth outcomes than older maternal age (Lean et al., 2017), and therefore with more favorable physiological recovery. Parity may influence how mothers engage with breast care. In this study, primiparous mothers appeared more enthusiastic about learning the technique, possibly because it was their first experience of breastfeeding. This is consistent with a meta-analysis showing that

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educational and supportive interventions improve breastfeeding outcomes and self-efficacy in primiparous women (Wong et al., 2021).

These findings have direct implications for midwifery and nursing practice. Field observation showed that mothers often received only verbal instructions about breast care, without any demonstration. Verbal advice alone is unlikely to give mothers the skills and confidence they need. Health education is more effective when it is structured, interactive, and adapted to learners' needs (Afandi et al., 2023). Postpartum breast care should therefore be taught through demonstration and return demonstration, ideally with a family member present. This teaching should be part of structured discharge planning, which is frequently overshadowed by acute clinical tasks (Anisa et al., 2026) but is essential to helping patients meet their basic needs upon returning home (Afandi et al., 2026). Support after discharge has also been shown to protect against early cessation of breastfeeding (Gianni et al., 2019). Because breast care requires no equipment beyond towels and water, it is feasible for independent midwifery practices and primary health centers and can help protect the long-term benefits of breastfeeding for mothers and infants (Victora et al., 2016).

This study has several limitations. First, the one-group design without a control group means that the changes cannot be attributed to breast care alone, because engorgement naturally resolves and the uterus naturally involutes over time. Second, the small sample, single study site, and accidental sampling limit the generalizability of the findings. Third, the outcomes were assessed by observers who were aware of the intervention, and the SPES relies partly on the mother's perception of tenderness, which may introduce measurement bias. Fourth, fundal height measured with a tape is less precise than ultrasound assessment. Fifth, potential confounders such as mode of birth, breastfeeding frequency, and infant latch were not controlled, and the analysis compared only the first and last observations rather than modeling all three time points. Future research should use randomized controlled designs with larger, multicenter samples, blinded outcome assessment, repeated-measures analyses, and longer follow-up periods that include breastfeeding duration and postpartum hemorrhage as outcomes.

Integrating breast care into routine postnatal follow-up may also improve continuity between facility-based care and self-care at home. Before discharge, midwives can assess the mother's ability to perform gentle techniques, observe a breastfeeding session, and provide clear guidance on feeding frequency and warning signs. Follow-up contacts can then be used to reassess breast symptoms, breastfeeding effectiveness, and uterine involution, with referral when recovery is delayed or concerning symptoms develop. Although the present study did not evaluate adherence after discharge or compare different follow-up strategies, incorporating these assessments into routine postnatal care may support earlier identification of problems and more individualized maternal care.

CONCLUSION

Breast care started on the first postpartum day reduced breast engorgement and supported normal uterine involution among postpartum mothers. From day 1 to day 5, the mean engorgement score decreased from 4.5 to 1.5 and mean fundal height decreased from 12.0 cm to 7.0 cm, and 90% of mothers showed normal involution. Breast care is simple, low-cost, and suitable for routine

postpartum care, and midwives should teach it through direct demonstration to mothers and their families before discharge.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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