Effect of Reverse Pressure Softening Technique on Breast Engorgement Among Postnatal Women

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Abstract

Background: Proper breastfeeding technique and an effective latch are essential for preventing breast engorgement in new mothers. In the first 14 days after delivery, Reverse Pressure Softening (RPS) has been proven to be a valuable intervention for alleviating breast engorgement. RPS involves applying gentle positive pressure to the areola near the nipple to reduce swelling and alleviate engorgement. **This research's objective** was estimating RPS effect on breast engorgement in postnatal women. **Design:** This research utilized a quasi-experimental approach. Setting: The study was executed in the postnatal ward of El-shatby Maternity University Hospital, with follow-up at participants' homes. **Sample:** A purposive sample of 80 postnatal women distributed equally between the control group (40 postnatal women), and the intervention group (40 postnatal women). **Tools:** Four different tools were employed for data collection: **tool I** Semi-structured Interview on General Characteristics of Postnatal Women. **Tool II** Visual Analog Scale (VAS) for pain assessment, **tool III** Six-point breast engorgement scale to measure engorgement severity and **tool IV** LATCH breastfeeding charting system to assess breastfeeding behaviors. **Results:** The study group (RPS intervention group) demonstrated a statistically significant improvement in comparison with the control group, as measured by the VAS and breast engorgement scale ($p < 0.001$). The study group also showed improved breastfeeding behaviors ($p < 0.001$). **Conclusion:** The RPS technique is an effective method for reducing breast engorgement and associated pain, particularly in primiparous (first-time) postnatal women. Additionally, it positively impacted newborn breastfeeding behavior. **Recommendation:** RPS should be promoted as a standard practice and incorporated into institutional policies as routine care for postnatal mothers experiencing breast engorgement.

Keywords: Breast engorgement, Post natal women, Reverse pressure softening.

Introduction

The most frequent breastfeeding issues, as well as the ones that are thought to be the main obstacles to breastfeeding during the first puerperal weeks, are breast engorgement (BE) and nipple trauma **(Ahmed et al., 2022)**. Breast engorgement is a painful sensation that results from the expansion and pressure that are caused by the synthesis and storage of breast milk. It often occurs on the third postpartum day and lasts for 24 to 48 hours, especially among primiparous women **(Sharma & Mahajan, 2023)**. Although breast engorgement can arise from various common causes, certain factors are unique to women, comprising increased breast vascularity, inappropriate feeding practices, hormone imbalance, and an inverted or flat nipple. Others are infant-related, including premature birth, congenital malformations such cleft lips and palates, poor bonding, and ineffective sucking **(Scime et al., 2023)**. Breast engorgement is often marked by enlarged, heavy, swollen, and painful breasts, accompanied by stretched nipples,

low-grade fever (below 39°C), and shiny skin on the breasts **(Douglas, 2022)**.

As a result, the infant has significant difficulty in breast feeding and frequently rejects the breast and because of the severe pain that results from engorgement, some mothers are forced to stop breastfeeding and move to another method to feed her child **(Mohamed et al., 2020)**. Breast engorgement significantly impairs milk production by causing milk to accumulate in the breast, increasing pressure in the milk ducts, and reducing blood circulation to the breasts. Some myoepithelial cells and alveolar cells may shrink and degenerate in response to elevated milk pressure. The atrophy of milk-producing cells can permanently affect the breast's capacity to produce milk, which causes long-term damage to the breast tissue. Due to the lymphatic system's inability to remove bacteria at its usual rate, the risk of infection will consequently rise **(Farag et al., 2023)**. Breast engorgement also negatively affects the letdown process since a poor latch leads to serious breast issues such as nipple trauma, mastitis, breast abscesses, and blocked milk ducts **(Ghattas et al., 2022)**.

By starting breastfeeding right away and continuing it frequently, breast engorgement can be avoided. Particularly among primiparous women, there is a lack of knowledge among mothers regarding breast engorgement definition, symptoms, causes, prevention, and management. Therefore, educating primipara mothers on proper breastfeeding technique and a baby's proper latch-on to the breast during feeding may help minimize breast engorgement **(Huang et al., 2022)**.

Breast engorgement can be treated using pharmacological and non-pharmacological approaches. One of the pharmacological techniques is the use of proteolytic subcutaneous oxytocin. Pain killers as Ibuprofen is safe to take during breastfeeding and can help with pain and discomfort **(Hanafy et al., 2022)**. However, most postpartum women today favor natural approaches for management of breast engorgement like warm compresses, cold gel pads, and cold cabbage compresses to stimulate the milk ejection reflex. Other recommended therapies comprise therapeutic ultrasonography, breast binding, breast massage, herbal remedies, Gua-Sha therapy, manual or electrical pumps, and the reverse pressure softening (RPS) technique **(Ebrahim & Esmat, 2018)**.

In the first 14 days following delivery, RPS has been found to be a very effective and straightforward intervention to manage breast engorgement. RPS involves applying gentle positive pressure to soften a 1–2-inch area of the areola near the base of the nipple, which helps shift the breast swelling backward and upward. This technique can be performed by a healthcare professional or taught to the mother for self-use **(Ananthavarsheni, 2019)**.

The milk ejection reflex is mechanically triggered by RPS's consistent stimulation of the nerves beneath the areola, which results in practically constant milk production in the breast within 1-2 minutes or less. The herbal lymphatic drainage is briefly transferred excess interstitial fluid in its direction. Milk transfer is made easier, and latch discomfort is decreased by gradually moving milk backward into deeper ducts to relieve over-distention of sub areola ducts. In response to the rippling of the tongue, areola flexibility is increased, allowing the nipple to stretch further into the baby's mouth **(Mounika et al., 2022)**.

Breast problems are most common in the first few days following delivery. Literature indicates that the incidence rate of breast engorgement is between 65% and 75% worldwide, while it is approximately 82% in Egypt **(Abd El-hady et al., 2021)**. RPS technique is a simple, non-pharmacological management approach. Although there are several ways to address breastfeeding-related engorgement, the researcher came to the conclusion that there wasn't enough information to recommend a particular management approach. As a result, this study was executed as a trial for estimating RPS

technique impact on breast engorgement among primiparous women.

Aim of the research:

This research's objective was determining the effectiveness of the reverse pressure softening (RPS) technique on alleviating breast engorgement in postnatal women.

Operational definitions:

- **Breast engorgement** is a condition in which the breasts become swollen, firm, and painful due to the buildup of excess milk, blood, and lymphatic fluid. The extent of engorgement was assessed using a six-point scale.
- **Reverse Pressure Softening (RPS)** is a method that applies gentle pressure to the areola to alleviate swelling and soften the breast, helping to enhance breastfeeding.

Research Hypotheses:

H0: Women who undergo the reverse pressure softening technique in the early post-natal period experience a similar level of breast engorgement severity compared to those receiving routine care.

H1: Women who receive the reverse pressure softening technique in the early post-natal period experience a lower severity of breast engorgement compared to those receiving routine care.

H2: Women who receive the reverse pressure softening technique in the early post-natal period experience less intense breast pain compared to those receiving routine care.

H3: Women who receive reverse pressure softening technique during early post-natal period exhibit better newborn feeding behavior compared to those who receive routine care.

Subjects and Method

Research design

A quasi-experimental research design was utilized in this study to explore the influence of the reverse pressure softening intervention (independent variable) on breast engorgement (dependent variable) among postnatal women. The study's objective was examining and comparing the results between those who received the intervention and those who were given routine care.

Setting:

The study was executed in the postnatal ward of El-Shatby Maternity University Hospital, Alexandria Governorate where participants initially received care. This setting was chosen because it provides postnatal services for women with various socioeconomic backgrounds and have increased turnover of primi-postnatal women. Also, after their discharge, they were followed up at their homes to monitor the effects of the intervention over time.

Sampling

A purposive sample of 80 postpartum women was selected based on the following inclusion criteria: first-time mothers (primiparas) who reported experiencing breast engorgement on the third or fourth postnatal day, had a normal vaginal delivery of a healthy, viable baby, willing to breastfeed, didn't use lactation suppressants, had no other breast-related problems, and agreed to participate in the study.

Sample size was estimated utilizing Epi info 7 statistical program, showing the following parameters:

A. Population size equal 416 (per month)

B. Expected frequency equal 50%

C. Acceptable error equal 10%

D. Confidence coefficient equal 95%

E. Minimal sample size equal 78

The total sample size consisted of 80 postpartum women, which was sufficient to ensure reliable results. The candidates were randomly assigned into two equal groups:

- **Intervention group**: These women were instructed on how to perform the reverse pressure softening technique and follow up performed to ensure their application.
- **Control group**: These women received routine care such as compresses and breast massage.

Tools

Data collection was done utilizing 4 tools:

Tool I: Semi-structured Interview on General Characteristics of Postnatal Women:

This tool was created by the researchers after reviewing the latest literature **(Abd El-hady et al., 2021; Pednekar, 2021; Farag et al., 2023)**.

It was divided into two sections:

Part 1: Socio-demographic characteristics of postnatal women, comprising information such as age, educational background, occupation, place of residence, and family structure.

Part 2: History of Breastfeeding and Breast Engorgement, which covered aspects such as the initiation and duration of breastfeeding, the maternal position during breastfeeding, the onset of breast engorgement

Tool (II): Visual Analogue Scale (VAS): This tool, adapted from **Berens (2015)**, was utilized to evaluate breast pain intensity. The scale consisted of a 10-point numerical range, where 0 represented "no pain" and 10 indicated "the worst pain imaginable." A 3 cm segment on the scale was labeled with terms such as mild, moderate, and severe to help categorize pain levels. Participants were asked to select the point on the scale that best represented their perceived pain level at the time of the assessment.

The total score on the Visual Analogue Scale (VAS) ranges from 0 to 10 and is interpreted as follows:

0: No pain

1-3: Mild pain

4-6: Moderate pain

7-10: Severe pain

Tool (III): Six-point breast engorgement scale: It was adapted from **Hill and Humenick (1994)**, this scale is standardized to evaluate the severity of breast engorgement. The engorgement is assessed on a scale from 1 to 6.

The scoring of Six-Point Breast Engorgement Scale

Score	Description	Degree of Engorgement
1	Softening with no changes in the breast	**Normal**
2	Minimal changes in the breast	**Mild**
3	Firmness without breast tenderness	
4	Firmness with the onset of breast tenderness	**Moderate**
5	Firmness with noticeable breast tenderness	
6	High degree of firmness with significant tenderness	**Severe**

Tool (IV): LATCH breastfeeding charting system: It was adapted from **Jensen et al. (1994)**. This tool provides a systematic technique for evaluating key factors that influence breastfeeding success. It consists of five components, each related to either the infant's feeding behavior or the mother's experience during breastfeeding. Each component is rated on a scale of 0 to 2, with higher scores indicating better breastfeeding performance.

Component		Description
L	Latch	How well the infant latches onto the breast. A good latch is deep and secure.
A	Audible Swallowing	Presence of audible swallowing, indicating effective milk intake
T	Type of Nipple	The shape and condition of the nipple, and whether it is suitable for breastfeeding
C	Comfort	Mother's comfort level during breastfeeding
H	Hold	Amount of assistance the mother needs to position and hold the baby at the breast.

Interpretation of the LATCH scale total score:

The total score ranged between 0-10 and it is interpreted as follows:

- **0-5**: Represents poor breastfeeding performance, with significant difficulties in feeding.
- **6-7**: Reflects a fair level of breastfeeding success, with some issues but generally effective.
- **8-10**: Indicates Good breastfeeding, with a secure latch, efficient milk intake, and good maternal comfort.

Method:

The study was conducted as follows:

- **Approval and Authorization**: The study received approval from the scientific research Ethics committee at the Faculty of Nursing, Alexandria University, prior to its commencement (AU-20-3-245). Formal authorization to conduct the research was also obtained from the relevant study environments.
- **Development of Tools**:
  - **Tool I** was developed by the researchers after an extensive review of recent and relevant literature.
  - **Tools II, III, and IV** were adapted and translated into Arabic to align with Egyptian culture.
- **Validity Testing**: The content and face validity of the tools were evaluated by five obstetric and gynecology, and community nursing experts ensuring that the tools were relevant and appropriate for the study.
- **Pilot Study**: A pilot study was carried out on 10% of postnatal mothers who were not a part of the main study sample. This phase helped evaluate the clarity and relevance of the tools. Following the feedback, appropriate adjustments were made to the tools.
- **Reliability Testing**: Tools II, III, and IV underwent reliability testing utilizing Cronbach's alpha. The results indicated high reliability for all three tools, with scores of:
  - **0.87** for Tool II (Visual Analogue Scale),
  - **0.85** for Tool III (Six-point breast engorgement scale),
  - **0.88** for Tool IV (LATCH Newborn Feeding Behavior scale).
- **Data Collection:** Tools II, III, and IV were administered during both pre- and post-tests to evaluate the intervention impact.
- **Study Duration:** Data collection took place over a 5-month period, from January 2023 to May 2024.
- **Study Phases:** The study was carried out in the following three phases: (assessment, intervention and follow-up & evaluation phases):

Phase 1: Assessment:

In the assessment phase, all postnatal women who met the inclusion criteria and consented to participate in the study were interviewed individually and privately in the postnatal units before their discharge. The interview aimed to gather necessary demographic and breastfeeding-related data using Tool I.

Additionally, the condition of the women's breasts was evaluated using Tools II, III, and IV to establish a baseline assessment before the intervention (at the third to fourth postnatal day).

Phase II (intervention): Researchers started to carry out the intervention at the postnatal women homes while the control group only received the routine interventions in the hospital such as warm compresses and combing

Intervention Group:

The postnatal women in the intervention group were taught to apply one of the three techniques of Reverse Pressure Softening (RPS) that best suited their condition, just before breastfeeding their newborn babies. The instructions for applying RPS were as follows:

Principles of RPS application:

1. Ensure hygiene of both hands and fingernails.
2. Apply gentle, firm pressure to avoid causing pain.
3. Pressure should be focused on the central 1-2 cm of the areola, directly where it connects to the nipple base.
4. Apply pressure inward, perpendicular to the mother's chest wall, for 1 to 3 minutes.
5. Continue RPS until the engorgement subsides sufficiently, enabling successful latching by the baby.

Techniques for applying Reverse Pressure Softening (RPS) (Figure 1)

First Technique (Flower Hold):

1. Instruct the mother to place three or four curved fingertips of each hand in a tight circle around the base of the nipple, ensuring that the nails lightly touch the areola.
2. Apply gentle but firm pressure for 1-3 minutes, enough to create 6-8 depressions at the nipple's base.
3. This technique softens the central area of the areola, even in the absence of obvious edema, making it easier to extend the nipple into the baby's mouth more deeply and comfortably for latching.

Second Technique (Two-Handed - Two Steps):

1. Position the first projections of the fingers (upper and lower) at the base of the nipple.
2. Straighten the first 1-2 fingers on each hand, pointing them sideways in different directions.
3. Apply inward pressure for a few minutes.
4. Afterward, reposition the fingers, touching the sides of the nipple base, and point the fingertips toward the floor, overlapping the initial pressure points.
5. This technique ensures consistent pressure and helps alleviate engorgement in the nipple area.

Third Technique (Two-Handed - One Step):

1. With the flats of both thumbs or the tips of the first few fingers on each hand, apply gentle pressure to create a 1–2-inch depression above and below the nipple.
2. Alternate applying pressure to the opposite quadrants in 2-minute intervals, ensuring the first set of depressions overlaps to help move edema from the entire area around the nipple base.
3. Continue applying pressure in this alternating pattern to relieve engorgement and soften the breast tissue.
4. After performing RPS, additional fingertip expression becomes easier and more effective, softening the areola and facilitating better latching by creating space for the baby's chin **(Cotterman, 2004)**.

Each session will last approximately **5-10 minutes** per breast, with a total of **two sessions per day** for **3 days** after delivery

First technique (flower hold)

Second technique (2handed -2 steps)

Third technique (2 handed -1 step)

Figure 1: Techniques for applying RPS (Cotterman, 2004).

Phase III (follow-up & evaluation): During this phase, the research team executed follow-up assessments with mothers via telephone and home visits to evaluate how effective RPS was in

reducing breast engorgement. The final assessment was carried out on day three, following three consecutive days of RPS application, to examine the study's hypothesis.

- Degree of breast engorgement was compared within each group before and after intervention and the variations between the study (RPS intervention) group and control group (routine care) were analyzed.
- After collecting the necessary data, statistical analysis of results was done

Statistical analysis:

1. The data collected were analyzed utilizing the Statistical Package for Social Sciences (SPSS), version 27.0 (Armonk, NY: IBM Corp). The following steps were taken for statistical analysis:
2. Qualitative data were summarized utilizing frequencies and percentages.
3. The Shapiro-Wilk test was applied to estimate the normality of distribution.
4. Quantitative data were described utilizing range (minimum and maximum), mean, standard deviation, and median.
5. The significance of the results was estimated at the 5% level of significance.
6. The data analysis comprised the following statistical tests:
   - **Chi-square test:** Utilized for comparing categorical variables between different groups.
   - **Fisher's Exact test:** Applied as a correction for chi-square when more than 20% of the cells have an expected count below 5.
   - **Independent t-test:** Utilized for comparing normally distributed quantitative variables between two groups.
   - **Friedman test:** Used to compare abnormally distributed quantitative variables across more than two groups or time points.

Ethical Considerations:

The following issues were considered for each recruited postnatal woman:

- A written informed consent was obtained from each study subject after explanation to the aim of the study and assurance that the collected data will be used only for the study purpose.
- Study subjects' anonymity was maintained as well as confidentiality of the collected data.
- Subjects' voluntary participation and their right to withdraw from the study at any time without penalty was assured.
- The privacy of the study participants was asserted.
- Dealing with the study subjects was based on mutual respect.

Results

Table (1) illustrates that the mean age was almost the same (23.95 ± 3.34 and23.15 ± 3.45) years among the control and study group respectively.

Concerning level of education, it was obvious that three quarters (75%) of the control group and four fifths (80%) of the study group had secondary education or its equivalent. In addition, the same percent (95%) in both groups respectively were housewives. Moreover, all (100%) of the control and the study groups were married and lived in nuclear families respectively.

Furthermore, most (90% and 95%) of the control group and the study groups respectively were urban dwellers.

There were no statistically significant differences between the control and study groups in terms of their socio-demographic data.

Table (2) displays that all (100%) of the participants in control group had their newborn babies placed on the same bed

with them, compared to 95% of the study group. Regarding to initiation of breast feeding, it has been observed that the majority (95%) of the control group as well as the study group started to breast feed their newborn babies after one hour of delivery.

Maternal posture during breast feeding was incorrect for all (100%) women in the control and the study groups correspondingly. Furthermore, the same percentage (85%) of mothers in each group fed their infant from both breasts. The average for the control group was 8.75 ± 1.17 breast feedings during the day, while the study group had an average of 9.15± 1breast feedings.

Additionally, the duration of breastfeeding varied between the two groups. Slightly less than two thirds (65%) of the control group and more than half (55%) of the study group breast fed their babies for 10-15 minutes per feeding. When the mothers were asked about breast feeding at night, three quarters (75%) in the control and the study groups respectively stated that they sometimes breast feed their newborn babies at night.

Concerning the onset of breast engorgement, it occurred in 87.5% and 95% respectively for the two groups on the third postpartum day.

Table (3) represents breast pain before the intervention, as well as on the first, second, and third days following the intervention**.** Before the intervention, most of the control (92.5%) and all (100%) study group participants complained of severe breast pain with no statistically significant differences among the groups. However, following the RPS intervention, study group held significantly reduction in pain intensity on the first, second, and nearly two thirds (60%) of them had no pain on the third day following the intervention with statistically significant differences (P<0.001*). Furthermore, the control and the study groups differed significantly, according to the Chi square test results (P = <0.001*, 0.002*and <0.001* respectively). Yet control group continued to experience severe pain from the first to the third day without any statistically significant differences where P was (0.054)

Table (4) Depicted that prior to the first session of intervention, both control and study groups held similarly (87.5% & 90% respectively) severe degree of breast engorgement with no statistically significant differences among the groups. However, following the first day of (RPS) intervention, three quarters (75%) of the study group experienced moderate breast engorgement. On the second day of intervention the breast engorgement had gone down to mild degree among less than three quarters (70%) of them Furthermore, on the third day of intervention, three fifths (60%) of the study group had normal breasts, and more than one-third (35%) experiencing mild breast engorgement. with statistically significant differences as P = (<0.001*).

Nevertheless, throughout the three days of follow-up, the control group continued to have moderate to severe breast engorgement, and there were no statistically significant changes occurred during this period. However, A highly statistically significant difference favoring the study group was observed (p=<0.001).

Table (5) illustrates that 90% of the control group neonates had poor breast feeding prior to the intervention, compared to 100% of the study group, with no statistically significant difference between the two groups (P = 0.116). On the first day of the RPS intervention, the study group's percentage of poor breastfeeding dropped to one-quarter (25%). Subsequently, on the second day of the intervention, half (50%) of newborn babies were obtaining satisfactory breast feeding, and on the third day, this percent raised to 95%. The intervention resulted in a significant change before and after intervention where(P=<0.001) which did

not happen in the control group, where the majority of newborn babies continued to feed poorly during the same follow-up period. Significant differences were observed on the first, second, and third days of the intervention between the control and the study groups ($P < 0.001$). Accordingly, it can be deduced that the intervention had a significant effect on improving breastfeeding among the study group compared to the control group.

Table 1: Distribution of study participants according to their socio-demographic characteristics (n=80)

Socio-demographic characteristics	Control (n = 40)		Study (n = 40)		Test of Sig.	P Value
	No.	%	No.	%		
Age (year)						
<25	24	60	30	75	χ^2=2.051	0.152
≥25	16	40	10	25		
Min. – Max.	20– 30		20– 32		t= 1.054	0.295
Mean ± SD.	23.95 ± 3.34		23.15 ± 3.45			
Education						
Illiterate	4	10.0	2	5	χ^2= 0.731	0.866
Basic education	4	10.00	4	10		
Secondary education or it Equivalent	30	75.00	32	80		
University education	2	5.00	2	5.00		
Occupation						
Housewife	38	95.00	38	95.00	χ^2= 0.000	^{FE}p= 1.000
Working	2	5.00	2	5.00		
Marital Status						
Married	40	100	40	100	–	–
Income						
Enough for living	28	70.00	20	50.00	χ^2= 3.333	0.0678
Not enough	12	30.00	20	50.00		
Type of family						
Nuclear	40	100	40	100	–	–
Crowding Index						
Min. – Max.	0.67 – 2.0		0.67 – 1.0		t= 1.205	0.232
Mean ± SD.	0.85 ± 0.31		0.78 ± 0.16			
Current residence						
Rural	4	10.00	2	5.00	χ^2= 0.721	^{FE}p= 0.675
Urban	36	90.00	38	95.00		

(SD) refers to Standard deviation (t) refers to Independent t-test
(χ^2) refers to Chi square test (FET) refers to Fisher's Exact Test
(p) : p value for comparing between both studied groups

Table 2: Distribution of the study participants according to their breast feeding and breast engorgement history (n=80)

Breast feeding and breast engorgement history	Control (n = 40)		Study (n = 40)		Test of Sig.	p
	No.	%	No.	%		
After delivery, newborn babies was placed either:						
In the same bed with the mother	40	100	38	95	χ^2= 2.051	^{FE}p= 0.494
In his carry cot in the same room	0	0.0	2	5		
Initiation of breast feeding after delivery					χ^2= 0.2912	0.865
- Within 30 minutes	2	5	2	5		
- After 1 hour	30	75	28	70		
- From 2 hours to 24 hours	8	20	10	25		
Maternal position during breast feeding						
Incorrect	40	100	40	100	-	-
One side breastfeeding						
Yes	6	15	6	15	χ^2= 0.000	1.000
N0	34	85	34	85		
Mean of number breast feeding per day						
Min. – Max.	7.0 – 11.0		7.0 – 11.0		t= 1.6417	0.105
Mean ± SD.	8.75 ± 1.17		9.15 ± 1.00			
Duration of breast feeding						
10 Minutes	12	30.0	16	40.0	χ^2= 4.2714	0.118
15 Minutes	14	35.0	6	15.0		
20 Minutes and more	14	35.0	18	45		
Frequency of Breastfeeding at night						
Always	10	25.0	10	25.0	χ^2= 0.000	1.000
Sometimes	30	75.0	30	75.0		
Onset of engorgement						
Third postpartum day	35	87.5	38	95.0	χ^2= 1.409	0.235
Fourth postpartum day	5	12.5	2	5.0		

(SD) refers to Standard deviation (t) refers to Independent t-test
(χ^2) refers to Chi square test (FET) refers to Fisher's Exact Test
(p) :p value for comparing between both studied groups

Table 3: Distribution of the study participants according to their breast pain intensity pre and after intervention as measured by Visual analogue scale (n=80)

Pain intensity	Control group (n = 40)								Study group (n = 40)								χ^2 ($^{FE}p_1$)	χ^2 (p_2)	χ^2 (p_3)	χ^2 ($^{MC}p_4$)
	Pre		1st day of intervention		2nd day of intervention		3rd day of intervention		Pre		1st day of intervention		2nd day of intervention		3rd day of intervention					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%				
No pain	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	24	60				
Mild (1 – 3)	0	0.0	0	0.0	1	2.5	2	5.0	0	0.0	0	0.0	16	40	14	35	3.117	31.746*	54.558*	81.356*
Moderate (4 – 6)	3	7.5	5	12.5	7	17.5	6	15.0	0	0.0	30	75	24	60	2	5	(0.241)	(<0.001*)	(0.002*)	(<0.001*)
Severe (7 – 10)	37	92.5	35	87.5	32	80.0	32	80.0	40	100.0	10	25.0	0	0.0	0	0.0				
Fr (p_0)	**7.632 (0.054)**								**110.446* (<0.001*)**											

(χ^2) refers to Chi square test **(MC) refers to Monte Carlo** **(FE) refers to Fisher Exact** **(Fr) refers to Friedman test**

(p0): p-value for comparing the periods **within each group**.

(p1): p-value for comparing the two groups at **baseline** (pre-intervention). (p2): p-value for comparing the two groups on the **first day** of the intervention.

(p3): p-value for comparing the two groups on the **second day** of the intervention. (p4): p-value for comparing the two groups on the **third day** of the intervention.

(*) Statistically significant at $p \leq 0.05$

Table 4: Distribution of the study participants according to the degree of breast engorgement as measured by Six-point breast engorgement scale (n=80)

Degree of breast engorgement	Control group (n = 40)								Study group (n = 40)								χ^2 ($^{FE}p_1$)	χ^2 ($^{MC}p_2$)	χ^2 ($^{MC}p_3$)	χ^2 ($^{MC}p_4$)
	Pre		1st day of intervention		2nd day of intervention		3rd day of intervention		Pre		1st day of intervention		2nd day of intervention		3rd day of intervention					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%				
Normal breast	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	24	60				
Mild breast engorgement	0	0.0	0	0.0	1	2.5	3	7.5	0	0.0	0	0.0	28	70.0	14	35	0.125 (1.000)	22.064* (<0.001*)	64.138* (<0.001*)	80.295* (<0.001*)
Moderate engorgement	5	12.5	9	22.5	4	10.0	3	7.5	4	10	30	75.0	12	30.0	2	5				
Severe engorgement	35	87.5	31	77.5	35	87.5	34	85.0	36	90	10	25.0	0	0.0	0	0.0				
Fr (p_0)	**5.553 (0.135)**								**111.492* (<0.001*)**											

(χ^2) refers to Chi square test **(MC) refers to Monte Carlo** **(FE) refers to Fisher Exact** **(Fr) refers to Friedman test**

((p0): p-value for comparing the periods **within each group**.

(p1): p-value for comparing the two groups at **baseline** (pre-intervention). (p2): p-value for comparing the two groups on the **first day** of the intervention.

(p3): p-value for comparing the two groups on the **second day** of the intervention. (p4): p-value for comparing the two groups on the **third day** of the intervention.

(*) Statistically significant at $p \leq 0.05$

Table 5: Distribution of the studied groups according to newborn feeding behavior as measured by LATCH breastfeeding charting system (n=80)

Latch score	Control group (n = 40)								Study group (n = 40)								Test of Sig. (p_1)	Test of Sig. (p_2)	Test of Sig. (p_3)	Test of Sig. (p_4)
	Pre		1st day of intervention		2nd day of intervention		3rd day of intervention		Pre		1st day of intervention		2nd day of intervention		3rd day of intervention					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%				
Poor breastfeeding	36	90	34	85	34	85.0	34	85	40	100	10	25	0	0.0	0	0.0	χ^2= 4.211 (FEp= 0.116)	χ2= 29.091* (<0.001*)	χ^2= 59.394* (<0.001*)	χ^2= 77.540* (^{MC}p <0.001*)
Fair breastfeeding	4	10	6	15	4	10.0	3	7.5	0	0.0	30	75	20	50	2	5				
Good breast feeding	0	0.0	0	0.0	2	5	3	7.5	0	0.0	0	0.0	20	50	38	95				
Fr (p_0)	**6.600 (0.086)**								**107.220 (<0.001*)**											

(χ^2) refers to **Chi square test**
(MC) refers to **Monte Carlo**
(FE**) refers to Fisher Exact**
(Fr:) refers to **Friedman test**
(p0): p-value for comparing the periods **within each group**.
(p1): p-value for comparing the two groups at **baseline** (pre-intervention).
(p2): p-value for comparing the two groups on the **first day** of the intervention.
(p3): p-value for comparing the two groups on the **second day** of the intervention.
(p4): p-value for comparing the two groups on the **third day** of the intervention.
(*): Statistically significant if $p \leq 0.05$.

Discussion

Exclusive breast feeding is undoubtedly the "gold standard" dietary source for the first few months after birth **(World Health Organization (WHO), 2021)**. Although motherhood is a wonderful and unique experience, a variety of physical, psychological, and social concerns can arise in the postpartum period, affecting nursing. Breast engorgement is one of the most prevalent painful and upsetting problems affecting many women in the early postnatal period, especially primiparous mothers, when they are adjusting to the demands of a newborn **(Sharma, 2018)**.

Engorgement is triggered by elevated lactogenesis and prolactin levels in postpartum mothers. It can lead to pain, sore nipples, mastitis, abscess formation, and reduced milk supply, all of which can interfere with successful breastfeeding. Proper management of breast engorgement is essential to support the success of exclusive breastfeeding. Breast engorgement should be managed effectively to ensure the success of exclusive breastfeeding **(Zakarija-Grkovic & Stewart, 2020)**.

Therefore, the health care providers including nurses ought to equip the mothers with the most effective strategies for preventing and enhancing their ability to cope with and manage this issue.

Several techniques for dealing with engorgement were examined through A Cochrane meta-analysis in 2020. The authors discovered that cabbage leaves, cold compresses, plant-based compresses, and massages can all help cure breast engorgement. However, the level of evidence supporting their use is low **(Zakarija-Grkovic & Stewart, 2020)**. On the other hand Reverse pressure softening (RPS) of the areola was proved as an effective approach for reducing engorgement and enhancing breast feeding quality 1 **(Ananthavarsheni, 2019; Pednekar, 2021; Sharma, 2023)**. However, there is limited research in Egypt regarding applying RPS to manage breast engorgement. Thus, this study aimed to evaluate the effect of the reverse pressure softening technique on postpartum women's breast engorgement.

The current study targeted primiparous women (mothers who were having their first child). This group was chosen because they were more likely to face nursing difficulties and challenges due to a lack of knowledge and experience about breastfeeding issues including breast engorgement, its symptoms, causes, prevention, and management; Therefore, new mothers require comprehensive support from family members, along with education and training from healthcare professionals on how to prevent and manage breast engorgement **(Degefa et al., 2019; Abd El-hady et al., 2021; Fadiloglu et al., 2021)**.

Based on the initial assessment of both control and study groups, it was detected that they were similar in terms of general characteristics, breast feeding history, pain intensity, level of breast engorgement, and latch score, with no statistically significant differences between them.

Concerning breast engorgement, it was clearly apparent that the majority of the mothers in the control group as well as study group (90% and 87%, respectively) had severe breast engorgement before the intervention. While following the reverse pressure softening intervention, results of the current study proved that the study group's degree of breast engorgement significantly improved considerably as compared to the control group, with a highly statistically significant difference($P<0.01$) between the two groups, particularly on the second and third day after the intervention.

These improvements can be attributed to the implementation of the

RPS technique, which stimulates the areola nerves and promotes the milk ejection reflex. This is achieved by temporarily increasing the movement of excess interstitial fluid, which helps to displace the milk backward, reduce over-distention of the sub-areolar ducts, alleviate latching discomfort, and enhance milk transfer, eventually resulting in less breast engorgement **(Mounika et al., 2022)**.

The findings of the present study are corroborated by **Sharma (2023)** in the study titled "effectiveness of reverse pressure softening technique on level of breast engorgement and breastfeeding among postnatal mothers". Sharma's results show a statistically significant difference between the groups under study, with postpartum moms who used the RPS technique reporting less breast engorgement than the control group.

Additionally, **Mounika et al. (2022)** examined how well the reverse pressure softening method affected the amount of breast engorgement in 60 new mothers. The findings demonstrated that using the RPS technique is one of the safest interventions for postpartum mothers, as it increases milk transfer, reduces the risk of nipple trauma, and aids in the resolution of breast engorgement (p=0.0001).

Furthermore, these findings are consistent with the research by **Massey (2022)** and **Pednekar (2021)**, which evaluated the RPS technique's efficacy in alleviating breast engorgement in postpartum mothers. Both studies reported a significant decrease in the level of breast engorgement in the experimental group compared to the control group.

Breastfeeding women frequently experience breast pain, which can be caused by breast engorgement and is one of the most common reasons why breastfeeding is stopped too soon **(Lucas et al., 2019)**. The Visual Analogue Scale (VAS) was used in the current study to measure the intensity of breast pain. The results showed that the majority of control and all study group participants reported severe breast pain prior to the RPS intervention, with no statistically significant differences between the groups. However, on the first, second, and third days of RPS intervention, the study group experienced a highly statistically significant reduction in breast pain levels when compared to the control group. It is worth noting that almost two-thirds of the study group reported no pain after three days of RPS intervention.

These findings are congruent with those of **Pednekar (2021)** experimental study which concluded that a significant decrease in breast pain following the application of the RPS technique for the intervention group than those of the control group.

Furthermore, the use of physical therapy techniques from breast cancer treatment to breastfeeding was investigated by **Mogensen et al. (2020)**. Their study showed that the RPS intervention can facilitate a deeper, pain-free latch for newborn babies while also reducing breast edema and engorgement.

The findings of the current study and earlier studies suggest a positive effect of RPS strategy as it helps remove swelling in the breast that is pushed upward and backward, promotes areola softening, reduces excess subareolar tissue resistance, enhances breast milk ejection reflex, and ultimately reduce the sense of pain in the breast.

In terms of newborn feeding behaviors as assessed by LATCH breastfeeding charting system. The results of this study showed that all study group neonates and most control group neonates had low latch scores before the intervention. These results may be attributed to the fact that the enrolled postpartum women were primiparas, lacking prior experience with breastfeeding. Additionally, fewer percentage of the

participants in both groups breastfeed within the first hour of childbirth as recommended by **World Health Organization (WHO) (2018)**. Additionally, all of them demonstrated incorrect position during breast feeding. Moreover, severe engorgement and associated pain may negatively affect the infant's ability to latch-on correctly because of distension and edema of the nipple and areolar region. **Fadiloglu et al. (2021)** prospective study on the risk factors that could influence LATCH scores supports the results of the current investigation. Women who do not try to breastfeed within 30 minutes typically have lower LATCH scores, according to Fadiloglu.

Another study conducted in Northwest Ethiopia by **Alemie et al. (2023)** revealed that that primipara, not receiving breastfeeding technique counseling during antenatal care follow-up, breast problems as engorgement, and a lack of breastfeeding experience were statistically significant predictors of ineffective breastfeeding.

It is important to note that the current research found a significant improvement in breastfeeding, with half of the participants showing good breastfeeding practices after two days of the intervention. By the third day, the majority of babies in the study group were feeding effectively. These results are confirmed by earlier research that showed RPS of areola to be useful in reducing breast engorgement and enhancing the quality of breastfeeding **Massey (2022)** & **Sharma (2023)**. The current and previous research findings suggest that the interplay between reverse pressure softening, and latch behaviors is crucial for breastfeeding success. By utilizing RPS, mothers can navigate the challenges of engorgement that may hinder a proper latch. This, in turn, can lead to softening areola, enhancing newborn latching and sucking reflex, improved milk supply, ultimately fostering a healthier and more satisfying breastfeeding experience overall. Undoubtedly, Effective breastfeeding boosts a mother's confidence and enhances the adoption of maternal roles **(Ozkaya & Korukcu, 2023)**.

Conclusion

Based on the findings of the current study, it could be concluded that the postpartum women who experience breast engorgement require additional care and support to alleviate their symptoms. Overall, this study showed that, when compared to the control group, the primiparous postpartum women in the intervention group experienced less breast engorgement and related breast pain when using the reverse pressure softening technique. Additionally, it enhanced the way they breastfed their newborn babies.

Recommendations

Based on the study's findings, researchers recommend:

- For all postpartum moms with breast engorgement, the reverse pressure softening technique ought to be advocated and suggested as an institutional policy and applied as standard care.
- In-service training for nurses, focusing on using the RPS technique as part of their discharge teaching plan for puerperal women to alleviate breast engorgement and pain, as well as enhance infant feeding behavior.
- Planning and developing effective teaching and counseling strategies for all pregnant and postnatal women especially primipara to enhance their self-care practices and to raise their awareness regarding the beneficial effect of RPS of areola on breast engorgement and newborn feeding behavior.
- The nursing education curricula should entail RPS technique as non-

pharmacological management of breast engorgement.

Further studies:

- More research is needed to assess the impact of an educational program regarding nonpharmacological techniques on mothers' knowledge and practices for preventing breast engorgement
- Larger, multicenter randomized trials are required to confirm the broader applicability of the RPS technique for managing engorgement across different clinical settings.

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References

Abd El-hady, E., El-Refaey, A. M., & Gaheen, M. A. (2021). Self-care practices of primipara women regarding breast engorgement. *Tanta Scientific Nursing Journal, 20*(1), 161-194. https://doi.org/10.21608/tsnj.2021.168860.

Ahmed, E. R., Hamido, S., Metwaly, N., & Mohamed, A. (2022). Nursing Care Guideline for the Breast Disorders among Post Cesarean Section Women. *Egyptian Journal of Health Care, 13*(1), 722-738. https://doi.org/10.21608/ejhc.2022.221392.

Alemie, K., Eshete, T., Ashebir, W., Gedif, G., Desta, M., Ayenew, T., Alamneh, A. A., Ketema, D. B., Tsega, T. D., & Telayneh, A. T. (2023). Ineffective breastfeeding techniques and associated factors among breastfeeding mothers who gave birth in the last 6 months in Sinan Woreda, Northwest Ethiopia. *Journal of public health research, 12*(2), 22799036231181184. https://doi.org/10.1177/22799036231181184.

Ananthavarsheni, T. (2019). *Study to Evaluate the Effectiveness of Reverse Pressure Softening Technique on the Level of Breast Engorgement and Breastfeeding among Postnatal Mothers in Selected Hospitals at Ranchi* [PhD Thesis]. Annai Meenakshi College of Nursing, Coimbatore.

Berens, P. D. (2015). Breast Pain: Engorgement, Nipple Pain, and Mastitis. *Clinical obstetrics and gynecology, 58*(4), 902-914. https://doi.org/10.1097/grf.0000000000000153.

Cotterman, K. J. (2004). Reverse pressure softening: a simple tool to prepare areola for easier latching during engorgement. *Journal of human lactation, 20*(2), 227-237. https://doi.org/10.1177/0890334404264224.

Degefa, N., Tariku, B., Bancha, T., Amana, G., Hajo, A., Kusse, Y., Zerihun, E., & Aschalew, Z. (2019). Breast Feeding Practice: Positioning and Attachment during Breast Feeding among Lactating Mothers Visiting Health Facility in Areka Town, Southern Ethiopia. *International journal of pediatrics, 2019*, 8969432. https://doi.org/10.1155/2019/8969432.

Douglas, P. (2022). Re-thinking benign inflammation of the lactating breast: Classification, prevention, and management. *Women's health (London, England), 18*, 17455057221091349. https://doi.org/10.1177/17455057221091349.

Ebrahim, R. M., & Esmat, O. M. (2018). Effect of educational program on mothers' using for non-pharmacological therapies to alleviate breast engorgement after

cesarean section. *International Journal of Novel Research in Healthcare and Nursing, 5*(2), 454-469.

Fadiloglu, E., Karatas, E., Tez, R., Cagan, M., Unal, C., Nar, M., Tanacan, A., & Beksac, M. S. (2021). Assessment of Factors Affecting Breastfeeding Performance and Latch Score: A Prospective Cohort Study. *Zeitschrift fur Geburtshilfe und Neonatologie, 225*(4), 353-360. https://doi.org/10.1055/a-1255-3525.

Farag, W., Alam, T., & Taman, A. (2023). Effect of scraping technique (gua-sha) on breast engorgement among primi post-natal women. *Egyptian Journal of Health Care, 14*(2), 673-688. https://doi.org/10.21608/ejhc.2023.302331.

Ghattas, V. N., Ibrahim, H. I., Mohamed, M. A. E.-S., & Amin, S. (2022). Effect of Olive Oil Massage on Breast Engorgement and Breastfeeding among Primiparous Postnatal Mothers with Cesarean Section Delivery. *Assiut Scientific Nursing Journal, 10*(31), 69-79. https://doi.org/10.21608/asnj.2022.140880.1388.

Hanafy, H., Mohammed, S., Ahmed, S., & Kamel, H. (2022). Effectiveness of Ultrasound Versus Transcutaneous Electrical Nerve Stimulation on Postnatal Breast Engorgement. *Egyptian Journal of Physical Therapy, 11*(1), 1-9. https://doi.org/10.21608/ejpt.2021.67506.1034.

Hill, P. D., & Humenick, S. S. (1994). The occurrence of breast engorgement. *Journal of human lactation, 10*(2), 79-86. https://doi.org/10.1177/089033449401000212.

Huang, C., Li, L., Zhang, T., & Luo, B. (2022). Breastfeeding education in Chinese hospitals: A cross-sectional study. *International journal of nursing studies, 133*, 104310. https://doi.org/10.1016/j.ijnurstu.2022.104310.

Jensen, D., Wallace, S., & Kelsay, P. (1994). LATCH: a breastfeeding charting system and documentation tool. *Journal of obstetric, gynecologic, and neonatal nursing, 23*(1), 27-32. https://doi.org/10.1111/j.1552-6909.1994.tb01847.x.

Lucas, R., Bernier, K., Perry, M., Evans, H., Ramesh, D., Young, E., Walsh, S., & Starkweather, A. (2019). Promoting self-management of breast and nipple pain in breastfeeding women: Protocol of a pilot randomized controlled trial. *Research in nursing & health, 42*(3), 176-188. https://doi.org/10.1002/nur.21938.

Massey, A. (2022). Efficacy of reverse pressure softening technique among postnatal mothers in selected hospitals at Kanpure. *International research journal of education and technology, 4*(11), 16-20.

Mogensen, N., Portman, A., & Mitchell, K. (2020). Nonpharmacologic Approaches to Pain, Engorgement, and Plugging in Lactation: Applying Physical Therapy Techniques From Breast Cancer Care to Breastfeeding Patients. *Clinical Lactation, 11*(1), 35-42. https://doi.org/10.1891/2158-0782.11.1.35.

Mohamed, R. S. F., Shelil, M. E. I., & Abd-Allah, I. M. (2020). Comparing between the Effect of Breast Massage versus Cabbage Leaves Compress on Reduction of Breast Engorgement among Postpartum Women. *Trends in Nursing and Health Care Journal, 1*(1), 111-128. https://doi.org/10.21608/tnhcj.2022.281297.

Mounika, M., Kalabarathi, S., & Padmapriya, D. (2022). Effectiveness of reverse presure softening technique on level of breast engorgement among postpartum mothers at Saveetha Medical College and Hospital, Thandalam, Chennai. *Cardiometry*(25),

231-237. https://doi.org/10.18137/cardiometry.2022.25.231237.

Ozkaya, M., & Korukcu, O. (2023). Effect of cold cabbage leaf application on breast engorgement and pain in the postpartum period: A systematic review and meta-analysis. *Health care for women international, 44*(3), 328-344. https://doi.org/10.1080/07399332.2022.2090567.

Pednekar, P. S. (2021). Effectiveness of Reverse Pressure Softening of Areola in Women with Postpartum Breast Engorgement. *Indian Journal of Physiotherapy & Occupational Therapy, 15*(2), 50-58. https://doi.org/10.37506/ijpot.v15i2.14513.

Scime, N. V., Metcalfe, A., Nettel-Aguirre, A., Nerenberg, K., Seow, C. H., Tough, S. C., & Chaput, K. H. (2023). Breastfeeding difficulties in the first 6 weeks postpartum among mothers with chronic conditions: a latent class analysis. *BMC pregnancy and childbirth, 23*(1), 90. https://doi.org/10.1186/s12884-023-05407-w.

Sharma, A. (2023). The effectiveness of reverse pressure softening technique on the level of breast engorgement and breastfeeding among postnatal mothers. *International Journal of Creative Research Thoughts, 11*(12), 770-787.

Sharma, R. (2018). Effectiveness of chilled cabbage leaf application on breast engorgement among postpartum women's. *Journal of medical science and clinical research, 6*(6), 878-882. https://doi.org/10.18535/ jmscr/v6i6.147.

Sharma, S., & Mahajan, N. (2023). Complications of Puerperium. In R. Garg (Ed.), *Labour and Delivery: An Updated Guide* (p.p. 687-701). Springer Nature.

World Health Organization (WHO). (2018). *WHO and UNICEF issue new guidance to promote breastfeeding in health facilities globally*. WHO.

World Health Organization (WHO). (2021). *Indicators for assessing infant and young child feeding practices: definitions and measurement methods*. WHO.

Zakarija-Grkovic, I., & Stewart, F. (2020). Treatments for breast engorgement during lactation. *The Cochrane database of systematic reviews, 9*(9), Cd006946. https://doi.org/10.1002/14651858.CD006946.pub4.