

## Reverse Pressure Softening of Areola: It's Effect on Breast Engorgement and Newborn Feeding Behavior among Puerperal Mothers

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### Abstract

**Background:** Breast engorgement is a serious and painful health problem. Reverse pressure softening of areola helps in pushing fluid back, empowers the nipple to protrude better, reduce breast engorgement and enhance newborn feeding behavior. **Aim:** Evaluate the effect of reverse pressure softening of areola on breast engorgement and newborn feeding behavior among puerperal mothers. **Design:** Quasi experimental pre & posttest study design was used. **Study sample:** A purposive sample of ninety puerperal mothers were allocated to either the intervention or the control group, with forty-five mothers in each group. **Setting:** The study was conducted at postpartum wards and Gynecological outpatient clinic, Mansoura University Hospitals, Egypt. **Four tools were used:** A structured interview questionnaire, six-point breast engorgement scale, visual analogue scale & LATCHES newborn feeding behavior. **Results:** At posttest two 37.8% of the intervention group had normal breast compared to 11.1% in the control group and 77.8% had adequate newborn feeding behavior in the intervention group vs. 6.7% in the control group. Highly statistical decrease in levels of breast engorgement, breast pain and improved newborn feeding behavior in favor of the intervention group at posttest one and two ( $p= 0.001$ ). **Conclusion:** Reverse pressure softening of areola was an effective method in reducing breast engorgement, breast pain and improving newborn feeding behavior among puerperal mothers. **Recommendations:** Raising awareness of puerperal mothers regarding the beneficial effect of reverse pressure softening of areola on breast engorgement and newborn feeding behavior.

**Keywords:** *Engorgement, Newborn Feeding Behavior, Puerperal Mothers & Reverse Pressure Softening of Areola.*

### Introduction:

The first four to six weeks following childbirth are known as the puerperium, or postpartum period, during which the mother's body goes through physiological and anatomical changes to return to its normal state. Certain changes, as involution of the uterus and vagina, are retrogressive, while others, as the onset of parenthood, production of milk for lactation, and the restoration of the regular menstrual cycle, are progressive. Although major problems might also occur, postpartum physiological changes may only cause discomfort for new mothers (Shamekh et al., 2022).

Production of milk starts in the breast alveoli and is pushed out into the milk ducts to be carried through the breast, is one of the postpartum changes. Progesterone, estrogen, and human placental lactogen levels all sharply decline after placenta delivery after that, prolactin hormone triggers the alveoli to begin producing milk, and oxytocin hormone enables the surrounding muscles to squeeze milk out through the milk ducts when the baby suckles (Alex et al., 2020). When the baby isn't positioned properly for two hours on the breast, the breast starts swollen and becomes hard, tender, and painful which is known as engorged breast (Varghese, & Patwa, 2020).

Breast engorgement is a condition in which the breasts swell and become painfully sensitive, it appears in the initial days following childbirth and is caused by elevated blood flow and milk production in the breast (Mohamed et al., 2022). One of the most prevalent mild discomforts, especially for primiparas, is primary breast engorgement affects 65% to 75% of breastfeeding women worldwide and 82% of Egyptian women in the third postpartum day (Shamekh et al., 2022 & Ghattas et al., 2022).

Engorgement of the breast usually starts on days two or four after delivery. It is a major postpartum problem as it can result in several problems such as feeling of discomfort, tenderness, obstructed milk ducts, infection, breast swelling, injured nipples, difficulty feeding, and reduced milk ejection reflex. Postpartum mothers may be at more risk of engorgement if they don't take action to prevent or manage breastmilk stasis brought on by intermittent or inadequate breast evacuation (Varghese, & Patwa, 2020, & Aprilina et al., 2021).

Within the first six weeks after postpartum, up to one-third of mothers who have breast problems such as infection, mastitis, or abscess due to improper treatment of engorgement may switch to other baby nourishment strategies. Research results from India

and throughout the world reported that breast feeding increases baby's chances for survival and growth, shields them from diseases, and gives the mother a natural defense against becoming pregnant again (Ananthavarsheni, 2019).

A mother learns the skill of breastfeeding by experience, and it becomes easier with time. Establishing appropriate breastfeeding skills is paramount. It has been determined that using the proper method during nursing is essential to successful breastfeeding because using the incorrect technique may exacerbate breast engorgement. For the baby to be able to suckle successfully, it must correctly latch onto the breast. It's crucial to assume proper techniques to initiate breastfeeding and avoid nipple pain (Sharma, 2023).

Breast engorgement and associated breast pain are treated with a variety of pharmacological and non-pharmacological methods, but pharmaceuticals have negative effects (Zagloul et al., 2020). Recently, there has been a lot of interest in non-pharmacological methods such as kangaroos, limiting fluid intake, binding the breasts, or wearing a tight bra, massaging with olive oil, applying cabbage leaves, hot and cold compresses either alone or in conjunction with herbal remedies like Fenugreek seeds and ginger, and cold aloe vera gel (Hassan et al., 2020; Mangesi & Zakarija-Grkovic, 2016).

Reverse pressure softening of areola (RPS) is a nonpharmacological breast engorgement relieving way developed by Cotterman, (2004) and recently used by Sharma, (2023). This technique has shown to be quite beneficial in the first 14 days after giving birth by applying light positive pressure which softens the areola, momentarily shifting some swelling upward and backward into the breast. The optimal time to perform RPS is right before each latch attempt, for as many feedings as necessary (Ananthavarsheni, 2019).

Early proactive use of RPS induces the milk ejection reflex and steadily stimulates the nerves beneath the areola, which helps to secrete milk from the breast almost often in one to two minutes or less, relieving over-distention of subareolar ducts, changing the shape of nipples, lessening latch discomfort. Moreover, areolar flexibility is released to allow the nipple to extend farther into the baby's mouth in response to the tongue's rippling which in turn improves newborn feeding behavior (Mounika et al., 2022). So, the researchers decided this technique as an intervention for the current study.

### Significance of the study

Breastfeeding is crucial for preventing the triple burden of infectious diseases, malnutrition, and premature death. It also supports healthy brain development and mortality, as well as lowering the

chance of obesity and chronic illnesses in later life in both high- and low-income nations (Horta et al., 2023). Breastfeeding encourages birth spacing because the hormones released by the mother's body during nursing suppress ovulation and lactational amenorrhea also, it protects the mother from long-term conditions like type 2 diabetes, cardiovascular disease, breast and ovarian malignancies, and diabetes (Louis-Jacques, & Stuebe, 2020).

Breastfeeding could avert 20,000 maternal and 823,000 child deaths annually (Rollins et al., 2016). As a result, it helps to achieve the third Sustainable Development Goal's first and second targets, which are connected to maternal and child mortality, respectively. Moreover, it has been estimated that not breastfeeding results in a yearly economic loss of almost \$302 billion, or 0.49% of global gross national income (Rollins et al., 2016).

One of the main reasons women stop breast feeding is breast engorgement. According to earlier research, the breast engorgement incidence is 1:8,000 globally, and 1:6,500 in India (Varghese, & Patwa, 2020), 82% of breastfeeding mothers in Egypt experience breast engorgement during the first postpartum week (Abdallah et al., 2018; Abd El-hady et al., 2021; Ghattas et al., 2022). Breast engorgement impairs the mother's ability to continue nursing by causing pain and discomfort, sore nipples, mastitis, abscess formation, decreased milk secretion, and the introduction of breast milk replacements (Abd El-hady et al., 2021).

Prompt pain alleviation, aiding in the baby's successful attachment to the breast, helping with the effective evacuation of milk, and avoiding repercussions and linked difficulties, such as mastitis and breast discharge, would be the best course of treatment for breast engorgement (Ozkaya, & Korukcu, 2023). Previous studies reported that RPS of areola was an effective in alleviating breast engorgement and improving quality of breast feeding (Ananthavarsheni, 2019, Pednekar, 2021, & Sharma, 2023). Furthermore, there is a little research in Egypt regarding implementing reverse pressure softening of areola to alleviate breast engorgement. So, the aim of the current study was to evaluate the effect of reverse pressure softening of areola on breast engorgement and newborn feeding behavior among puerperal mothers.

### Aim of the study:

This study aimed to evaluate the effect of reverse pressure softening of areola on breast engorgement and newborn feeding behavior among puerperal mothers.

### Operational definitions:

**Breast engorgement:** in the current study it means painful overfilling of the breasts with milk which

results in hard, painful, swelling, tender breast. It was assessed by a six-point breast engorgement scale.

**Newborn feeding behavior:** In the current study it means pattern of newborn's feeding it can be assessed by LATCHES scale.

**Reverse Pressure Softening Technique (RPS):** A method to soften the areola when breast fullness makes it hard to latch on which increase milk let down and enhance breast feeding.

#### Hypotheses of the study:

**Hypothesis 0:** Puerperal mothers with breast engorgement who practice reverse pressure softening of areola may exhibit the same levels of breast engorgement, breast pain and newborn feeding behavior as those who don't.

**Hypothesis I:** Puerperal mothers who receive reverse pressure softening of areola may exhibit less levels of breast engorgement than those who don't.

**Hypothesis II:** Puerperal mothers who receive reverse pressure softening of areola expected to have less intensity of breast pain than those who don't.

**Hypothesis III:** Puerperal mothers who receive reverse pressure softening of areola may exhibit adequate newborn feeding behavior than those who don't.

## Subjects and Method

### Study design:

A quasi-experimental pre- posttest control group study design was used in which independent variable (effect of reverse pressure softening of areola) on the dependent variable (breast engorgement, breast pain, and newborn feeding behavior) was assessed in this study.

### Study setting:

The study was carried out at postpartum wards and Gynecological outpatient clinic in Mansoura University Hospitals, Mansoura city, Dakhliya Governorate, Egypt.

**Sample type:** A purposive sample was used.

**Study subjects:** The sample included 90 puerperal mothers were selected from the previously mentioned setting to participate in this study according to the following:

#### Inclusion criteria:

##### Mothers who had:

- 1) Undergone caesarean section.
- 2) Engorged breast.
- 3) No nipple abnormalities.
- 4) Normal neonate.

#### Exclusive criteria:

##### Mothers who had:

- 1) Normal deliveries.
- 2) Cracked or fissured nipples.
- 3) Babies were admitted in neonatal intensive care unit or still birth.

### Sample size:

Using G 'power' version 3.1, and according to the study of **Ananthavarsheni, (2019)** to calculate the study sample in which the mean score in experimental group received reverse pressure softening of areola was  $1.64 \pm 0.63$  and the mean score in control group was  $4.24 \pm 0.78$ . Which was significant at  $P < 0.05$  level. Where effect size = 0.3 with a significance level ( $\alpha = 0.05$ ) with statistical power = 80%. The calculated total sample was (90) women, (45) women for each group.

The selected sample was assigned randomly and equally to two groups using random integer generator method (Random. org). Intervention group (received reverse pressure softening of areola) and control group (received only routine care).

### Tools of data collection:

After massive review of the related national / international studies the following tools were used as:

#### Tool I: A Structured Interview Questionnaire:

**Part 1:** Entitled **demographic data** of mothers as age, educational level, occupation, residence, & telephone number or WhatsApp.

**Part 2:** Consisted **breastfeeding data** as initiation of breast feeding postpartum, method, frequency, duration of breast feeding, and onset of breast engorgement.

#### Tool II: Six- Point Breast Engorgement Scale

This scale was adopted from **Hill & Humenick (1994)**. It is a standardized scale to assess the level of engorged breast by observation or self-reporting.

**Table (I):** Scoring system of the scale

Score	Interpretation of six- Point Breast Engorgement Scale	
(1)	Soft and no change in breast.	Breast is normal
(2)	Slight firmness in breast.	Mild breast engorgement
(3)	Firm without tenderness.	
(4)	Firm with mild tender breast.	Moderate breast engorgement
(5)	Firm breast & tender.	
(6)	Very firm, & very tender.	Severe breast engorgement

#### Tool III: Visual Analogue Scale (VAS):

This tool was adopted from (**Gift, 1989**), to assess breast pain. It included a 10 cm blank line with adjectives that described the extremes of pain at each end with frequently used no pain at one end and severe pain at the other end. The puerperal mothers were asked to indicate their intensity of breast pain by marking the line that most accurately reflects their experience.

**Visual Analogue Scale Scoring:** The score of zero (0) indicates no pain, while the (10) score indicates the worst possible pain. Score (1-3) refers to mild

pain. Score (4-7) refers to moderate breast pain. Score (8-10) refers to severe breast pain.

#### **Tool IV: LATCHES Newborn Feeding Behavior**

It was adopted from **Jensen et al., (1994)**. It included seven items related to mother and newborn to assess newborn feeding behavior.

**Table (II):** Scoring system of the tool:

LATCHES	Interpretation of the tool
L	How well the infant latches onto the breast.
A	The amount of audible swallowing noted.
T	Type of nipple.
C	Maternal comfort during feeding.
H	The amount of help the mother needs to hold her infant
E	Elimination of urine, stool: it's size and color.
S	Satiation

#### **Scoring system:**

Each component had a score ranging from 1 to 3, giving a maximum score of 36. The newborn feeding behavior quality was rated as follows: 1 to 12 = inadequate, 13 to 24 = moderately adequate, and 25 to 36 = adequate.

#### **Validity of the tools**

Data collection tools were tested for its validity by three specialists in woman's health & midwifery nursing field and the recommended modifications were done.

**Reliability of the tools:** The tools of data collection as 6-point breast engorgement scale, visual analogue scale, & LATCHES newborn feeding behavior were tested for their reliability using Pearson Correlation (test- retest) and they were 0.81, 0.87, & 0.92 respectively which means high reliability of tools.

**Pilot study:** Ten percent of the total sample was selected to conduct a pilot study to test the applicability, objectivity, and feasibility of the tools and to estimate the time required to complete the tools. Mothers in the pilot study were included in the total sample.

#### **Ethical considerations:**

An ethical approval letter from Research Ethics Committee, Faculty of Nursing, Mansoura University, Egypt was obtained to carry out this study. In addition to approval from the Mansoura University Hospitals' director. Following explanation of the study's aim, each mother who participated gave written consent. The confidentiality of the collected data, and the right to withdraw from the study were reassured to each mother.

#### **Field work:**

The current study was conducted from the beginning of January 2024 to the end of April 2024. This study comprised of three phases: preparatory, implementation and evaluation phase.

#### **Preparatory phase:**

- 1) Firstly, ethical approval from the Research Ethics Committee Ref. No. 0576/ on 27/12/2023, Faculty of Nursing & official permission from the director of Mansoura University Hospitals were obtained to ease conducting the study.
- 2) After a massive review of the related national and international studies, researchers prepared the current study's tools to collect the needed data from the study sample.
- 3) The researchers attended 4 days/ week in the study setting (Saturday, Sunday, Monday, & Wednesday) from 9 a.m. to 2 p.m. to collect the calculated sample size.

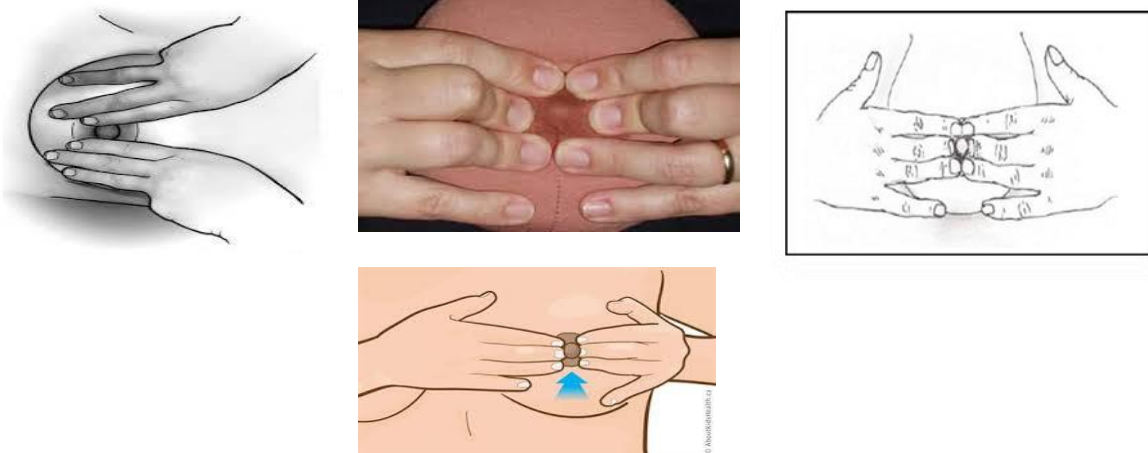
#### **Implementation phase:**

- **The control group**, once eligibility for participation was assured, the researchers interviewed puerperal mothers before their discharge from the postpartum ward, introduced themselves to them, clarified the research aim and method to each participated mother and encouraged them to perform written consent. Thereafter, the demographic data, & breast-feeding data were collected from each puerperal mother utilizing tool I: parts I, & II.
  - No additional measures were provided for the control group except the routine care provided during the postnatal follow-up as dictated by their obstetricians.
  - **Intervention group**, before discharge of women from the hospital, researchers interviewed each mother, greeted separately, and informed her about the aim, and method of the study. Also, the researchers obtained the consent of the mothers and ensured their right to withdraw from the study at any time.
  - According to the inclusion criteria, the researchers met 1-2 mothers /day 30 minutes for each one.
  - After that, demographic, & breastfeeding data were collected from each puerperal mother utilizing tool I: parts I, & II.
  - Researchers trained each puerperal mother the technique of **RPS of areola** for 10 mins. for each engorged breast before nursing the neonate /12 hours per day and advised them to perform it in case of occurrence of breast engorgement in a simple manner with illustrated colored brochure as:
- Steps of reverse pressure softening of areola (RPS):**
- The mother should lie on her back or in sitting position during **RPS** to delay re-entry of swelling and allowing adequate time for latching.
  - Apply gentle steady pressure to the areola directly at the base of the nipple. It should be gentle to avoid discomfort.
  - The pressure should be directed to the chest wall for a full minute or longer (10–20 minutes).

- Using the flats of two thumbs or the first few fingers of each hand, make a depression that is 1-2 inches long above and below the nipple. Continue alternating with repeated 2-minute exercises in the opposing quadrants until breast edema is reduced.

**Reverse pressure softening of areola can be performed by one of the two following methods:**

- Two-handed method:** Touch the side of the nipple with each fingertip, curving and shortening.



**Figure (I): Two -Handed Method Reverse Pressure Softening of Areola**



**Figure (II): Two -Thumbs- Reverse Pressure Softening of Areola.**

**Figures I & II were adopted from Cotterman, (2004):** Reverse pressure softening: a simple tool to prepare areola for easier latching during engorgement. *Journal of Human Lactation*, Vol. (20), No. (2), Pp. 227-3.

On the 3<sup>rd</sup> day postpartum researchers followed up on puerperal mothers through telephone calls or grouping them on WhatsApp to ask them about breast engorgement, breast pain, & newborn feeding behavior utilizing tools II, III, & IV as (a pretest). Also, researchers reviewed the technique of reverse pressure softening of areola with each mother, sending to them videos related to this technique and encouraged them to apply it to reduce breast engorgement, alleviate breast pain and improve quality of newborn feeding behavior.

#### **Evaluation phase:**

On the 7<sup>th</sup>, & 10<sup>th</sup> day post-partum each puerperal mother included in the control, or the intervention groups were asked or observed to assess signs of breast engorgement, breast pain, and newborn feeding behavior as posttest one, & posttest two respectively

Knuckles should touch the nipple while using two or three straight fingers on either side. Pinch the area above and below the nipple (**Figure I**).

- Two thumbs method:** Grasping the thumbnail base with the side of the nipple with straight thumbs. Make a ¼ turn. Repeat the nipple above and below (**Figure II**).

utilizing tools II, III, & IV. This phase was done by interviewing the mothers during post-partum follow up or communicating with them on telephone or WhatsApp.

#### **Statistical Analysis:**

The study's data was analyzed using "IBM SPSS Statistics Version 23 for Windows Package Program". Categorical data was displayed as percentages and numbers. While numerical data was explained using (Mean ± SD). Comparison between the studied groups were tested with ( $\chi^2$ ) for categorical variables while, (t-test) for numerical measurements. Pearson Correlation (test-retest) was used to test tools' reliability. Significance differences were estimated at p-value = 0.05 (**Infanger & Schmidt-Trucksäss, 2019**).

## Results:

Table (1): Demographic data of the studied groups (n= 90).

Demographic data	Intervention group (n=45)		Control group (n=45)		Significance Test	P-value
	No	%	No	%		
<b>Age in (years)</b>						
< 25 yrs.	11	24.4	10	22.2	$X^2 = 0.50$	0.78
25-<35 yrs.	26	57.8	29	64.5		
≥ 35 yrs.	8	17.8	6	13.3		
<b>Mean ± SD</b>	<b>27.98 ± 5.35</b>		<b>29.13 ± 4.98</b>		t= 1.06	0.29
<b>Educational level</b>						
Illiterate	7	15.6	5	11.1	$X^2 = 0.81$	0.67
Middle education	27	60	31	68.9		
High education	11	24.4	9	20		
<b>Occupation</b>						
Housewife	32	71.1	34	75.6	$X^2 = 0.23$	0.63
Working	13	28.9	11	24.4		
<b>Residence</b>						
Rural	25	55.6	27	60	$X^2 = 0.18$	0.67
Urban	20	44.4	18	40		

Chi square for Qualitative data & student t test for Quantitative data.  
Statistically significant at  $p < 0.05$ .

Table (2): Distribution of the studied groups according to their current breastfeeding data (n= 90).

Current Breast-feeding data	Intervention group (n=45)		Control group (n=45)		$X^2$	P-value
	No	%	No	%		
<b>Initiation of breast feeding postpartum</b>						
Within 30 minutes	7	15.6	8	17.8	$X^2 = 0.97$	0.81
From 30 min. - 1hr.	4	8.9	6	13.3		
From 2 hrs. - 24hrs.	19	42.2	15	33.3		
After 24hrs.	15	33.3	16	35.6		
<b>Method of breast feeding</b>						
Scheduled	15	33.3	18	40	$X^2 = 0.43$	0.51
On demand	30	66.7	27	60		
<b>Frequency of breast feeding (n= 15) (n= 18)</b>						
Every 30 mins.	10	66.7	14	77.8	$X^2 = 0.51$	0.45
Every 2hrs.	5	33.3	4	22.2		
<b>Duration of breast feeding</b>						
10 minutes	36	80	38	84.4	$X^2 = 0.30$	0.58
15 minutes.	9	20	7	15.6		
<b>Onset of breast engorgement</b>						
3 <sup>rd</sup> day postpartum	17	37.8	16	35.6	$X^2 = 0.20$	0.91
4 <sup>th</sup> day postpartum	13	28.9	12	26.6		
5 <sup>th</sup> day postpartum	15	33.3	17	37.8		

Statistically significant at  $p < 0.05$ .

Table (3): Mean differences between the studied groups regarding breast engorgement before intervention, posttest one and posttest two (n=90).

Breast engorgement	Intervention group (n= 45)		Control group (n=45)		t- test	P- value
	Mean	SD	Mean	SD		
<b>Before intervention</b>	5.40	0.49	5.47	0.50	0.63	0.53
<b>Posttest one</b>	3.78	0.67	4.98	0.69	8.36	0.001**
<b>Posttest two</b>	1.93	0.91	3.64	1.21	7.57	0.001**

\*\* Indicates highly statistically significance ( $p= 0.001$ ).

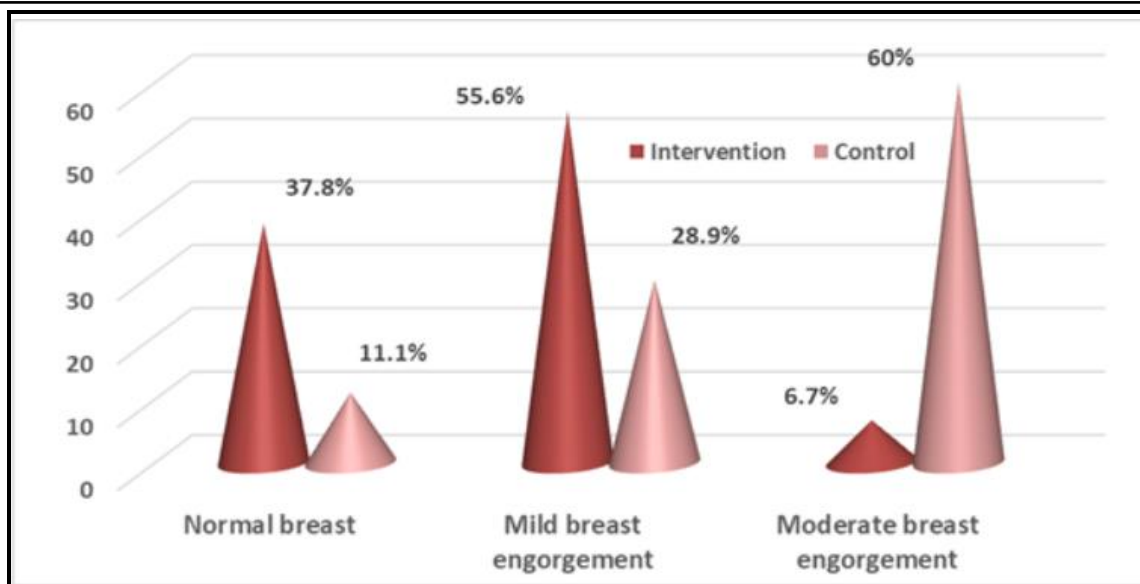


Figure (1): levels of breast engorgement among the studied groups at posttest two (n= 90).

Table (4): Mean differences between the studied groups regarding breast pain intensity before intervention, posttest one and posttest two (n=90).

Breast pain intensity	Intervention group (n= 45)		Control group (n=45)		t- test	P- value
	Mean	SD	Mean	SD		
Before intervention	8.91	0.85	9.13	0.79	1.29	0.20
Posttest one	5.09	1.28	7.07	0.75	8.96	0.001**
Posttest two	1.13	1.18	4.44	2.06	9.35	0.001**

\*\*Statistically significant differences.

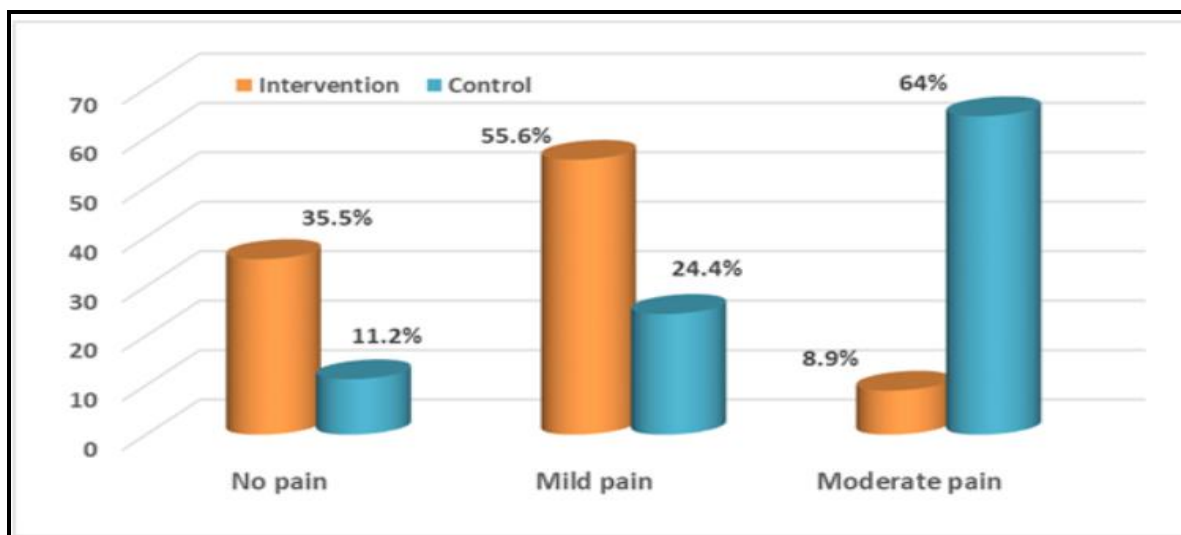
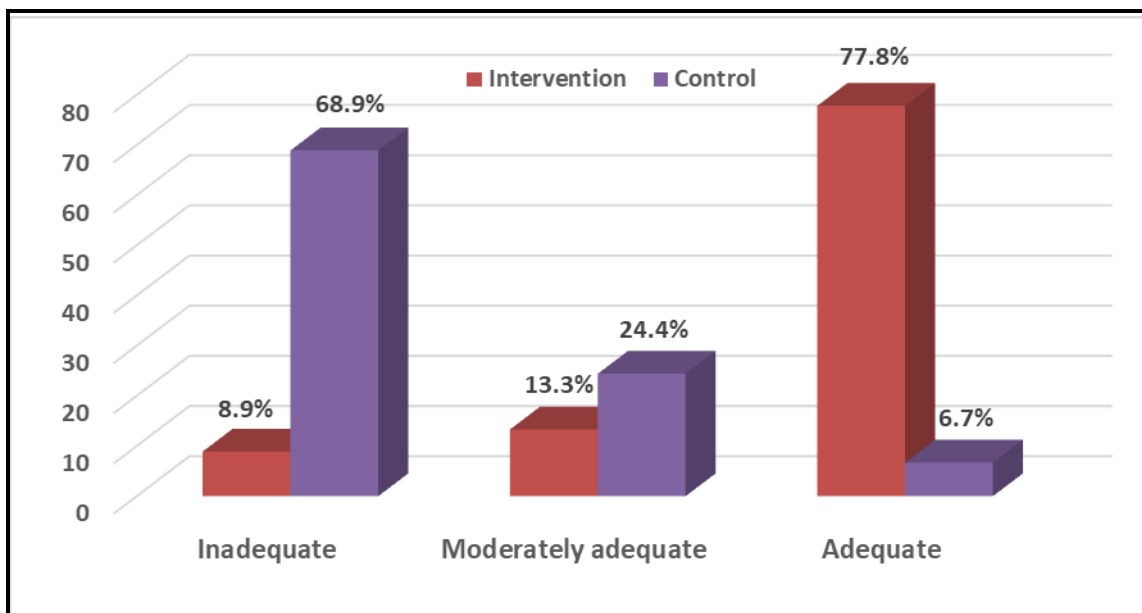


Figure (2): Levels of breast pain intensity between the studied groups at posttest two (n=90).

Table (5): Distribution of the studied groups according to newborn feeding behavior (n=90).

Newborn feeding behavior	Intervention group (n= 45)		Control group (n=45)		t- test	P- value
	Mean	SD	Mean	SD		
Before intervention	12.18	2.10	12.53	1.39	0.95	0.35
Posttest one	20.71	2.22	15.13	1.01	15.32	0.001**
Posttest two	27.49	6.43	11.56	6.50	11.69	0.001**

\*\* Statistically significant differences



**Figure (3): Levels of newborn feeding behavior between the intervention and control groups at posttest two (n=90).**

**Table (1):** Shows the mean age of mothers in the intervention group ( $27.98 \pm 5.35$ ) compared to ( $29.13 \pm 4.98$ ) of those in the control group. Regarding mothers' educational level, 60% of the intervention group had middle education compared to (68.9%) of the control group. Also, (71.1%) of the intervention group were housewives compared to (75.6%) of the control group and (55.6%) of mothers in the intervention group are living in rural areas vs. (60%) of the control group. No statistically differences were found between both groups ( $p > 0.05$ ).

**Table (2):** Explains breastfeeding was initiated within 30 minutes by only (15.6%) of mothers in the intervention group compared to (17.8%) of the control group. While more than two fifth (42.2%) of mothers in the intervention group-initiated breastfeeding from 2 to 24 hr. postpartum compared to (33.3%) of the control group. Regarding the method of breastfeeding only (33.3%) of puerperal mothers reported scheduled breastfeeding compared to (40%) of the control group. (80%) of mothers in the intervention group breastfeed their babies for 10 minutes, compared to (84.4%) of the control group. Breast engorgement occurred on the 3<sup>rd</sup> day postpartum as reported by (37.8%) of the intervention group compared to (35.6%) of the control group. However, no statistical differences between both groups were observed ( $P > 0.05$ ).

**Table (3):** Demonstrates before intervention, no statistically significant difference was found between both groups regarding breast engorgement, while highly statistically significant differences were found

between the studied groups at posttest one, & two ( $p = 0.001$ ).

**Figure (1):** Displays (37.8%) of mothers in the intervention group had normal breast vs. (11.1%) of the control group at posttest two. Also, (55.6%) of the intervention group had mild breast engorgement compared to (28.9%) of the control group and only (6.7%) of mothers in the intervention group had moderate breast engorgement versus (60%) of those in the control group.

**Table (4):** Elucidates that before intervention, there was no difference between the studied groups in terms of intensity of breast pain, while highly statistical variations were found between both groups at posttest one and posttest two ( $p = 0.001$ ).

**Figure (2):** Reveals that at posttest two more than one third (35.5%) of mothers in the intervention group had no breast pain vs. (11.2%) of those in the control group. Only (8.9%) of the intervention group had moderate breast pain compared to (64%) of the control group.

**Table (5):** Points that there is no statistically significant difference was found between the studied groups regarding newborn feeding behavior before implementing RPS technique, while highly statistically significant differences were found between both groups at posttest one and two ( $p = 0.001$ ).

**Figure (3):** Clarifies more than three quarters (77.8%) of newborns had adequate feeding behavior in the intervention group vs. only (6.7%) of those in the control group.



**Discussion:**

This study aimed to evaluate the effect of RPS of areola on breast engorgement, & newborn feeding behavior among puerperal mothers. Findings of the current study revealed differences highly significant between both groups, whereas puerperal mothers who practiced RPS of areola had decreased levels of breast engorgement, breast pain, & improved newborn feeding behavior. As a result, the current study's hypotheses **I, II, & III** were achieved.

Several non-pharmacological interventions were studied to reduce breast engorgement as (i.e., breast massage, milk expression, cold gel packs, cold cabbage leaves, warm and cold compresses) however, there hasn't been much reliable research on these techniques. Because non-pharmacologic treatments for breast engorgement are often similar, further evidence-based research into them is therefore required (**Berens et al., 2016; Zakarija-Grkovic & Stewart, 2020**). Therefore, this study was implemented to evaluate the effect of RPS of areola on breast engorgement, & newborn feeding behavior among puerperal mothers.

The current study's findings indicated significant decreases regarding levels of breast engorgement on 7<sup>th</sup>, & 10<sup>th</sup> days post intervention in favor of mothers in the intervention group. Researchers interpreted this to the ability of RPS of areola to lessens pressure on the breast, enhances breast softness, changing the shape of the nipples and better latching by assisting the baby's tongue in removing more milk while being extremely gentle on the mother's breast. Therefore, hypothesis (**I**) of the current study was assured.

These findings are consistent with the study of **Sharma, (2023)** entitled "Effectiveness of reverse pressure softening technique on level of breast engorgement and breast feeding among postnatal mothers". Reported a significant difference between the studied groups in post-test levels of engorged breast and breastfeeding among postnatal women. According to **Sharma's** findings, postnatal mothers who applied RPS technique reported successful breast feeding and decreased breast engorgement.

In addition to that, **Mounika et al., (2022)** studied at Saveetha Medical College and Hospital in Thandalam, Chennai, effectiveness of reverse pressure softening technique on breast engorgement. They pointed to statistical mean difference in breast engorgement for the experimental group. **Mounika** concluded that the used technique was the most straightforward and secure way to reduce breast engorgement during the postpartum period.

Else, a similar study of **Massey & Tutor, (2022)** at Kanpure entitled "Efficacy of reverse pressure softening technique among postpartum mothers", revealed statistically significant alter in mean of

breast engorgement between pre and posttest ( $p=0.05$ ). In addition to, **Pednekar, (2021)** evaluated effectiveness of RPS in women with engorged breast and reported significant decrease in level of engorgement among participants in the RPS group than those in the control group. Another supported study conducted by **Ananthavarsheni, (2019)** regarding effectiveness of RPS on breastfeeding and engorgement, revealed significant difference in breast feeding and engorgement for the experimental group and concluded efficacy of this technique in alleviating engorgement and empower feeding of the neonate.

Regarding intensity of breast pain, the current study findings reported significant decreases in levels of breast pain on 7<sup>th</sup>, & 10<sup>th</sup> day in favor of the intervention group, which indicated positive effect of reverse pressure softening of areola as it helps removing swelling backwards and upward in the breast, promoting softening of areola, increasing breast milk letdown and finally decreasing the sense of pain in the breast. These findings are consistent with the study of **Pednekar, (2021)** who reported significant breast pain reduction after implementing this technique for the intervention group. Thus, hypothesis (**II**) was achieved through this result.

Furthermore, in United States **Mogensen, et al., (2020)** investigated "Applying physical therapy techniques from breast cancer care to breastfeeding patients". They proved that reverse pressure softening of areola had beneficial effects in lowering edema, engorgement and facilitating a deep, pain-free newborn latch. Also, it stimulated latching, milk-ejection reflex in newborns, reduced excess subareolar tissue resistance, and lessened breast edema and engorgement, among the other three therapeutic effects.

Regarding newborn feeding behavior, results of the current study yielded significant improvements in newborn feeding behavior among the intervention group, reflecting the efficacious effect of RPS of areola which reduced breast engorgement, softened areola, enhanced newborn latching, sucking reflex and latter improved newborn feeding behavior. So that hypothesis (**III**) supported this result. These findings are coinciding with **Sharma, (2023)** who reported that after implementing RPS, significant difference was observed in level of breastfeeding on the fourth day postpartum between the experimental and control groups.

In addition to the study of **Yadav et al., (2022)** entitled "Effectiveness of prenatal lactation counseling on breastfeeding practices, breast engorgement, and newborn feeding behavior among postnatal mothers at a teaching institution in Rajasthan, India". They reported, more than two thirds of newborns in the experimental group had

vigorous feeding, more than one fifth of them fed moderately, and less than a tenth fed poorly. In contrast, more than two thirds of newborns in the control group fed moderately, one third fed poorly, and less than a tenth fed vigorously.

Furthermore, at Sri Ramachandra Hospital, **Reena et al., (2015)** investigated “Effectiveness of lactational counseling on breast engorgement and feeding behavior of newborn among primigravida”. They found substantial differences between the studied groups on 2<sup>nd</sup>, & 3<sup>rd</sup> days postpartum in terms of sufficient infant feeding behavior in favor of the study group (P = 0.000).

### Conclusion:

The present study revealed a highly significant decrease in breast engorgement, breast pain, & improving newborn feeding behavior among puerperal mothers in the intervention group vs. those in the control group. So, RPS of areola was found to be an effective nonpharmacological method in reducing breast engorgement, breast pain, and improving newborn feeding behavior among puerperal mothers.

### Recommendations:

**Based on the study’s findings, researchers recommend:**

- Raising awareness of puerperal mothers regarding the beneficial effect of RPS of areola on breast engorgement and newborn feeding behavior.
- The reverse pressure softening of areola technique should be advocated as a safe, non-pharmacological way to relieve breast engorgement. It can be applied by puerperal mothers to reduce breast engorgement, breast pain, and improve newborn feeding behavior.
- Nurses should be trained in applying RPS of areola as part of their discharge teaching plan for puerperal mothers to relieve signs of breast engorgement, breast pain and improve newborn feeding behavior.

### Further studies:

- Incorporate larger sample size regarding the effect of reverse pressure softening of areola on breast engorgement to widespread its use.
- Further studies about the use of RPS of areola for treatment of breast-feeding problems are needed.

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### Conflict of Interest:

No conflict of interest was found.

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