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Effect of Breast Milk, Peppermint Water and Breast Shell on Treatment of Traumatic Nipple in Puerperal Lactating Mothers

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Abstract: **Nipple trauma occurs in 29–76% of breastfeeding mothers within the first postpartum week which causes pain and discomfort for the mothers to continue breastfeeding. Aim of the study: Compare the effect of breast milk, peppermint water and breast shell on treatment of traumatic nipple in puerperal lactating mothers. Research design: A quasi-experimental research design was utilized. Settings: The study was conducted in postnatal clinics at Abu EL-Matamer Central Hospital and Housh Issa Central Hospital affiliated to Ministry of Health in El-Beheira Governorate. Subjects: Convenient sample of 120 puerperal lactating mothers with nipple trauma diagnosed in their first postpartum week were selected according to eligibility criteria. The selected subjects were randomly divided into three equal study groups. Tools of data collection: Five tools were used for data collection namely: A structured interview schedule; breast feeding observation checklist; visual analogue pain intensity scale; nipple soreness rating and nipple trauma score. Results: Findings demonstrate that the mean score of nipple pain, nipple soreness and nipple trauma were significantly decreased among the breast milk, peppermint water, and breast shell groups in the seventh and fourteenth day of intervention. There were a statistically significant difference between the three groups in favor of the peppermint water group in relation to nipple pain, nipple soreness and nipple trauma in the seventh and fourteenth days of intervention. Conclusion: The study concluded that peppermint water treatment was more effective in nipple trauma healing and pain relief than breast milk and breast shell treatment.**

Keywords: **Nipple trauma, Breast Milk, Peppermint Water, Breast Shell, Puerperal mothers, Lactation.**

1. INTRODUCTION

Almost all mothers can breastfeed successfully, which includes initiating breastfeeding within the first hour of life, exclusively for the first 6 months and continuing breastfeeding up to 2 years of age. Exclusive breastfeeding is particularly beneficial for mothers and infants [1]. Over 820 000 children's lives could be saved every year among children under 5 years, if all children 0–23 months were optimally breastfed. Breastfeeding improves intelligence quotient (IQ), school attendance, and is associated with higher income in adult life. Nevertheless, many infants and children do not receive optimal feeding. Only about 36% of infants aged 0–6 months worldwide were exclusively breastfed over the period of 2007-2014[2].

Egypt Demographic and Health Survey (EDHS) 2014 shows that among infants under two months of age, 71 percent are receiving only breast milk. However, the proportion of exclusively breastfed drops off rapidly among older infants. By age 4-5 months, only around 1 in 8 children were being exclusively breastfed.

Breastfeeding can be challenging, especially in the early days. Many women who start out breastfeeding stop before the recommended minimum of exclusive breastfeeding for six months. Often women stop because common problems interfere with their ability to breastfeed [3].

Several studies have shown that women with breast and nipple complications reported that it affects their success and continuation of breastfeeding. In a survey in New York City, 35% of nursing mothers stopped breastfeeding after one week due to the pain of cracked nipples [4]. Thirty percent stopped breastfeeding between weeks one and three. Another survey of breastfeeding mothers in Brazil reported that there was 25% higher risk of interruption of exclusive breastfeeding when the women had cracked nipples. Mothers with higher education levels were more likely to continue breastfeeding despite the pain of cracked nipples [5].

A recent study conducted in Zagazig, reported that majority of women were exposed to nipple soreness and breast engorgement and none of the women in the sample extend exclusive breastfeeding until the 6 months after delivery [6]. Also, (Elwelely & Mansour, 2018) highlighted that problems preventing mothers from adequate breastfeeding, include insufficient milk production or perceived insufficiency, cracked or sore nipples, inverted nipples and breast engorgement [7].

Normally, nipples are kept supple from the secretions of the montgomery tubercles in the areola. They can become sore when they are excessively dry or wet, which makes them crack or fissure [8]. Nipple pain can be classified as an acute pain because, usually, it occurs in the first week postpartum. The most commonly cause is inadequate positioning and attaching of the infant to the breast, which can lead to damage to the skin of the nipple and pose a major challenge for breastfeeding women, as they need to breastfeed around eight times a day in the early postpartum period. Frequent incorrect feeding hampers the tissue repair process and can lead to further damage [9, 10].

Image analysis revealed five signs of nipple trauma erythema, swelling, blistering, fissure, and scabbing. Scabbing and blistering can be used as indicators to assess the severity of nipple trauma based on the mothers' subjective experiences of pain intensity. In addition, reliability of these signs for establishing nipple trauma was confirmed. Erythema and swelling were the most frequently observed signs in nipple skin trauma during the first postpartum week [11].

Unfortunately, healing damaged nipples in breastfeeding women is complicated due to repeated trauma from infant sucking and exposure to maternal skin and infant oral flora predisposing the nipple to secondary bacterial and fungal infection [12]. Previous reports have suggested establishment of a good feeding position by the mother and baby, and correct attachment of the baby are important factors in successful breastfeeding, prevention and improvement of nipple trauma and nipple pain [13,14].

A variety of interventions designed to reduce nipple pain in breastfeeding women have been reported. These include pharmacological topical treatments with antibacterial sprays, antifungal cream; non-pharmacological topical applications as peppermint oil/water, lanolin; dressings using warm compresses, hydrogel dressings, tea bags; breast shells and expressed breast milk (EBM) [12]. Other interventions that have been identified in the literature include time-restricted breast-feeding or exposure of the nipples to phototherapy and air-drying [14].

Despite a lack of evidence-based studies on efficacy of EBM, it is widely used for the prevention and treatment of sore nipples [15]. EBM has immune globulin content and healing elements such as growth factors, anti-inflammatory and anti-microbial substances [13]. Peppermint water is popularly used as a natural remedy for the prevention of nipple pain and damage, it possesses antibacterial activity. Peppermint water has calming and numbing effects and has been used externally for skin anesthetic, burns, wounds, itching and inflammation. However, this has not been evaluated previously [16].

Studies revealed that hydrogen dressings were associated with a high incidence of infections and their use cannot be recommended. Systemic antibiotics are recommended if a positive culture for staphylococcus aureus is obtained. Warm water compresses warrant further investigation into their effectiveness in nipple pain [14].

Significance of the study:

Nipple pain and trauma are major reasons why women abandon breastfeeding. Previous studies have revealed that nipple trauma occurs in 29–76% of breastfeeding mothers within the first postpartum week. Nipple trauma causes pain and

discomfort, which render it difficult for the mother to continue breastfeeding. Therefore, prevention and treatment of nipple trauma during the early postpartum period are essential for successful breastfeeding [11]. Over the years, various methods have been used for prevention and treatment of nipple trauma, and although several studies have been conducted to validate the effectiveness of these methods, there is no consensus on the most effective strategies in the resolution or reduction of nipple pain [11,17,18]. To improve breastfeeding duration and exclusivity rates and to address one of the most common difficulties encountered by breastfeeding women systematically, a good understanding of nipple pain and a corresponding effective treatment is needed [12]. Therefore the current study done to compare the effect of breast milk, peppermint water and breast shell on treatment of traumatic nipple in puerperal lactating mothers

Aim of the study

This study was aimed to compare the effect of breast milk, peppermint water and breast shell on treatment of traumatic nipple in puerperal lactating mothers

Research hypotheses:

H0: Puerperal lactating mothers with nipple trauma who apply breast milk, peppermint water or breast shell experience similar healing of nipple trauma and pain.

H1: Puerperal lactating mothers with nipple trauma who apply breast milk exhibit faster healing and less pain than those who apply peppermint water or breast shell.

H2: Puerperal lactating mothers with nipple trauma who apply peppermint water exhibit faster healing and less pain than those who apply breast milk or breast shell.

H3: Puerperal lactating mothers with nipple trauma who apply breast shell exhibit faster healing and less pain than those who apply breast milk or peppermint water.

Operational definition:

Nipple trauma in the current study refers to erythema, cracking, edema, fissures, soreness**,** blisters, white spots, yellow or dark spots and ecchymosis in the nipples

2. MATERIALS AND METHOD

Materials

Research Design:

A quasi-experimental research design was utilized.

Settings:

The current study was conducted in postnatal clinics at Abu EL-Matamer Central Hospital and Housh Issa Central Hospital affiliated to Ministry of Health in El-Beheira Governorate.

Subjects:

The study comprised of a convenient sample of 120 puerperal lactating mothers with nipple trauma. Epi -Info program was used to estimate the sample size using the following parameters:

- Target population 267 per 3 months;

- Expected frequency p = 50%;

- Acceptable error = 5%;

- Confidence coefficient = 95%;

- Sample size = 120.

The study subjects were selected from the aforementioned settings according to the following inclusion criteria: Lactating mothers with nipple trauma diagnosed by obstetrician in their first postpartum week, did not start any treatment for

nipples trauma, had a healthy full term single baby (without cleft lip or cleft palate), having a telephone for contact and willing to participate in the study. Lactating mothers who presented with a diagnosis of diabetes, severe anemia, autoimmune disease, ductal infections, infectious mastitis, a nipple with pus, or an inverted nipple were excluded from the study.

The selected subjects were randomly divided into three equal study groups:

Study group (1) included 40 women who were advised to paint their traumatized nipples with their breast milk and air dry them after each feeding.

Study group (2) comprised 40 women who were instructed to paint their traumatized nipples with peppermint water after each feeding

Study group (3) involved 40 women who were instructed to position the breast shell on the breast after each feeding.

Women in the three groups were instructed to continue the treatment for 14 day duration.

Tools:

Five tools were used to collect the necessary data.

Tool (I): A structured interview schedule: It was developed by the researchers and entailed information related to:

- Socio-demographic data such as: name, age, residence, address, phone number, level of education and occupation.

- Reproductive history such as: gravidity, parity, mode of last delivery, number of living children. It also included questions related to antenatal visits of current pregnancy, and received information about breast care and breast feeding.

- Breast feeding history such as: initiation of breast feeding, duration of breast feeding, method of nipple withdrawal and number of breastfeeding per day.

Tool (II): Breast Feeding Observation checklist:

It was modified from **WHO B-R-E-A-S-T Feed observation form**, which was developed by World Health Organization & United Nations Children's Fund, 1993 [19] . Breast feeding observation checklist used to observe the breastfeeding process for 5 minutes. It contains: mother's and infant's positions as well as the infant's attachment to the breast.

The following arbitrary scoring and grading system was developed to grade positioning (mother and infant), and infant's attachment during breastfeeding based on WHO criteria. Each criterion was assigned 1 point.

Correct body position:

1. Mother relaxed and comfortable

2. Mother sit straight and well supported back

3. Trunk facing forward and lap flat

4. Baby neck straight or bent slightly back and body straight

5. Baby body turned toward mother

6. Baby body close to mother body and facing breast with the newborn's nose opposite her nipple and chin touching the breast.

7. Baby whole body supported not just the neck and shoulders.

Correct baby's attachment:

1. Mouth wide and open

2. Lower lip turned outwards

3. Baby's chin touching breast

4.   More areola seen above baby mouth

A scoring system for correct body position:

-      One criterion from mother's position and one criterion from infant's position or both from mother's position take score 1-2 and considered "poor".

-      At least one criterion from mother's position and two or three criteria from infant's position take score 3-4 and considered "average".

-      At least two criteria from mother's position and three or fourth criteria from infant's position take score 5-7 and considered "good".

A scoring system for correct baby's attachment:

-      Any one of four criteria take score 1 and considered "poor".

-      Any two of four criteria take score 2 and considered "average".

-      Any three or all the four criteria take score 3-4 and considered "good".

Tool (III): Visual Analogue pain intensity scale (VAS)

VAS was adopted and translated to an Arabic version to be used in the current study. It was developed by Melzack and Katz (1994) [20]. VAS used to estimate the subjective level of nipple pain intensity. It is a standardized self-reported device consists of a ruler marking a range of scores from 0 to 10 in increments of 1, where 0 represents 'no pain' and 10 represents 'the most intense pain'. The mother was asked to select from that 10 points numerical continuum the number that corresponds to her perceived pain intensity.

Tool (IV): Nipple soreness rating scale (NSRs)

It was developed by Storr (1988) [21]. The scale was adopted and used to assess nipple condition. **NSRs** included six items that describe nipple soreness. Those items scored by Likert scale from Zero to 5 for each item, Zero refers to no nipple pain or discomfort as the score increase it refers to increase discomfort and pain as follows: Normal nipple color, no tenderness (0), Nipple slightly red and\or tender for first 5-10 seconds of feeding (1), Nipple red and tender for longer than first 5-10 seconds of feeding (2), tender between feeding, makes mother grimace when baby starts feeding (3), Nipple beginning to crack, involuntary gasps of pain when baby starts feeding (4), Nipple cracked, feels sore "down to my toes" when baby starts feeding (5).

Tool (V): Nipple Trauma Score (NTS)

NTS was developed by Abou-Dakn et al, (2011) [22]. It was adopted and used to evaluate nipple trauma. The NTS score ranges between 0 and 5 and is based on wound depth and the extent of tissue damage. It is rated as follows: No microscopically visible skin changes (score 0), erythematic or edema or combination of both (score 1), superficial damage with or without scab formation of less than 25% of the nipple surface (Score 2), superficial damage with or without scab formation of more than 25% of the nipple surface (score 3), partial thickness wound with or without scab formation of less than 25% of nipple surface (score 4), partial thickness wound with or without scab formation of more than 25% of nipple surface (score 5). A nipple was considered to be healed if the corresponding trauma score rating was zero. A score of 1 to 5 indicated nipple trauma i.e. an absence of healing.

Methods

1.   Official permission to carry out the study was obtained from the responsible authorities of the study settings after explaining the purpose of the study.

2.   Tools Validity and reliability:

• Tool I was developed by the researchers after reviewing relevant and recent literature. Content validity was assured by a jury of 5 experts in the field.

- Tool II (Breast Feeding Observation checklist) was modified after reviewing relevant literature, and checked for content validity by a jury of 5 experts in the field. Reliability of tool II was tested by Interrater method, where r = 0.917.

- Tool III (**VAS**) was adopted and translated to an Arabic version then checked for content validity by a jury of 5 experts in the field. The VAS reliability was confirmed by a test -retest method, r = 0.887.

- Tool IV (**NSRs**) was adopted from Storr (1988) and there is no supportive evidence on its reliability or validity. So, the NSRs was checked for content validity by a jury of 5 experts in the field. Its reliability was confirmed by Interrater method, where $r = 0.852$.

- Tool V (**NTS**) was adopted from Abou-Dakn et al (2011). It is a valid and reliable as reported by Abou-Dakn et al, the testing of NTS revealed a high interobserver reliability where $r = 0.88$.

3. A pilot study was conducted on 12 puerperal lactating mothers with nipple trauma (who were excluded from the study sample) to test the clarity, applicability of the study tools, identification of a suitable place for interviewing women, and to detect any possible obstacles that might face the researchers.

4. Data were collected from the beginning of January 2018 till the end of December 2018. Each setting of the previous mentioned settings was visited two days per week for data collection from 8 am to 1 pm.

5. Data collection started from the first day of enrolment, which was the first postnatal visit for all eligible lactating women came to the previous mentioned settings complaining from nipple trauma at their first puerperal week. Each study subject diagnosed with nipple trauma was interviewed for 15-20 minutes during the first postpartum visit.

6. Data of Tool (I) was collected from three study groups through an interview schedule, that was conducted individually and in a total privacy. Tool (II) was used by the researchers for three groups to observe the correctness of body position and correctness of attachment. The researchers instructed the mother to breastfeed her baby and observe the breastfeeding process for 5 minutes.

7. Mothers in the three study groups received face-to-face instructions on breastfeeding techniques and breast hygiene using a simple illustrative pamphlet. The pamphlet contained simple pictures about the anatomy of the breast, breastfeeding position and infant's attachment. Then mothers were advised to have a body shower with warm water every day, keep their nipples dry and avoid using soap or other materials that could cause dryness of the nipple skin.

8. Tools III, IV and V were used to assess the nipple pain intensity, nipple soreness and nipple trauma for the three study groups before the interventions (pre-test).

9. The three methods of treatment (Breast Milk, Peppermint Water and Breast Shell) were applied by the study subjects for a duration of 14 days as follows:

- Study group (1) was advised to paint their nipples and areola with two to three drops of their expressed breast milk and let the air dries them after each feeding from day 1 till day 14. The researchers demonstrated for each mother how to apply two to three drops of breast milk on the nipples and areola, and allowed the air-dry them, and it was followed by re-demonstrations by mother.

- Study group (2) was instructed to wash the nipples with water then put soaked cotton with peppermint water on the nipples and areola after each feeding from day 1 to day 14 and wash it before the next feed. The researchers demonstrated for each mother how to apply peppermint water on the nipples and areola, and it was followed by re-demonstrations by mother. A single supply of quantified peppermint water was given to all participants of the peppermint water group and they were asked not to use their own household peppermint water or any other medication. Preparation of the peppermint water was done by adding essential oil of peppermint to 1 litter of distillate water gradually while the distillate water saturated with it.

- Study group (3) was instructed to apply the breast shells on their breast then the brassiere was repositioned after each feeding from day 1 to day 14. The researchers demonstrated for each mother how to wear breast shells on their breasts as follows: breast shells are made up of two silicone or plastic parts that are worn over the breasts. You place the round bottom ring over your areola allowing your nipple to stick through a hole in the center. This piece puts a gentle pressure

at the base of your nipple. It shouldn't be painful. A second dome-shaped piece fits over the bottom ring to protect your nipple and collect any breast milk that may leak from your breasts while you're wearing the breast shells. After demonstration the researchers asked the mother to re-demonstrate it. Women in that study group were instructed to wash the nipples before breastfeeding and to remove the breast shell during breastfeeding. They also instructed to wash the breast shells with warm soapy water every day, and allow them to dry thoroughly.

- All women of the study subjects were instructed to follow proper breast feeding technique while applying the specific intervention for the three study groups.

10. Follow-up was conducted by the researchers for the three study groups at the third day, seventh day, and fourteenth day of intervention. This follow up was carried out at homes. During the visits, the researchers ensured that the participants were performing interventions correctly and the nipples were examined for trauma healing and pain used tools III, IV and V.

11. Follow-up telephone interviews were conducted by the researchers at days 2, 5, 9 and 11 of intervention, to assess whether the participants were following the prescribed treatment and their self-perception of the progression of their nipple trauma and nipple pain (better, worse, or unchanged). In cases of worsening, the participants received a home visit on the same day to assess the occurrence of adverse events.

12. The participants who did not apply the treatment for 4 or more consecutive feedings or who used treatments other than those prescribed in the study were excluded from the study.

13. **The healing process** and pain of the traumatic nipples were assessed and compared among the three study groups to find out the most effective method in dealing with nipples trauma.

Ethical consideration:

Purpose of the study was explained to each woman and an oral consent for participation in the study was obtained. Those who agreed to participate were assured about confidentiality, privacy and their right to withdraw from the study at any time.

Statistical Analysis:

Statistical analysis was done after collection of data by using Statistical Package for Social Sciences (SPSS) version 20 program. A descriptive and analytical statistics were used such as percentages, means and standard deviations. Chi-square-test and One-Way ANOVA Repeated Measures- test at 0.05 level to find out the statistical significance difference of the results were used.

3. RESULTS

Table (I) shows no significant difference between the three study groups in their socio-demographic data where, the mean age of study subjects in the breast milk, peppermint water, and breast shell groups was 24.575±5.378, 24.025±4.974, and 23.875±5.055 years, respectively. About half (47.5 %, 50% & 52.5% respectively) of them were in their twenties. Regarding level of education, it was obvious that around one-third or slightly more (32.5%, 35% &37.5%) of the breast milk, peppermint water, and breast shell groups respectively had primary/ preparatory education. Moreover, 35%, 40% & 37.5% of the three groups respectively had secondary education. The majority (80%, 85% and 80%) of the three groups respectively, were housewives. Also, the majority (82.5%, 85% and 75%) of the three groups, respectively, were from rural areas.

It is obvious from **table (II)** that there were no statistically significant differences between the three study groups in their reproductive history and obtained antenatal visits. Regarding gravidity, more than three-quarters (77.5%, 75% & 80%) of the breast milk, peppermint water, and breast shell groups respectively were primigravida. Also the majority (77.5%, 80% & 80%) of the three study groups respectively were primipara. As regards type of current delivery, about one–half (52.5%, 57.5% &47.5%) of the three study groups respectively had vaginal delivery. The majority (87.5%, 82.5% & 90%) of the three groups respectively had one or two child. Also, the majority (90%, 85% &82.5%) of the three groups respectively obtained antenatal visits during their latest pregnancy. However, 57.5%, 65% & 70% of the three study groups respectively did not receive any knowledge about either breast care or breastfeeding before or after childbirth.

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Table (III) demonstrates that relatively similar proportion 50%, 45% & 50% of the breast milk, peppermint water, and breast shell groups respectively had initiated breastfeeding during the first 5 hours after childbirth. The majority (87.5 %, 87.5% & 85%) of the three study groups respectively were feeding their newborns on demand. Also, 67.5%, 77.5% & 62.5% of the three groups respectively introduced the nipple only into the baby's mouth during breastfeeding. Moreover, 70%, 60% & 75% of the three study groups respectively were pulling the nipple out of the infant's mouth when he stops suckling. Interestingly enough, 65%, 47.5 & 65% of the three groups respectively were breastfeed their infants more than 10 times daily. The duration of breastfeeding session was less than 10 minutes among 32.5%, 37.5% & 22.5% of the breast milk, peppermint water, and breast shell groups respectively. Moreover, 42.5%, 35% & 40% of the three study groups respectively had 10 minutes duration of breast feeding session. In addition, 25%, 27.5% and 37.5% of the three groups respectively had more than10 minutes duration of breast feeding session. No significant difference was observed between the three groups in relation to their breast feeding technique.

It is evident from Table (IV) that absence of any significant differences between the breast milk, peppermint water, and breast shell groups in their total score of quality of position (mother and newborn) and attachment grade. The largest proportion (70%, 80% & 62.5) of the three study groups respectively had poor body position (mother and newborn), compared to no one of them had good body position. In addition, the largest proportion (67.5%, 77.5% & 62.5%) of the three groups respectively had poor attachment, compared to no one of them had good attachment.

Table (V) compares the mean score of nipple pain in four time periods among the breast milk, peppermint water, and breast shell groups. The mean score of nipple pain in the first day before intervention was almost equal (7.075±0.859, 6.925±0.764 & 6.775±0.620) for the breast milk, peppermint water, and breast shell groups, respectively. No statistical significant difference was observed between the three groups (P=0.210), which assures homogeneity of the three researchable groups. In addition, the mean score of nipple pain in the third day of intervention was almost equal (5.875±0.791, 5.975±0.768 & 6.075±0.829) for the breast milk, peppermint water, and breast shell groups, respectively. No statistical significant difference was illustrated between the three groups (P=0.534). On the other hand, in the seventh day of intervention there was a significant decreased trend in the mean score of nipple pain 3.275±0.452, 3.225±0`.423 & 4.025±0.800 for the breast milk, peppermint water, and breast shell groups, respectively. There was a highly statistically significant difference between the three groups in favor of the peppermint water group where P = 0.000. Moreover, in the fourteenth day of intervention there was a significant decreased trend in the mean score of nipple pain 0.875±0.791, 0.825±0.712 & 1.325±0.888 for the breast milk, peppermint water, and breast shell groups, respectively. There was a statistically significant difference between the three study groups in favor of the peppermint water group where P = 0.011. Regarding the change in the mean score of the nipple pain within groups, the same table shows that there was a significant decreased trend in the mean score nipple pain from 7.075±0.859 at the first day before intervention to 0.875±0.791 at the fourteenth day of intervention in the breast milk group, where (P=< 0.00001). In the peppermint water group there was also a significant decreased trend in the mean score nipple pain from 6.925±0.764 at the first day before intervention to 0.825±0.712 at the fourteenth day of intervention, where (P=< 0.00001). Moreover, within the breast shell group there was a significant decreased trend in the mean score nipple pain from 6.775±0.620 at the first day before intervention to 1.325±0.888 at the fourteenth day of intervention, where (P=< 0.00001).

Table (VI) demonstrates the mean score of nipple soreness in four time periods among the breast milk, peppermint water, and breast shell groups. In the first day before intervention the mean score of nipple soreness was almost equal (4.325±0.797, 4.225±0.920 & 4.275±0.933) for the breast milk, peppermint water, and breast shell groups, respectively. No statistical significant difference was calculated between the three groups (P=0.880), which assures homogeneity of the three researchable groups. In addition, the mean score of nipple soreness in the third day of intervention was almost equal (2.975±0.423, 2.825±0.385 & 3.075±0.656) for the breast milk, peppermint water, and breast shell groups, respectively. No statistical significant difference was found between the three groups (P=0.086). On the other hand, in the seventh day of intervention there was a significant decreased trend in the mean score of nipple soreness 1.275±0.640, 1.225±0.531 & 1.675±0.829 for the breast milk, peppermint water, and breast shell groups, respectively. There was a statistically significant difference between the three groups in favor of the peppermint water group where P = 0.006. Moreover, in the fourteenth day of intervention there was a significant decreased trend in the mean score of nipple soreness 0.175±0.385, 0.075±0.267 & 0.375±0.490 for the breast milk, peppermint water, and breast shell groups, respectively. There was a statistically significant difference between the three groups in favor of the peppermint water group where P = 0.003.

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Concerning the change in the mean score of the nipple soreness within groups, this table exhibits that there was a significant decreased trend in the mean score of nipple soreness from 4.325±0.797 at the first day before intervention to 0.175±0.385 at the fourteenth day of intervention in the breast milk group, where (P=< 0.00001). In the peppermint water group there was also a statistically significant decreased trend at the mean score of nipple soreness from 4.225±0.920 at the first day before intervention to 0.075±0.267 at the fourteenth day of intervention, where (P=< 0.00001). Moreover, in the breast shell group there was a statistically significant decreased trend at the mean score of nipple soreness from 4.275±0.933 at the first day before intervention to 0.375±0.490 at the fourteenth day of intervention, where (P=< 0.00001).

Table (VII) clarifies the nipple trauma mean score in four time periods among the breast milk, peppermint water, and breast shell groups. On the first day before intervention the mean score of nipple trauma was almost equal (4.525±0.599, 4.375±0.774 & 4.325±0.888) for the breast milk, peppermint water, and breast shell groups, respectively. No statistically significant difference was observed between the three groups (P=0.477), which assures homogeneity of the three researchable groups. In addition, the nipple trauma mean score in the third day of intervention was almost equal (3.025±0.480, 2.925±0.572 & 3.125±0.686) for the breast milk, peppermint water, and breast shell groups, respectively. No statistically significant difference was found between the three groups (P=0.315). On the other hand, on the seventh day of intervention there was a significant decreased trend in the mean score of nipple trauma 1.325±0.730, 1.275±0.640 & 1.675±0.764 for the breast milk, peppermint water, and breast shell groups, respectively. There was a statistically significant difference between the three groups in favor of the peppermint water group where P = 0.027. Moreover, in the fourteenth day of intervention there was a significant decreased trend in the mean score of nipple trauma 0.150±0.362, 0.075±0.267& 0.425±0.594 for the breast milk, peppermint water, and breast shell groups, respectively. There was a statistically significant difference between the three groups in favor of the peppermint water group where P = 0.001. Regarding the change in the mean score of the nipple trauma within groups, this table illustrates that there was a significant decreased trend in the mean score of nipple trauma from 4.525±0.599 at the first day before intervention to 0.150±0.362 at the fourteenth day of intervention in the breast milk group, where (P=< 0.00001). In the peppermint water group there was also a statistically significant decreased trend in the mean score of nipple trauma from 4.375±0.774 at the first day before intervention to 0.075±0.267 at the fourteenth day of intervention, where (P=< 0.00001). Moreover, in the breast shell group there was a statistically significant decreased trend in the mean score of nipple trauma from 4.325±0.888 at the first day before intervention to 0.425±0.594 at the fourteenth day of intervention, where (P=< 0.00001).

4. DISCUSSION

Painful nipple trauma is problematic for mothers and may cause severe pain and mastitis leading to low prevalence of breastfeeding [23, 24]. It also can cause physiological distress and problems in general activity, sleep, mood and mother/ baby relationship [25]. Nipple trauma confronts breastfeeding women 3-6 days postpartum and in some mothers, may persist to 6 weeks after delivery [26, 27]. There are various medicinal, non-medicinal and herbal remedies for the prevention and treatment of nipple pain and trauma [25]. But conclusive judgment about the efficacy of these interventions requires further and more accurate studies with adequate sample sizes [12].

Pain during breastfeeding is a sign of a problem and should not be ignored. Although sore or tender nipples are common during the first few days of breastfeeding, it should improve. Normal soreness or pain usually occurs for about a minute when the baby first latches on to the breast. Pain that is severe or continuous or that occurs again after it seemed to resolve is a sign of a problem and should be corrected. Other problems may include cracked, bleeding, or bruised nipples [28, 29].

This study compared the effect of peppermint, breast milk and breast shell on treatment of traumatic nipple among postpartum women along four time periods. There was no statistically significant difference between the three study groups regarding their demographic data, reproductive history and all the three groups had similar distributions. The nipple cracks and pain could be attributed to many reasons such as lack of experience or knowledge, late initiations of breast feeding, wrong position and technique. In considerations to these causes, similarity between the groups was assured.

The present study revealed that the mean score of nipple pain was significantly decreased among the three interventional groups especially at the 7th and 14th day of intervention. The peppermint water group showed the lower pain scores in the 7th and 14th day of intervention respectively in comparison to the breast milk and the breast shell groups. This indicates that the peppermint water treatment was more effective in relieving nipple pain than breast milk and breast shell treatment. These results may be attributed to the fact that peppermint (scientific name: Mentha piperita) has antiseptic, calming and numbing effects and has been used to relieve skin irritations and makes it resistant to cracks [30]. Menthol affects the cell membrane, attacks microorganisms and inflammatory factors and thus prevents damage to tissue cells. Menthol also, has a pain killing activity through affecting Kap-opioid receptors and thus restrains flow and transmission of pain signals and leads to less feeling of pain [31, 32]. In this respect, **Singh et al, (2011)** [33] studied the antioxidant and antibacterial effects of Mentha Piperita. They concluded that peppermint oil had a strong antibacterial activity and this effect was comparable with those of gentamycin.

The current findings are similar to those of **Naser et al, (2017)** [34] who reported that women in peppermint water group had significantly experience more mild and moderate pain and less severe pain compared to breast milk group (30% &2% vs. 26% & 6% respectively). The findings of the present study are also in line with the study of **Akbari et al,** (2014) [35] which indicated that the pain intensity score before treatment and day 10 after delivery, as well as the pain intensity score before treatment and day 14 after delivery were significantly decreased among the peppermint water group than breast milk group. In addition, the study of **Thabet et al, (2013)** [36] revealed that women in the peppermint water group experienced mostly no pain (92% & 96%) at 15 and 30-day post partum respectively compared to those in the expressed breast milk group and the control group (64% & 68%, 44% & 40% respectively) (p < 0.001). They concluded that peppermint water in breastfeeding lactating women along with instruction about breast feeding technique is associated with fewer nipple cracks, less pain and soreness compared to those in breast milk group. Moreover, **Abd-Elsalam S et al, (2011)** [37] studied the effect of using pharmacological versus alternative therapy on traumatic nipples for lactating mothers. They found that peppermint water is effective in decreasing the nipple pain compared to tea bag or lanolin cream application after feeding. The findings of the present study are also similar to those of **Melli et al, (2007)** [16] who reported that nipple pain in the peppermint water group was lower than the expressed breast milk group

Dissimilar to the findings of the present study, **Gharakhani Bahar et al,(2018)** [38] compared the effects of mint tea bag, mint cream, and breast milk on the treatment of cracked nipple in the lactation period. They found that the severity of nipple pain was significantly lower in breast milk than the peppermint tea and peppermint cream groups. In addition, **Fadel and Khedr (2018)** [39] also found that expressed breast milk can be used as a lubricant on nipple to manage nipple pain among early lactating women. They recommended the necessarily of raising awareness of obstetricians and nurses concerning the utilization of expressed breast milk to alleviate nipple pain among early lactating women. Moreover, the study of **Shanazi et al, (2015)** [40] revealed that the mean score of nipple pain at the prior to intervention stage, third, seventh, and fourteenth days of intervention was not significantly different between the lanolin, peppermint, and dexpanthenol groups. But, repeated measures ANOVA showed a significant difference in comparison of the four time periods of intervention in each group.

The results of the current study revealed that the mean nipple soreness and nipple trauma scores in the seventh and fourteenth days of intervention were significantly lower in the peppermint water group than that of the breast milk, and breast shell groups. This indicates that the peppermint water treatment was more effective in nipple trauma healing than breast milk and breast shell treatment. This may be attributed to the main causes of soreness and cracking of nipples are dehydration and breastfeeding trauma. These problems may result from incorrect positioning of the baby, too full breast, candidiasis, bad hygiene, use of soaps, lotions and perfumes, and dry skin and eczema. The anti-inflammatory action of peppermint is helpful in attacking the microorganisms and thus prevents the damage of tissue cells. In this respect, **Schelz et al, (2007)** [41] reported that peppermint has an antiseptic effect, increases tissue flexibility and prevent crack.

As'adi and Kariman (2018) [42] in their systematic review concluded that peppermint is an effective herbal remedy for preventing nipple trauma and /or pain. Another systematic review done by **Niazi et al, (2018)** [43] concluded that some of the effective therapies for the nipple fissure and pain prevention and treatments are using: menthol (mint oil), hot water compress and teaching the correct breastfeeding methods.

The current results are also congruent with the results of at least five other researches. *First*, **Naser et al, (2017)** [34] who concluded that peppermint water is effective in the prevention of nipple trauma compared to the application of express breast milk. *Second*, **Akbari et al,** (2014) [35] who found that menthol essence could cure nipple fissures in the breastfeeding women. They added that peppermint water was effective in the prevention of nipple pain and damage. *Third*, **Thabet et al, (2013)** [36] who reported that the application of peppermint water was found to be an effective method to prevent nipple cracks. The relative risk of overall nipple and areola cracks in the control group and expressed breast milk group was higher than in the peppermint water group at 15 and 30-day post partum. In addition, at 15 and 30 days, it was observed that women in the peppermint water group were less likely to report no cracks than women in the expressed breast milk group and control group. They concluded that peppermint water in breastfeeding lactating women is associated with fewer nipple cracks and is more effective than expressed breast milk. *Fourth,* **Abd-Elsalam S et al, (2011)** [37] who found that peppermint water is effective in prevention of nipple soreness compared to tea bag or lanolin cream application after feeding. *Fifth,* **Melli et al, (2007)** [16] who reported that the women who were randomized to receive peppermint water were less likely to experience nipple and areola cracks compared to women using expressed breast milk. Women who used the peppermint water on a daily basis were less likely to have a cracked nipple than women who did not use peppermint water. They also concluded that peppermint water is effective in the prevention of nipple pain and damage. Moreover, **Melli et al,** [44] conducted another study in 2007 for examining the effects of peppermint gel, lanolin ointment and placebo gel on the prevention of nipple fissures. They reported that prophylactic peppermint gel usage was associated with fewer nipple cracks. It was more effective than lanolin and placebo.

On the other hand, the current study results contradict to the findings of **Gharakhani Bahar et al, (2018)** [38] who found that the mean score of nipple wound among the groups was significantly lower in the breast milk group than that of the mint tea and cream groups. The lowest mean scores were observed in the breast milk group (2±0), the mint cream (2.44±1.85), and mint tea group (2.58±1.18). They added that breast milk is effective in nipple wound healing and pain relief during the breastfeeding period compared to mint cream and mint tea; therefore, the use of breast milk is recommended for the recovery of nipple crack and pain relief. In addition, the study of **Shanazi et al, (2015)** [40] also found that similar levels of improvement in term of nipple trauma resulted from administration of the peppermint, lanolin and dexpanthenol creams.

In the present study, it was observed that breast milk also decreased the mean score of nipple pain, trauma and soreness over the four time periods of intervention, where the ANOVA repeated measures showed a significant difference in comparison of the four time periods of intervention. The efficacy of breast milk may be due to the breast milk have healing elements such as antibodies, anti-inflammatory, anti-microbial substances and epidermal growth factor which may potentially promote the growth and repair of skin cells [18]. This current finding is similar to the finding of the study of **Mohammad et al, (2005)** [45] who found that breast milk was more effective in managing nipple soreness than lanoline in relation to healing time. The healing time in the lanolin group was longer than the breast milk group (p=0.029) and the control group (p=0.028). No side effects were noted during the study. This study suggests that, due to the better healing of the sore nipple with breast milk, its availability, without payment and side effect, breast milk is recommended for the treatment of sore nipples. On the contrary, the study of **Neto et al, (2018)** [46] revealed that there was pain improvement from the second to the third assessment in the group that used HPA lanolin, while the pain remained unchanged between these two periods in the breast milk group. In terms of trauma, improvement was identified in its extension and depth from the first to the third assessment, and it was higher in the HPA lanolin group than in the breast milk group. They concluded that the treatment of pain and nipple trauma with HPA lanolin achieved better results than the one with breast milk, based on a 7-day treatment period. **As'adi et al, (2017)** [47] also found that the mean nipple fissure severity in ointment group was lower than that of the control group (48.02), where there was significantly different between the two groups (p=0.047). And the mean nipple pain intensity in ointment group (40.57) was lower than that of the control group (49.81), but there was no significant difference between the two groups (p=0.056). They concluded that saqez ointment was more effective than breast milk in healing and controlling nipple fissures during one-month follow-up, without resulting in any side effects. In addition, **Eshgizade et al, (2016)** [48] found that there was significant differences among the olive oil, Aloe vera, and breast milk groups in terms of the pain severity and breast fissure, so that pain severity and breast fissure was least in the group received aloe vera extract. There was no significant difference between breast milk and olive oil groups. They concluded that the olive oil, Aloe vera extract, and breast milk reduce pain severity and breast fissure in lactating mothers, but aloe vera extract is more effective than olive oil and breast milk. Moreover, **Ahmed et al,**

(2015) [49] showed that lanolin, tea bag compresses and expressed breast milk had the same effect of relieving nipple trauma. Furthermore, **Abou-Dakn et al, (2011)** [22] concluded that HPA lanolin, combined with breastfeeding education, was more effective than expressed breast milk, combined with breastfeeding education, in reducing nipple pain and promoting healing of nipple trauma.

It is interesting to notice in the present study that breast shells also decreased the mean score of nipple pain, trauma and soreness over the four time periods of intervention, where the ANOVA repeated measures showed a significant difference in comparison of the four time periods of intervention. The efficacy of breast shells may be due to the breast shell prevent direct contact of the injured nipple with clothes, promoting immediate pain relief in the nipple-areola region in addition to providing comfort to women between breast feedings. Use breast shells allow air to circulate around the nipple and create healing. Since they help to prevent further pain and irritation, the nipples may heal more quickly [50]. No researches carried out to measure the effect of breast shells alone on the treatment of nipple trauma and pain. But some studies measure its effect combined with other treatment such as breast milk and lanolin. In this respect, **Vieira et al, (2017)** [51] studied the effects of anhydrous lanolin versus breast milk combined with a breast shell for the treatment of nipple trauma and pain during breastfeeding. They found that the healing of nipple trauma was faster in the group treated with breast milk combined with a breast shell, starting on the third day of intervention. And the intensity of pain was lower in the group treated with breast milk combined with a breast shell starting on the fifth day of treatment. They concluded that the intervention with breast milk combined with a breast shell was more effective than anhydrous lanolin for the treatment of nipple trauma and pain in breastfeeding women. This treatment should be encouraged among breastfeeding women to promote healing and reduce pain. In addition, **Brent et al, (1998)** [50] found that the use of breast shells combined with lanolin resulted in greater improvement of nipple soreness than the use of moist wound dressings, although both groups showed significant improvements in at least some areas. On the other hand, **Dennis et al, (2014)** [12] concluded that there was insufficient evidence to recommend the breast shells with lanolin, lanolin alone, or any intervention for the treatment of nipple pain or trauma.

5. CONCLUSION

Based on the results of the present study, it can be concluded that; H2 is accepted; while H0, H1 and H3 are rejected as evidenced by peppermint water treatment was more effective in nipple trauma healing and pain relief than breast milk and breast shell treatment. However, peppermint water, breast milk, and breast shell treatments significantly decreased nipple trauma and pain.

RECOMMENDATIONS

Based on the results of the present study, the following recommendations can be suggested:

- Application of peppermint water could be suggested as a treatment of nipples trauma.

- Puerperal lactating mothers should be educated about positioning and attachment of the baby to the breast for breastfeeding to prevent the incidence of traumatic nipples.

- Replication of the present study with larger sample size and different settings is recommended to validate its results

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Appendix - A

Table (I): Number and percent distribution of the study subjects according to their socio-demographic-characteristics.

Socio-demographic data	Breast milk group = 40		Peppermint water group = 40		Breast shell group= 40		FET/X^2 (P)
	No	%	No	%	No	%	
Age (years):							1.243 (0.871)
<20	14	35.0	13	32.5	15	37.5	
20 -	19	47.5	20	50.0	21	52.5	
≥30	7	17.5	7	17.5	4	10.0	
Mean ± SD	24.575±5.378		24.025±4.974		23.875±5.055		F (P) 0.206(0.814)
Level of education:							2.01 (0.919)
- Illiterate/read & write	8	20.0	6	15.0	4	10.0	
- Primary/ preparatory.	13	32.5	14	35.0	15	37.5	
- Secondary	14	35.0	16	40.0	15	37.5	
- University	5	12.5	4	10.0	6	15.0	
Occupation:							0.445 (0.801)
- Housewife	32	80.0	34	85.0	32	80.0	
- Working	8	20.0	6	15.0	8	20.0	
Current residence:							1.398 (0.497)
- Urban	7	17.5	6	15.0	10	25.0	
- Rural	33	82.5	34	85.0	30	75.0	

χ^2 (P): Chi-Square Test & P for χ^2 Test   F (P): One-Way ANOVA-Test& P for One-Way ANOVA-Test

Table (II): Number and percent distribution of the study subjects according to their reproductive history and antenatal visits

Reproductive history	Breast milk group = 40		Peppermint water group = 40		Breast shell group= 40		FET/X^2 (P)
	No	%	No	%	No	%	
Gravidity:							0.287 (0.866)
- Primigravida	31	77.5	30	75.0	32	80.0	
- Multigravida	9	22.5	10	25.0	8	20.0	
Parity:							0.101 (0.951)
- Primipara	31	77.5	32	80.0	32	80.0	
- Multipara	9	22.5	8	20.0	8	20.0	
Type of current delivery:							0.802 (0.670)
- Vaginal	21	52.5	23	57.5	19	47.5	
- C.S.	19	47.5	17	42.5	21	52.5	
Number of living children:							1.01 (0.604)
< 3	35	87.5	33	82.5	36	90.0	
≥3	5	12.5	7	17.5	4	10.0	
Obtained Antenatal visits:							0.959 (0.619)
- Yes	36	90.0	34	85.0	33	82.5	
- No	4	10.0	6	15.0	7	17.5	
Received information about breast care and breast feeding :							1.377 (0.502)
- Yes	17	42.5	14	35.0	12	30	
- No	23	57.5	26	65.0	28	70.0	

χ^2 (P): Chi-Square Test & P for χ^2 Test

Table (III): Number and percent distribution of the study subjects according to their breast feeding technique

Technique of breast feeding	Breast milk group = 40		Peppermint water group = 40		Breast shell group= 40		FET/X^2 (P)
	No	%	No	%	No	%	
Initiation of breastfeeding after delivery:							0.812 (0.937)
- Immediately after delivery (within 1st hour)	4	10.0	6	15.0	6	15.0	
- 1-5 h	20	50.0	18	45.0	20	50.0	
- during the first day	16	40.0	16	40.0	14	35.0	
Type of feeding:							0.144 (0.931)
- On demand	35	87.5	35	87.5	34	85.0	
- Scheduled	5	12.5	5	12.5	6	15.0	
Part of the breast introduced into the infant's mouth:							2.188 (0.335)
- The nipple only	27	67.5	31	77.5	25	62.5	
- The nipple and areola	13	32.5	9	22.5	15	37.5	
Method of nipple withdrawal:							2.157 (0.340)
- Pulling the nipple from the infant's mouth	28	70.0	24	60.0	30	75.0	
- The infant leaves the breast spontaneously	12	30.0	16	40.0	10	25.0	

Number of breastfeeding times/day:							
- <5	6	15.0	9	22.5	4	10.0	4.18
- 5-10	8	20.0	12	30.0	10	25.0	(0.382)
- >10	26	65.0	19	47.5	26	65.0	
Duration of breastfeeding (Bilateral):							
- <10 minutes	13	32.5	15	37.5	9	22.5	2.978
- 10 minutes	17	42.5	14	35.0	16	40.0	(0.562)
- > 10 minutes	10	25.0	11	27.5	15	37.5	

χ^2 (P): Chi-Square Test & P for χ^2 Test

Table (IV): Number and percent distribution of the study subjects according to the quality of their total position (mother and newborn) and attachment (latch on) grade

Total position and attachment grade	Breast milk group = 40		Peppermint water group = 40		Breast shell group= 40		χ^2 (P)
	No	%	No	%	No	%	
Body position:							
- Poor	28	70.0	32	80.0	25	62.5	2.985
- Average	12	30.0	8	20.0	15	37.5	(0.560)
- good	0	00.0	0	00.0	0	00.0	
Attachment:							
- Poor	27	67.5	31	77.5	25	62.5	2.188
- Average	13	32.5	9	22.5	15	37.5	(0.701)
- good	0	00.0	0	00.0	0	00.0	

χ^2 (P): Chi-Square Test & P for χ^2

Table (V): Comparison of mean score of nipple pain in four time periods among the breast milk, peppermint water, and breast shell groups

Study groups	Total Visual Analogue pain intensity scale scores				
	1st day before interventions	3rd day	7th day	14th day	F (P)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Breast milk group = 40	7.075±0.859	5.875±0.791	3.275±0.452	0.875±0.791	493.355 (< 0.00001) [*]
Peppermint water group = 40	6.925±0.764	5.975±0.768	3.225±0.423	0.825±0.712	904.302 (< 0.00001) [*]
Breast shell group= 40	6.775±0.620	6.075±0.829	4.025±0.800	1.325±0.888	584.674 (< 0.00001) [*]
F (P)	1.583 (0.210)	0.631 (0.534)	23.553 (0.000) [*]	4.737 (0.011) [*]	

F (P): One-Way ANOVA Repeated Measures- test & P for One-Way ANOVA Repeated Measures -test

*: Significant at P ≤0.05

Table (VI): Comparison of mean total score of nipple soreness in four time periods among the breast milk, peppermint water, and breast shell groups

Study groups	Total nipple soreness rating scale scores				
	1st day before interventions	3rd day	7th day	14th day	F (P)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Breast milk group = 40	4.325±0.797	2.975±0.423	1.275±0.640	0.175±0.385	743.769 (<0.00001) *
Peppermint water group = 40	4.225±0.920	2.825±0.385	1.225±0.531	0.075±0.267	567.667 (<0.00001) *
Breast shell group= 40	4.275±0.933	3.075±0.656	1.675±0.829	0.375±0.490	608.932 (<0.00001) *
F (P)	0.128 (0.880)	2.508 (0.086)	5.294 (0.006) *	6.092 (0.003) *	

F (P): One-Way ANOVA Repeated Measures- test & P for One-Way ANOVA Repeated Measures -test

*: Significant at $P \leq 0.05$

Table (VII): Comparison of mean total score of nipple trauma in four time periods among the breast milk, peppermint water, and breast shell groups

Study groups	Total nipple trauma score				
	1st day before interventions	3rd day	7th day	14th day	F (P)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Breast milk group = 40	4.525±0.599	3.025±0.480	1.325±0.730	0.150±0.362	1038.83 (< 0.00001) *
Peppermint water group = 40	4.375±0.774	2.925±0.572	1.275±0.640	0.075±0.267	784.385 (<0.00001) *
Breast shell group= 40	4.325±0.888	3.125±0.686	1.675±0.764	0.425±0.594	684.650 (<0 .00001) *
F (P)	0.744 (0.477)	1.167 (0.315)	3.735 (0.027)	7.340 (0.001) *	

F (P): One-Way ANOVA Repeated Measures- test & P for One-Way ANOVA Repeated Measures –test

*: Significant at $P \leq 0.05$