Effect of Expressed Milk, Peppermint Water Versus Routine Care on Cracked Nipple among Lactating Women

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Abstract: 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. The purpose of this study was to investigate the effect of peppermint water versus expressed breast milk on cracked nipple among lactating women. Methods: A quasi–experimental design was utilized. Sample: Purposive sample of 90 lactating women Setting: The study was carried out in postnatal ward and postnatal clinics at four settings in Menoufia governorate: Menoufia University Hospital, Shebin El-Kom Teaching Hospital, Sirs-Elian Hospital, and Menouf Hospital. Instruments: An interviewing questionnaire, breastfeeding observation checklist, numerical rating scale, nipple soreness rating scale, nipple trauma score, and nipple trauma score Result: There was a statistically significant difference between the intervention groups in favor of the expressed milk group in relation to nipple pain, nipple soreness, and nipple trauma. Conclusion: Expressed breast milk was more effective than peppermint water as it relieves cracked nipple. Recommendations: Encouraging the use of expressed breast milk as it was safe and less expensive for those who have cracked nipple.

Key Words: *peppermint water, expressed breast milk, routine care, and cracked nipple.*

Introduction

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 (Farag et al. 2020).

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 nipple (Elagamy et al., 2019). Thirty percent stopped breastfeeding between weeks one and three. Another survey of breastfeeding mothers in Brazil reported that there was a 25% higher risk of interruption of exclusive breastfeeding when the women had cracked nipple. Mothers with higher education levels were more likely to continue breastfeeding despite

the pain of cracked nipple (Elalfy et al., 2022).

A variety of interventions designed to reduce nipple pain in breastfeeding women have been reported. These included pharmacological topical treatments with antibacterial sprays, and antifungal cream; non-pharmacological topical applications such as peppermint oil/water, lanolin; dressings using warm compresses, hydrogel dressings, tea bags; breast shells, and expressed breast milk (EBM). Other interventions that have been identified in the literature included time-restricted breastfeeding or exposure of the nipple to phototherapy and air-drying (Niazi et al., 2018).

Maternity nurse plays a crucial role in providing physical, psychological, and emotional support and necessary information to women. The nurse caring for the breastfeeding mother should help the women achieve independence and success in her feeding efforts prepared with knowledge of the anatomy and physiology of the breast and lactation, the component and positive effects of breast milk, and the techniques of breastfeeding. The nurse can help women and their families by using their own resources to achieve a successful experience (Piro & Ahmed,2020).

Significance of the study:

Cracked nipple presents a high incidence, especially in the first 30 days postpartum, it is a painful condition. It often causes interruption of exclusive breastfeeding and early weaning. In the city of New York, 35 % of the women stopped breastfeeding within a week after birth due to nipple trauma, and 30 % between 1 and 4 weeks postpartum. Similarly, in the municipality of Feira de Santana, Northeastern Brazil, a 25 % higher risk of interruption of exclusive breastfeeding was found in the first month of lactation when cracked nipple were present (Mosquera et al., 2019). It is estimated that 34 to 96 percent of breastfeeding women experience cracked nipple which may cause premature weaning (Mustafa et al., 2021). The UNICEF was ranked the indicators of exclusive breastfeeding in King Saudi Arabia only was 31% in 1996, while in Egypt it was,68% in 1995, 30% in 2003, 38.3% in 2005, 53.2 % in 2008 and, 65%in 2015 (Nafee & Al-Dossary,2018).

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 cracked nipple and a corresponding effective treatment is needed (Hables & Salah,2021). Therefore, the current was conducted to investigate the effect of peppermint water versus expressed breast milk on cracked nipple among lactating women.

Purpose of the Study:

The study aimed to evaluate the effect of nursing intervention on cracked nipple among lactating women.

Research Hypotheses:

1- Lactating women with cracked nipple who apply peppermint water have lower pain intensity and tenderness scores than lactating women who receive routine care.

2- Lactating women with cracked nipple who apply expressed milk secretion have lower pain intensity and tenderness scores than lactating women who receive routine care.

3- Lactating women with cracked nipple who apply expressed milk secretion have lower pain intensity and tenderness scores than lactating women who apply peppermint water.

Methods

Research design:
A quasi-experimental research design was used to carry out the present study (Nonequivalent groups design).

Settings:
The present study was conducted in the postnatal ward and postnatal clinics at four settings in Menoufia governorate: Menoufia University Hospital, Shebin El-Kom Teaching Hospital, Sirs-Elian Hospital, and Menouf Hospital for selection of all cases. These settings were selected because they are government hospitals and are known to have a high flow rate of postpartum women during the postpartum period from rural and urban areas. They also provide many services to the public clients; one of these services is providing health care to the postnatal women. They also provide a number of other services to meet the medical, dietary, financial, and social needs of postnatal women. They have an increased turnover of postpartum women. The flow rate of postpartum women (primipara and multipara) attending an emergency day ranges from (10- 12) cases in University Hospital, (5-8) cases in Shebin El-Kom Teaching Hospital, (5-10) cases in Sirs-Elian Hospital, and (8-12) cases in Menouf Hospital.

Sampling:
A purposive sample of 90 lactating women was recruited from the above-mentioned hospitals (30 women were selected from Menoufia University Hospital, 21 women from Shebin El-Kom Teaching Hospital, 19 from Sirs-Elian Hospital, and 20 from Menouf Hospital) who met the inclusion criteria were selected, including Lactating mothers with cracked nipple did not start any treatment, free from any medical diseases which interfere with breastfeeding (infectious disease as active pulmonary tuberculosis),

delivery of a viable healthy newborn (without cleft lip or cleft palate), accept to participate in the study and accept the follow-up contact after discharge from the hospital. The selected women were then randomly assigned into three groups (G1, G2, and G3). Each of the 90 women was asked to pick a piece of paper containing a number (1, 2, or 3). Those who selected number 1 were assigned to G1, those who selected number 2 were assigned to G2, and those who selected number 3 were assigned to G3. This technique was used to avoid sample contamination and bias

Sample size:
According to the literature review of the previous studies that examined the same outcomes and found significant differences, the sample size was calculated for each group according to the following equation. The researcher considered a type I error of 0.05, a test power of 0.8, m = n1 =size of the sample from population 1, and d = 2 as the least significant difference (Sharma et al., 2020).

$$N = \frac{2(z_1\text{-}\alpha + z_1\text{-}\beta)^2\ \sigma^2\ \{1 + (m\text{-}1)\ p\}}{md2}$$

Based on the sample size measured, a total of 90 lactating women were enrolled in the study (30 for each group) as:
- G1: It is comprised of 30 lactating women who were instructed to apply expressed breast milk after each feeding.
- G2: It is comprised of 30 lactating women who were instructed to apply peppermint water on the nipple and areola after each feeding.
- G3: It is comprised of 30 lactating women who were left for routine postpartum hospital care.

Instruments:

Instrument I: A structured interviewing questionnaire: -
It was developed by the researcher to collect the necessary data about the studied lactating women. It was in the form of open and close-ended questions. It was used for the pretest only. It was revised by three experts and tested for validity and reliability. It was comprised of three main parts:

Part I: Demographic data such as name, age, level of education, residence, phone number, occupation, and family income.

Part II: Obstetrical history such as gravidity, parity, mode of previous delivery, number of living children. It also included questions related to antenatal visits of current pregnancy and antenatal care that was received during the current pregnancy.

Part III: Women's knowledge regarding cracked nipple: It was developed by the researcher to assess the level of women's knowledge regarding cracked nipple and consisted of 6 questions which includes definition, causes, signs and symptoms, complications, preventive measures as well as its management.

Scoring:
Six knowledge questions were determined, according to the literature (Sethi et al., 2019), and coded accordingly. Each question item of knowledge was given a score; correct & complete answers took (3), correct & incomplete answers took (2), whereas incorrect or don't know took (1). The total score of knowledge (18) was classified as follows:

- Good > 75% (15-18).

- Average or fair: 51% to < 75% (11-14).

- Poor = 50% (6-10).

Validity of the Instrument: -
The validity of the instrument was established by three experts (two Professors in Maternal and Newborn Health Nursing and one Professor in Obstetrics and Gynecology). They reviewed the instruments for content accuracy and internal validity. Suggestions were incorporated into the instrument and modifications were made.

Reliability of the Instrument: -
Test-retest reliability of the instrument was used by the researcher for testing the internal consistency of the instrument. It was done through the administration of the same instrument to the same lactating women under similar conditions on two or more occasions. Scores from repeated testing were compared and "r" was computed.

Instrument II: Breastfeeding Observation Checklist:
It was adapted from World Health Organization & United Nations Children's Fund (1993). A breastfeeding observation checklist was used to observe the breastfeeding process for 5 minutes. It contained: the mother's and newborn's positions as well as the newborn's attachment to the breast. It was used for pretest only. It was revised by five experts and tested for validity and reliability.

Correct body position:
1. The mother is relaxed and comfortable.
2. Mother sits straight and is well supported back.
3. Trunk facing forward and lap flat.
4. Newborn neck straight or bent slightly back and body straight.
5. Newborn body turned toward the mother.
6. The newborn body is close to the mother's body and faces the breast with the newborn nose opposite the nipple and chin touching the breast.

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

Correct newborn's attachment:
1. Mouth wide and open.
2. Lower lip turned outwards.
3. Newborn's chin touching the breast.
4. More areolas saw above the newborn mouth.

A scoring system for correct body position:

● One criterion for the mother's position and one criterion for the newborn's position or both from the mother's position was taken to score 1-2 and considered "poor".
● At least one criterion for the mother's position and two or three criteria for the newborn's position was taken to score 3-4 and considered "average".
● At least two criteria for the mother's position and three or fourth criteria for the newborn's position were taken to score 5-7 and considered "good".

A scoring system for correct newborn attachment:
● Any one of four criteria were taken to score 1 and considered "poor".
● Any two of the four criteria were taken to score 2 and considered "average".
● Any three or all the four criteria were taken to score 3-4 and considered "good".

Validity of the Instrument: -
The validity of the instrument was established by five experts (three Professors in Maternal and Newborn Health Nursing and two Professors in Obstetrics and Gynecology). They reviewed the instruments for content accuracy and internal validity. Suggestions were incorporated into the instrument and modifications were made.

Reliability of the Instrument: -
Test–retest reliability was used by the researcher for testing the internal consistency of the instrument. It was done through the administration of the same instrument to the same participants under similar conditions. Its reliability has been verified with Chronbach's alpha which revealed that all of the coefficients were desirable and satisfactory. The instrument was found to be reliable as the reliability co-efficient was r= 0.85.

Instrument III: Numerical Rating Scale (NRS)
It is a subjective self-reported scale developed by Lafoy and Goden (2000) to describe the mother's self-rating of pain. The scale was used to assess the intensity of nipple pain. It was used for pre and post-test. The women were asked to write the number from (0 to 10) or mark a spot on the line corresponding to the intensity of their perceived pain at a particular time on a possible scale of (0 to 10) on a horizontal line, where 0 represents no pain, 1-3 represents mild pain which it was characterized by pinking and/or aching and can tolerate the pain, 4-6 represents moderate pain and it was characterized by pressing, sharp cramping and burning, while 7-10 represent severe pain it was characterized by no tolerance to pain and interfere with daily activity.

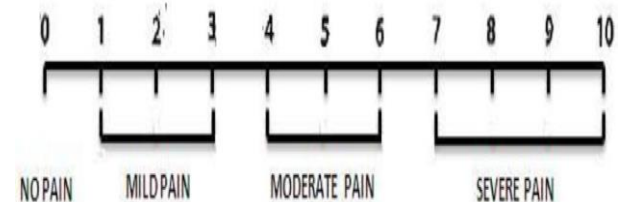A numerical rating scale (NRS) measurement of pain level

Figure 16 Adopted from Wang, L., Xiao, Y., Urman, R., Yingzi Lin. & Lin, Y (2020). Cold pressor pain assessment based on EEG power spectrum. SN Appl. Sci. 2, 1976

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Validity of the Instrument: -

The validity of the instrument was established by three experts (one professor in Maternal and Newborn Health Nursing and two Professors in Obstetrics and Gynecology). They reviewed the instruments for content accuracy and internal validity. Suggestions were incorporated into the instrument and modifications were made.

Reliability of the Instrument: -

Test–retest reliability was applied by the researcher for testing the internal consistency of the instrument. It was done through the administration of the same instrument to the same participants under similar conditions on one or two occasions. Scores from repeated testing were compared to test the consistency of the results over time.

Instrument IV: Nipple soreness rating scale (NSR):

It was adapted from Storr, (1988) to assess healing of the nipple soreness. It was used in the pre and post-test. It was revised by five experts and tested for validity and reliability.

Scoring system: These items were scored on the Likert scale from zero to 5 for each item, zero refers to no nipple pain or discomfort as the score increase it refers to an increase in the discomfort and pain level as follows:

- Normal nipple color, no tenderness (0)
- Nipple slightly red and\or tender for the first 5-10 seconds of breastfeeding (1)
- Nipple red and tender for longer than the first 5-10 seconds of breastfeeding (2)
- tender between breastfeeding, makes the mother looks like grimace when the newborn starts breastfeeding (3)
- Nipple beginning to crack, involuntary gasps of pain when the newborn starts breastfeeding (4)
- Nipple cracked, feels sore "down to my toes" when the newborn starts breastfeeding (5).

Validity of the Instrument: -

The validity of the instrument was established by five experts (three Professors in Maternal and Newborn Health Nursing and two Professors in Obstetrics and Gynecology). They reviewed the instruments for content accuracy and internal validity. Suggestions were incorporated into the instrument and modifications were made.

Reliability of the Instrument: -

Test–retest reliability was used by the researcher for testing the internal consistency of the instrument. It was done through the administration of the same instrument to the same participants under similar conditions. Its reliability has been verified with Chronbach's alpha which revealed that all of the coefficients were desirable and satisfactory. The instrument was found to be reliable as the reliability co-efficient was r= 0.85.

Instrument V: Nipple Trauma Score (NTS):

It was adapted from Abou-Dakn (2011) to evaluate the depth and extent of nipple trauma. It was used for pre and post-test. It was revised by five experts and tested for validity and reliability.

Scoring system: the NTS ranges between 0 and 5 and based on trauma depth and the extent of tissue trauma as follows:

- No microscopically visible skin changes (score 0).

- Erythematic or edema or combination (score 1).
- Superficial trauma with or without scab formation of less than 25% of the nipple surface (score 2).
- Superficial trauma with or without scab formation of more than 25% of the nipple surface (score 3).
- Partial-thickness trauma with or without scab formation of less than 25% of nipple surface (score 4).
- Partial-thickness trauma with or without scab formation of more than 25% of the nipple surface (score 5).

Validity of the Instrument: -
The validity of the instrument was established by five experts (three Professors in Maternal and Newborn Health Nursing and two Professors in Obstetrics and Gynecology). They reviewed the instruments for content accuracy and internal validity. Suggestions were incorporated into the instrument and modifications were made.

Reliability of the Instrument: -
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Administrative Approvals: An official letter was taken from the Dean of Faculty of Nursing, Menoufia University, and addressed to the directors of the study settings. Official permission was obtained to carry out the study from the directors of the

above-mentioned settings. Also, the approval of the Ethical & Hearing Committee of the Faculty of Nursing, Menoufia University was obtained.

Ethical Considerations:
Approaches to ensure the ethics were considered in the study regarding confidentiality and informed consent. The researcher introduced herself to the studied lactating women and explained the purpose of the study and nature of the research to obtain their acceptance to be recruited in the study as well as to gain their cooperation. Confidentiality was achieved by the use of locked sheets with the names of the participating women replaced by numbers. All participating women were informed that the information they provided during the study would be kept confidential and used only for statistical purposes after finishing the study. The study findings would be presented as group data without personal participant information remaining. After explanations prior to enrollment in the study, informed consent was obtained from all women. Each woman was informed that participation in the study was voluntary and that they could withdraw from the study whenever decided and each woman was given the opportunity to freely refuse participation. They were freely asking any questions about the study details.

Pilot study
A total of 10% of the participants (9 women) were included in the pilot study. They were excluded from the study sample to assure the stability of the results and make the necessary modifications. They were recruited from the postpartum ward in order to assess the feasibility and clarity of the instruments and determine the needed time to answer the questions. The postpartum lactating women were informed about the purpose of the

study before the intervention. The results of the pilot study helped in refining the interviewing questionnaire and setting the final schedule. On the basis of the pilot study's results, the necessary modifications were made accordingly.

Fieldwork:

The current study was carried out in four consecutive phases, namely preparatory, assessment, implementation, and evaluation phases.

1- Preparatory phase:

An extensive review to formulate a knowledge base relevant to the study area was done including electronic dissertations, available books, articles, and periodicals. Written permission from the institutional authority of the four hospitals was obtained before conducting the study. The researcher constructed the different data collection instruments and sought the managerial arrangement to carry out the study. The researcher prepared the guiding booklet which included three chapters to provide postpartum women's information about the cracked nipple and how to manage it.

2- Assessment Phase:

The researcher collected the data from the lactating women in the three groups (two study groups and one control group) through interviewing and physical assessment. The data were collected over a period of 6 months from the beginning of April 2021 to the end of September, 2021 in the postpartum ward and postpartum clinics 3 days/week from 9 Am to 3 Pm according to the availability of postpartum women who met the inclusion criteria. This protocol was followed till the needed number was reached. During the initial visits, the researcher greeted the women, introduced herself, and explained the purpose of the research in order to obtain their acceptance and recruited in

this research as well as to gain their cooperation. After taking informed consent from the postpartum women who met the inclusion criteria, each woman was interviewed to collect the data related to the demographic characteristics; obstetrical history and assess their level of knowledge about the cracked nipple. The interview took about 30 minutes for each woman as six women were interviewed per day; the lactating women were asked in Arabic language and documented their answers in the utilized instruments.

During the initial visit, areas of weakness in women's knowledge and practices were identified and a guiding booklet was developed. Objectives of the guiding booklet were set according to the needs of the study women and the review of related literature. The booklet content was planned to be provided to the studied lactating women individually about the basic and practical knowledge related to the cracked nipple. Two guiding booklets about the cracked nipple (definition, causes, signs & symptoms, complications, and nursing intervention to relieve the cracked nipple) were developed by the researcher to both G1 and G2 and reviewed by two experts in the field of maternal and newborn health nursing

During the initial interview, all women were observed for the correct body position and technique of attachment. The researcher was instructing the mother to breastfeed her newborn and observe the breastfeeding process for 5 minutes using breastfeeding observation checklist. The researcher then started to assess the condition of the nipple of the studied groups using the Numerical Rating Scale (Lafoy & Goden, 2000), the Nipple soreness rating scale (NSR) (Storr, 1988), and the Nipple Trauma Score (NTS) (Abou-Dakn et al., 2011). This assessment was considered as a

baseline measurement of the depth and extent of the cracked nipple, and the severity and intensity of nipple pain.

The schedule of home visits was reported to all the studied groups in which follow-up telephone interviews were conducted by the researcher for all groups one week after recruitment on the 7th day and 14th day after the intervention, to assess whether the lactating women followed the prescribed treatment and their self-perception of the progression of their nipple trauma and nipple pain (better, worse, or unchanged). In case of worsening, the lactating women received a home visit on the same day to assess the occurrence of adverse events. The studied groups' telephone numbers and places of their houses were taken to facilitate communication and follow-up. All women of the studied lactating women in the three groups were instructed to follow proper breastfeeding techniques through face-to-face instructions on proper breastfeeding techniques and breast hygiene using a simple illustrative brochure.

3- Implementation phase (for both G1 & G2:

It started immediately after assessment (pre-intervention) on the 3rd day postpartum; each woman in the group received two sessions, one for the level of knowledge about the cracked nipple and proper breastfeeding technique and one for applying the nursing intervention to relieve the cracked nipple. Each session took about 30-45 minutes and there is 10 minutes break between the two sessions. The extra time allowed for the lactating women for asking any questions or clarification related to the sessions.

4- Evaluation phase:

In this phase, all postpartum women recruited in this study were evaluated for the condition of the nipple by the researcher using the follow-up form (instrument 3) on the 7th postpartum day during the routine follow-up of postpartum women at an outpatient clinic in the hospital or by follow-up home visit for women who cannot able to follow up in hospital to assess the effectiveness of the intervention and also were assessed on the 14th postpartum day. The researcher received the data by telephone contact or during routine follow-up to assess the effectiveness of the intervention. This post-assessment took about 15-20 min for each woman and the telephone call took about 15 minutes. A comparison was then held between the 1st and successive measurements which were done on the 7th and 14th days after delivery.

Statistical Analysis:

Data were collected, tabulated, and statistically analyzed using an IBM personal computer with Statistical Package of Social Science (SPSS) version 22 (SPSS, Inc, Chicago, Illinois, USA). Chi-square test, Fischer exact test (FE), A nova test and Spearman correlation were used to analyze the data.

Results

Table (1) shows the demographic characteristics of the studied lactating women. There was no statistical significant difference among the control group, peppermint water group and expressed breast milk group regarding the age, residence, occupation and level of education (P – value >.05).

Table (2):- shows obstetrical history of the study postpartum women. It reveals that, all the studied lactating women were primgravida and primipara without statistical significant difference (P –value >.05).

Figure (1):- shows the total knowledge score among the studied lactating women regarding the cracked nipple. It

reveals that the majority of the studied lactating women had poor knowledge score regarding the cracked nipple in the control group, peppermint water and expressed breast milk groups (70.0%, 73.3% and 60 % respectively).

Table 3:- shows comparison among the studied lactating women in the control group, peppermint and expressed milk groups (N=90) according to the quality of breastfeeding position and attachment with the newborn during breastfeeding. There was no statistically significant difference (p-value □.05) between the control group, peppermint water group, and expressed breast milk group regarding using the correct breastfeeding position and correct attachment with the newborn during breastfeeding. The majority of the studied Lactating Women in the control group, peppermint and expressed milk groups (80%, 76.7% & 80% respectively) had poor body position (mother and newborn) compared to no one of them had good body position. In addition, the largest proportion of the three groups had a poor attachment, compared to no one of them having good attachment (86.7%, 90% & 80% respectively).

Table 4:- shows comparison of the mean score of total pain among the control group, peppermint water and expressed milk groups. There was no statistically significant difference among the study groups regarding the pain intensity in the control, peppermint water, and expressed milk groups before the intervention (pretest) in which the majority of them (63.3%,76.7 &80.0%) had severe (unbearable pain) {7-10} respectively. After the intervention (7th day), there were statistically significant differences (p≤ .05) between control & peppermint water groups and expressed milk groups regarding the mean score of total pain score. After

the intervention (14th day), there was a very high statistically significant difference (p≤ .001) between the control & peppermint water groups and expressed milk groups regarding the mean score of total pain score.

Table 5:- shows the degree of nipple soreness among the studied lactating women in the control, peppermint water and expressed milk groups before the intervention (pretest) (N=90). There was no statistically significant difference among the studied groups regarding the degree of nipple soreness (p>.05).

Table 6:- shows the degree of nipple soreness among the studied lactating women in the control group, peppermint water, and expressed milk groups after the intervention (posttest) (N=90). There was a highly statistically significant difference between the control & peppermint water groups regarding the nipple soreness and between the control & expressed breast milk groups and also between the peppermint water & expressed milk groups.

Table 7:- shows degree of nipple soreness among the studied lactating women in the control group, peppermint water and expressed milk groups after the intervention (follow-up) (N=90). There was a highly statistically significant difference between the control & peppermint water groups regarding the degree of nipple soreness, between the control & expressed breast milk groups, and between the peppermint water & expressed milk groups (p≤ .01).

Table 8: shows the degree of nipple trauma of the studied lactating women in the control group, peppermint water and expressed milk groups before the intervention (pretest) (N=90). There was no statistically significant difference among the study groups regarding the nipple trauma (p>.05).

Table 9:- shows the degree of nipple trauma of the studied lactating women in the control group, peppermint water, and expressed milk groups after the intervention (posttest) (N=90). There was no statistically significant difference between the control & peppermint water groups regarding the degree of nipple trauma (p>.05) while there was a highly statistically significant difference between the control & expressed breast milk groups and between the peppermint water & expressed milk groups (p≤ .001).

Table 10:- shows the comparison of degree of nipple trauma among the studied lactating women after the intervention (follow-up) (N=90). There was a highly statistically significant difference between the control group & peppermint water groups regarding the degree of nipple trauma, between the control & expressed breast milk groups, and between the peppermint water & expressed milk groups (p≤.01).

Results

Table 1: Demographic Characteristics of the Studied Lactating Women **(N=90).**

Variables	Control group (N=30)		Peppermint water group (N=30)		Expressed milk group (N=30)		X^2	P -value
	No.	%	No.	%	No.	%		
Age (years)								
< 25 years.	12	40.0%	8	26.7%	13	43.3%	4.73	**P**= 0.31
25 < 30 years.	16	53.3%	20	66.6%	15	50.0%		
30 < 35 years.	2	6.7%	2	6.7%	2	6.7%		
The level of education								
Illiterate	3	10.0%	2	6.7%	1	3.3%	2.92	**P**= 0.82
Read and write	2	6.7%	1	3.3%	1	3.3%		
Secondary	18	60.0%	17	56.7%	16	53.4%		
University	7	23.3%	10	33.3%	12	40.0%		
Occupation								
Works	3	10.0%	4	13.3%	2	6.7%	7.41	**P**1= 0.69
Housewife	27	90.0%	26	86.7%	28	93.3%		
Residence								
Urban	13	43.3%	15	50.0%	9	30.0%	2.576	**P**= 0.27
Rural	17	56.7%	15	50.0%	21	70.0%		
Family income								
Enough	21	70.0%	26	86.7%	26	86.7%	3.63	**P**= 0.16
Not enough	9	30.0%	4	13.3%	4	13.3%		

Table 2: Obstetrical History of the Studied Lactating Women **(N=90).**

Variables	Control group (N=30)		Peppermint water group (N=30)		Expressed milk group (N=30)		X^2	P -value
	No.	%	No.	%	No.	%		
Number of pregnancy (N=30)			**(N=30)**		**(N=30)**			
Primigravida	30	100.0%	30	100.0%	30	100.0%	NA	
Number of delivery (N=30)			**(N=30)**		**(N=30)**			
Primipara	30	100.0%	30	100.0%	30	100.0%	NA	
Type of current delivery								
Normal labor	6	20.0%	5	16.7%	5	16.7%	$X^2$1= 0.11	P1= 0.50
Cesarean section	24	80.0%	25	83.3%	24	80.0%	$X^2$2= 1.09	P2= 0.58
Assisted vaginal delivery	0	0.0%	0	0.0%	1	3.3%	$X^2$3= 1.02	P3= 0.60
Have you been following up during the pregnancy?								
Yes	20	66.7%	25	83.3%	24	80.0%	$X^2$1= 2.22	P1= 0.11
No	10	33.3%	5	16.7%	6	20.0%	$X^2$2= 1.36 $X^2$3= 0.11	P2= 0.19 P3= 0.50
If no, what are the reasons (N=10)			**(N=5)**		**(N=6)**			
Lack of awareness regarding antenatal care services	3	30.0%	0	0.0%	3	50.0%		
The place is far, and transportation is difficult	1	10.0%	0	0.0%	0	0.0%	$X^2$1= 4.35	P1= 0.50
The follow up is expensive	1	10.0%	1	20.0%	0	0.0%	$X^2$2= 2.13	P2= 0.71
They only take care of dangerous situations	2	20%	1	20.0%	2	33.3%	$X^2$3= 5.62	P3= 0.23
Follow up wastes time	0	0.0%	1	20.0%	0	0.0%		
more than one cause	3	30.0%	2	40.0%	1	16.7%		
If yes, how many (N=20) **Follow up visits during the pregnancy?**			**(N=25)**		**(N=24)**			
< 4 times	5	25.0%	4	16.0%	5	20.8%	$X^2$1= 0.56	P1= 0.35
>4 times	15	75.0%	21	84.0%	19	79.2%	$X^2$2= 0.11 $X^2$3= 0.19	P2= 0.50 P3= 0.47
Have you ever received any information regarding breastfeeding, breast care, and problems associated with breastfeeding?								
Yes	8	26.7%	4	13.3%	5	16.7%	$X^2$1= 1.66	P1= 0.16
No	22	73.3%	26	86.7%	25	83.3%	$X^2$2= 0.88 $X^2$3= 0.13	P2= 0.26 P3= 0.50
Did you prepare your breast for breastfeeding during pregnancy?								
Yes	3	10.0%	2	6.7%	3	10.0%	$X^2$1= 0.22	P1= 0.50
No	27	90.0%	28	93.3%	27	90.0%	$X^2$2= 0.00 $X^2$3= 0.22	P2= 0.66 P3= 0.50

NB: $X^2$1&P1 is comparison between the control & peppermint water groups

$X^2$2&P2 is comparison between the control & expressed milk groups

$X^2$3&P3 is comparison between the peppermint water & expressed milk groups

Figure 1: Total Knowledge Score among the Studied Lactating Women Regarding the Cracked Nipple Before the Intervention **(N=90)**
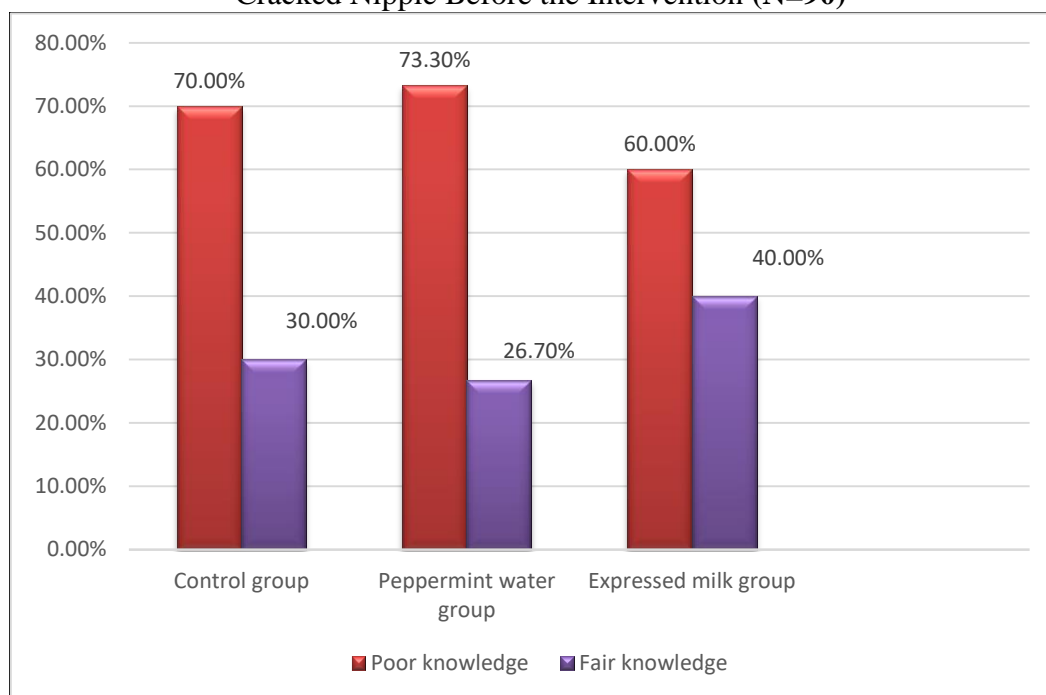

Table (3): Comparison among the Studied Lactating Women regarding Assessment of Using the Correct Breastfeeding Position and Correct Attachment with the Newborn **(N=90).**

Variables	Control group (N=30)		Peppermint water group (N=30)		Expressed milk group (N=30)		X^2	P -value
	No.	%	No.	%	No.	%		
Assessment of using the correct breastfeeding position								
Poor	24	80.0%	23	76.7%	24	80.0%	X^21= 0.09	P1= 0.50
Average	6	20.0%	7	23.3%	6	20.0%	X^22= 0.00	P2= 0.63
							X^23= 0.09	P3= 0.50
Assessment of using the correct attachment with the newborn during breast feeding								
Poor	26	86.7%	27	90.0%	24	80.0%	X^21= 0.16	P1= 0.50
Average	4	13.3%	3	10.0%	6	20.0%	X^22= 0 .48	P2= 0.37
							X^23= 1.17	P3= 0.24

NB: X21&P1 is comparison between the control & peppermint water groups

X22 & P2 is comparison between the control & expressed milk groups

X23 & P3 is comparison between the peppermint water & expressed milk groups

Table (4): Comparison of Mean Score of Total Pain Among the Studied Lactating Women **(N=90).**

Variables	Control group (N=30) Mean ± SD	Peppermint water group (N=30) Mean ± SD	Expressed milk group (N=30) Mean ± SD	ANOVA test	P - value
Pretest	7.87 ± 1.54	7.20 ± 1.63	7.23 ± 1.73	5.34^{ns}	0.15
Posttest	7.27 ± 1.66	4.13 ±1.89	2.77 ± 1.30	60.46*	0.00
Follow-up	7.10 ± 2.06	1.43 ± 1.75	0.30 ± 0.70	181.87***	0.00
ANOVA test	1.56	80.58**	213.44**		
P-value	0.22	0.00	0.00		

**** = highly significant (p≤.01)**

Table (5): Degree of Nipple Soreness Among the Studied Lactating Women in the Control Group, Peppermint Water and Expressed Milk Groups before the Intervention (Pretest) **(N=90).**

Variables	Control group Pretest (N=30) No.	%	Peppermint water group Pretest (N=30) No.	%	Expressed milk group Pretest (N=30) No.	%	X^2	P –value
What's the degree of nipple soreness?								
Nipple red and tender for longer than first 5-10 seconds of feeding	0	0.0%	1	3.3%	0	0.0%		
Tender between feeding, makes mother grimace when newborn starts feeding {3}	8	26.7%	2	6.7%	6	0.0%	$X^2 1$= 5.12	P1= 0.16
Nipple beginning to crack, involuntary gasps of pain when newborn starts feeding {4}	3	10.0%	4	13.3%	4	13.3%	$X^2 2$= 45.80 $X^2 3$= 3.21	P2= 0.01 P3= 0.36
Nipple cracked, feels sore "down to my toes" when newborn starts feeding {5}	19	63.3%	23	76.7%	20	80.0%		

NB: X^2 1&P1 is comparison between the control & peppermint water groups

X^2 2&P2 is comparison between the control & expressed milk groups
X^2 3&P3 is comparison between the peppermint water & expressed milk groups

Table (6): Degree of Nipple Soreness among Studied Lactating Women in the Control Group, Peppermint Water and Expressed Milk Groups after the Intervention (Posttest) **(N=90).**

Variables	Control group Posttest (N=30)		Peppermint water group Posttest (N=30)		Expressed milk group Posttest (N=30)		X^2	P –value
	No.	%	No.	%	No.	%		
What's the degree of nipple soreness?								
Nipple slightly red or tender for first 5-10 seconds of feeding	0	0.0%	1	3.3%	5	16.7%	$X^2_1=$ 17.43** $X^2_2=$ 29.18*** $X^2_3=$ 12.11**	P1= 0.002 P2= 0.00 P3= 0.007
Nipple red and tender for longer than first 5-10 seconds of feeding	1	3.3%	3	10.0%	8	26.7%		
Tender between feeding, makes mother grimace when newborn starts feeding {3}	8	26.7%	14	46.7%	15	50.0%		
Nipple beginning to crack, involuntary gasps of pain when newborn starts feeding {4}	8	26.7%	12	40.0%	2	6.7%		
Nipple cracked, feels sore "down to my toes" when newborn starts feeding {5}	13	43.3%	0	0.0%	0	0.0%		

NB: X^2 1&P1 is comparison between control & peppermint water groups

X^2 2&P2 is comparison between control & expressed milk groups

X^2 3&P3 is comparison between peppermint water & expressed milk groups

** = highly significant (p≤.01.

Table (7): Degree of Nipple Soreness of the Studied Lactating Women in the Control Group, Peppermint Water, and Expressed Milk Groups after the Intervention (Follow-up) (**N=90).**

Variables	Control group Follow-up (N=30)		Peppermint water group Follow-up (N=30)		Expressed milk group Follow-up (N=30)		X^2	P –value
	No.	%	No.	%	No.	%		
What's the degree of nipple soreness?								
Normal nipple color, no tenderness {0}	0	0.0%	5	16.7%	16	53.3%		
Nipple slightly red or tender for first 5-10 seconds of feeding	0	0.0%	14	46.7%	14	46.7%		
Nipple red and tender for longer than first 5-10 seconds of feeding	1	3.3%	2	6.7%	0	0.0%	$X^2 1=$ 39.33** $X^2 2=$ 60.00** $X^2 3=$ 16.76**	P1= 0.00 P2= 0.00 P3= 0.002
Tender between feeding, makes mother grimace when newborn starts feeding {3}	8	26.7%	8	26.7%	0	0.0%		
Nipple beginning to crack, involuntary gasps of pain when newborn starts feeding {4}	1	3.3%	1	3.3%	0	0.0%		
Nipple cracked, feels sore "down to my toes" when newborn starts feeding {5}	20	66.7%	0	0.0%	0	0.0%		

NB: X21&P1 is comparison between the control & peppermint water groups

X22&P2 is comparison between the control & expressed milk groups

X23&P3 is comparison between the peppermint water & expressed milk groups

** = highly significant (p≤.01)

Table (8): Degree of Nipple Trauma of the Studied Lactating Women in the Control Group, Peppermint Water, and Expressed Milk Groups before the Intervention (Pretest) **(N=90).**

Variables	Control group Pretest (N=30)		Peppermint water group Pretest (N=30)		Expressed milk group Pretest (N=30)		X^2	P -value
	No.	%	No.	%	No.	%		
What's your degree of nipple trauma								
Erythematic or edema or combination of both	0	0.0%	1	3.3%	2	6.7%		
Superficial damage with or without scab formation of less than 25% of the nipple surface	8	26.7%	7	23.3%	4	13.3%		
superficial damage with or without scab formation of more than 25% of the nipple surface	6	20.0%	10	33.3%	7	23.3%	$X^2 1= 8.40$ $X^2 2= 5.88$ $X^2 3= 3.73$	P1= 0.08 P2= 0.21 P3= 0.44
partial thickness wound with or without scab formation of less than 25% of the nipple surface	6	20.0%	10	33.3%	11	36.7%		
Partial thickness wound with or without scab formation of more than 25% of the nipple surface	10	33.3%	2	6.7%	6	20.0%		

NB: X^2 1&P1 is comparison between control & peppermint water groups

X^2 2&P2 is comparison between control & expressed milk groups

X^2 &P3 is comparison between peppermint water & expressed milk groups

Table (9): Nipple Trauma of the Studied Lactating Women in the Control Group, Peppermint Water, and Expressed Milk Groups after the Intervention (Posttest) **(N=90).**

Variables	Control group Posttest (N=30)		Peppermint water group Posttest (N=30)		Expressed milk group Posttest (N=30)		X^2	P -value
	No.	%	No.	%	No.	%		
What's your degree of nipple trauma?								
Erythematic or edema or combination	0	0.0%	1	3.3%	15	50.0%		
Superficial damage with or without scab formation of less than 25% of the nipple surface	8	26.7%	14	46.7%	10	33.3%		
superficial damage with or without scab formation of more than 25% of the nipple surface	6	20.0%	7	23.3%	5	16.7%	$X^2$1= 7.460 $X^2$2= 31.31** $X^2$3= 21.25**	P1= 0.11 P2= 0.00 P3= 0.00
partial-thickness wound with or without scab formation of less than 25% of the nipple surface	9	30.0%	7	23.3%	0	0.0%		
Partial thickness wound with or without scab formation of more than 25% of the nipple surface	7	23.3%	1	3.3%	0	0.0%		

NB: X^2 1&P1 is comparison between the control & peppermint water groups

X^2 2&P2 is comparison between the control & expressed milk groups

X^2 3&P3 is comparison between the peppermint water & expressed milk groups

** = highly significant (p≤.01).

Table (10) Comparison of Degree of Nipple Trauma among the Studied Lactating Women after the Intervention (Follow-Up) **(N=90).**

Variables	Control group Follow-up (N=30)		Peppermint water group Follow-up (N=30)		Expressed milk group Follow-up (N=30)		X^2	P -value
	No.	%	No.	%	No.	%		
What's your degree of nipple trauma								
No microscopically visible skin changes	0	0.0%	12	40.0%	24	80.0%		
Erythematic or edema or combination	0	0.0%	10	33.3%	6	20.0%		
Superficial damage with or without scab formation of less than 25% of the nipple surface	4	13.3%	7	23.3%	0	0.0%	$X^2 1=$ 46.39**	
superficial damage with or without scab formation of more than 25% of the nipple surface	6	20.0%	1	3.3%	0	0.0%	$X^2 2=$ 60.00**	**P**1= 0.00 **P**2= 0.00 **P**3= 0.005
partial thickness wound with or without scab formation of less than 25% of the nipple surface	9	30.0%	0	0.0%	0	0.0%	$X^2 3=$ 13.0**	
Partial thickness wound with or without scab formation of more than 25% of the nipple surface	11	36.7%	0	0.0%	0	0.0%		

NB: $X^2 1$&P1 is comparison between the control & peppermint water groups

$X^2 2$&P2 is comparison between the control & expressed milk groups

$X^2 3$&P3 is comparison between the peppermint water & expressed milk groups

** = highly significant (p≤.01)

Discussion

The purpose of the current study was to investigate the effect of expressed breast milk versus peppermint water on cracked nipple among lactating women. The discussion encompasses the demographic characteristics, obstetrical history, level of knowledge regarding the cracked nipple, and its prevention as well as the effect of peppermint water, expressed breast milk, and routine care on the cracked nipple. Moreover, the effect of expressed breast milk versus peppermint water on the cracked nipple among lactating women was investigated and discussed.

The present study revealed that about half of the studied lactating women in the control group, peppermint water and expressed breast milk groups their age average between twenty to twenty-nine years. This finding might be because the majority of females were married at this age which is considered a mid-reproductive age and also because older women have more

experience in breastfeeding and are less likely to develop cracked nipple. The present finding comes in agreement with Ismail et al. (2019) who investigated the effectiveness of the effect of expressed breast milk, peppermint water, and breast shell on the treatment of traumatic nipple in puerperal lactating mothers in El-Beheira, Egypt. They reported that the mean age of study participants in the expressed breast milk, peppermint water, and breast shell groups was mid-reproductive age. About one-half of the studied lactating women in the three groups were in their twenties. These findings are in disagreement with Abdelmawgoud et al. (2020) who investigated the effect of extra virgin olive oil compared to breast milk on painful and damaged nipple during lactation. Their findings revealed that the mean age of virgin olive oil and expressed breast milk groups was 31.08 ±2.52 & 32.77 ±3.71 years, respectively.

The present study showed that more than half of the studied lactating women in the control group, peppermint water, and expressed breast milk groups had secondary education and almost more than half were from rural areas. This may be interpreted as the rural residents usually prefer to have secondary education and then got married. This was supported by Nageeb et al. (2018) in Dakahlia Governorate, Egypt who investigated the effect of olive oil on nipple trauma among lactating mothers. Their findings revealed that more than one-half of the olive oil group and nearly half of the control group had a secondary education level and the majority of the studied lactating women of olive oil and control groups were from the rural area. This is not consistent with a study conducted in Egypt by Naser, et al. (2017) who investigated the effect of peppermint

water versus expressed breast milk on nipple trauma among lactating primiparous. Their findings revealed that about one-half of the study participants had university education in both breast milk and peppermint group without statistically significant differences between both groups regarding their age or residence.

Regarding occupation, the present study revealed that the majority of housewives in the study groups were more likely to suffer from cracked nipple than the working ones. This could be attributed to the fact that the nonworking women and less educated are more than working ones and the educated working mothers may have more access to different sources of accurate information about breastfeeding. The present findings were supported by the study of Ismail et al. (2019) who investigated the effectiveness of the effect of expressed breast milk, peppermint water, and breast shell groups on the treatment of traumatic nipple in puerperal lactating mothers in El-Beheira, Egypt. They reported that the majority of the three groups were housewives.

Regarding family income, the present study revealed that the majority of the studied lactating women in the control group, peppermint water, and expressed breast milk groups had enough income. This may be rationalized as the study participants were women and usually had the caring and responsibility regarding the economic support. They also had support from social organizations. The present finding comes in agreement with Naser et al. (2017) who investigated the effect of peppermint water versus expressed breast milk on nipple trauma among lactating primiparous. Their findings revealed that about one-half of the study participants in peppermint water and expressed breast milk equally

perceived their monthly income as sufficient.

Regarding the number of pregnancies and delivery, all the study lactating women were primigravida & primipara. This finding might be because older mothers have more experience in breastfeeding and are less likely to develop cracked nipple. Santos et al. (2016) studied the prevalence and factors associated with cracked nipple in the first month postpartum. They mentioned in northeastern Brazil that high rates have also been reported in primipara than multipara.

Regarding the type of current delivery, the present study revealed that the majority of the three groups had Cesarean sections. This finding might be because lower education was also identified as the most important factor increasing the prevalence of Cesarean sections. Also the increases in the level of economic and social status and because Cesarean sections in terms of the social bookmarking higher status and be considered a sign of respect to comfort the mother, contributes to an increase in cesarean sections. The pain caused by the surgical incision may affect the positioning of the mother-child dyad during breastfeeding so elevated cracked nipple incidence has been reported in Cesarean section rather than vaginal delivery.

Postoperative care routines delay the onset of lactation, disrupt mother-infant interaction, and inhibit infant suckling. Mothers who had Cesarean section were more likely to have problems related to breastfeeding, including the cracked nipple, in comparison to mothers who had a vaginal delivery. This finding is in the same line as a study conducted in Iran by As'adi et al. (2017) who investigated the effect of Saqez (Pistacia Atlantica) which is an herbal ointment on the treatment of nipple fissure and nipple pain in breastfeeding women. Their findings revealed that the majority of the study participants in the control group and ointment group had Cesarean sections. This finding is not in congruence with Essa & Ebrahim, 2017 who investigated the effect of breast milk versus therapeutic honey (apical) on cracked nipple' healing in Alexandria, Egypt. Their findings revealed that high rates have been reported vaginally than delivered by cesarean section.

Regarding the pregnancy follow-up, there was no statistically significant difference between the study groups. The majority of the studied lactating women in the control, peppermint water, and expressed breast milk groups were followed-up and sought antenatal care during pregnancy. Also, regarding the number of antenatal visits, the majority of the studied lactating women had followed up on their pregnancy more than four times. This may be rationalized as all the studied groups were primipara who needed antenatal care guidelines. This indicates that the number of visits is influenced by the increased needs that arise during pregnancy. All literature emphasizes the importance of antenatal education for pregnant women to avoid any complications during pregnancy, labor, and the postpartum period. This finding comes in accordance with the study of Ismail et al. (2019) who investigated the effectiveness of the effect of expressed breast milk, peppermint water, and breast shell on the treatment of traumatic nipple in puerperal lactating mothers in El-Beheira, Egypt. They reported that the majority of the three groups obtained antenatal visits during their latest pregnancy. Walker revealed that the number of prenatal care visits for pregnant women was approximately eight visits for nulliparous women and seven for parous women. Also, these

findings were not in congruence with a study conducted in 41 countries, including eight high-income countries, 18 middle-income countries, and 15 low-income countries, in rural, urban, and semi-urban locations by Downe et al. (2019) about provision and uptake of routine antenatal services: a qualitative evidence synthesis. The findings revealed that most of the women ignored the importance of antenatal follow-up and thus had a lack of antenatal follow-up visits.

Moreover, the present findings revealed that the majority of the studied groups did not receive knowledge about breastfeeding, breast care, and problems associated with breastfeeding. So, the majority of the studied groups did not perform any preparation for breasts during pregnancy. This may reflect the deficiencies in health institutions regarding their role toward health education. In addition, this is probably because the interest of antenatal clinics focuses mainly on serious cases and neglects health teaching about such subjects for pregnant women, especially primipara. This is in agreement with Santos et al. (2016) who mentioned in their study about prevalence and factors associated with cracked nipple in the first month postpartum which was conducted in northeastern Brazil that the majority of the study groups had no idea either about breast preparation or breast care during pregnancy as most of the women never had any guidance on breastfeeding received during prenatal care.

On investigating knowledge about cracked nipple in the present study, it was noted that the study groups had poor knowledge regarding cracked nipple. This is not surprising since they were less educated and housewives. These findings may be attributed to the fact that all of the study groups were primiparous who usually lack knowledge and experience in motherhood crafts, which in turn makes them at high risk of the cracked nipple. They may also have incorrect knowledge or are unaware of their own health as well as insensitive to minor symptoms of the cracked nipple, incapable of overcoming embarrassment to report them or seek medical help. In addition, homemakers may lack autonomy, empowerment, and decision-making abilities to follow correct breastfeeding techniques. This assumption has been supported by several literature reviews since they indicate that a cracked nipple is one of the most common minor discomforts confronting nursing women after birth either because of the lack of knowledge or because they were not properly prepared during the antenatal period or early postpartum periods. It often causes interruption of exclusive breastfeeding and early weaning (Santos et al., 2016). For example, the study of Al Ketbi et al. (2018) in, Abu Dhabi, United Arab Emirates revealed that although most women are aware of the fact that breastfeeding is the best source of nutrition for infants, they often lack knowledge regarding the reduction in health risks that occur through breastfeeding such as cracked nipple.

The present study also illustrated that the majority of study groups do not know that cracked nipple are one of the health problems associated with breastfeeding. This is probably because many of them were from rural areas in which they do not have good access to care and information. This was supported by Moon & homesick, (2016) who conducted a study in Belgaum, and revealed that nipple trauma and engorged breast occur frequently when women receive inappropriate advice and care. Unfortunately, when women were

asked about preventive and curative measures undertaken to relieve cracked nipple, the majority of the study groups responded incorrectly. Again, this is probably attributed to the fact that all of the study groups were primiparous with limited educational backgrounds. A study was conducted in this context by National Center for Chronic Disease Prevention and Promotion of Health for Women before, during, and after Pregnancy, (2015). It revealed that pain during breastfeeding is preventable when a woman receives appropriate advice about starting and continuing to breastfeed after delivery.

The present study revealed that more than half of the study participants in the control, peppermint water respectively starts breastfeeding during the first day while more than half of the study participants in expressed breast milk group start breastfeeding after the first day. This finding might be because the knowledge of the mothers was inadequate in areas of time of initiation of breastfeeding. And the majority of women don't know that breastfeeding should be started as early as possible. This is attributed to the fact that the majority of study participants were primiparous and had Cesarean sections usually lacks knowledge and experience in motherhood crafts. In addition, the pain caused by the surgical incision may affect the initiation of breastfeeding & positioning of the mother-child dyad during breastfeeding. Postoperative care routines and also, loss of breastfeeding supportive environment in the hospitals delay the onset of lactation, disrupt mother-infant interaction. The present finding comes in agreement with Sathenahalli & Netra, (2021) who investigated the assessment of breastfeeding practices in lactating mothers: more road to cover. Their findings revealed that the majority of

mothers initiated breastfeeding within the first day of birth. Only one-fourth of mothers initiated breastfeeding immediately within 30 minutes of birth.

Regarding breastfeeding time, the present study revealed that the majority of the study participants in the control, peppermint water, and expressed breast milk groups respectively had fed their babies on demand. This finding might be because the majority of women were housewives and this could happen because the mothers can have frequent contact with their babies and give breast milk. On the other hand, mothers were more likely employed and thus spend less time with the child to give the breast milk consistently. The result of the present study was accepted because the World Health Organization and the United Nations Children's Emergency Fund recommended that breastfeeding should be on-demand not on any strict schedule (Nyqvist et al. 2015). On the other hand, this finding is not in congruence with Sathenahalli & Netra, (2021) who investigated the assessment of breastfeeding practices in lactating mothers: more roads to cover. Their findings revealed that only one-third of mothers were aware of demand feeding. This refers to that mothers don't aware of the importance of feeding their baby on demand not regulated by the hour as it helps to completely empty her breast and prevent the development of breast problems.

Regarding the number of breastfeeding times, the present study revealed that the majority of the study participants in the control, peppermint water, and expressed breast milk group respectively had fed their baby more than 10 times. This finding might be because the majority of women were from the rural area which they have a very positive attitude towards

breastfeeding and it's important for the development of the child the majority of them were housewives and have frequent contact with their babies give breast milk.This finding is in the same line as a study conducted in Ethiopia by Arage & Gedamu, (2016) in Ethiopia, who investigated "exclusive breastfeeding practice and its associated factors among mothers of infants less than six months of age in Debre Tabor Town, Northwest Ethiopia: a cross-sectional study ". Their findings revealed that the majority of mothers give breast milk to their infant eight times and above per 24 hrs.

Regarding breastfeeding duration, the present study revealed that the majority of the study participants in the control, peppermint water, and expressed breast milk group respectively had fed their babies for 10 minutes. This finding might be because due to a lack of primipara women's experience and knowledge regarding breastfeeding techniques. This finding matched with Abdallah et al. (2018) who investigated "Breast and nipple problems encountered among puerperal primipara women in Zagazig". Their findings revealed that most of the studied women fed their infants for less than 15 minutes. On the other hand, the present study contradicted Hassan, et al. (2020) who investigated the effect of breastfeeding knowledge and practices among primiparous women with cesarean section: impact on breast engorgement in Upper Egypt. Their findings revealed that more than half of women fed their babies for less than 10 minutes.

The present study revealed that the majority of the study participants in the control, peppermint water, and expressed breast milk groups respectively had entered the nipple only into the newborn mouth. This was

not amazing since almost of the studied subjects lived in rural areas, were housewives, and had large and extended families So, they tended to consult older experienced women as well as friends and relatives. Also, this result may reflect how much peers and friends can affect or form one's knowledge regarding important health issues and/or practices such as breastfeeding. It is well known that receiving information from wrong sources is just as bad as ignorance. This result completely contradicts the literature review which emphasizes that correct positioning of the nipple is essential to prevent sore nipple the whole areola should be well into the mouth, above the tongue, so that the gums can perform the essential driving action (Hassan et al., 2020). This finding is in the same line as Abobaker et al. (2020) in Cairo, Egypt who investigated the effectiveness non-pharmaceutical approach to the traumatic nipple for lactating mothers. Their findings revealed that more than half of the study participants in three groups respectively entered the nipple only into the newborn mouth.

The present study revealed that the majority of the study participants in the control, peppermint water, and expressed breast milk group respectively had pulled the nipple out of the mouth of the newborn. The results of the present study reveal an unacceptable finding where the majority of women did not receive any knowledge about breast care and breastfeeding problems. This may reflect the deficiencies in health institutions regarding their role in health education. All literature emphasizes the importance of antenatal education for pregnant women to avoid or decrease the incidence of complications during pregnancy, labor, and the postpartum period. During the antenatal period, the maternity nurse

should provide the necessary information to a pregnant woman about pregnancy, delivery, and postpartum care. The most important information that should be given to women during the third trimester of pregnancy includes information about puerperium; breastfeeding techniques and breast care for lactating mothers (Hassan et al. 2020). Also, parity influence the mother's awareness and knowledge about breastfeeding's importance on breastfeeding initiation and continuation more than the influence of regardless of different ages or parity status (Farag et al. 2020).

Concerning breastfeeding position and attachment in the present study, it was noted that the majority of the studied participants in the control, peppermint, and expressed milk groups (80%, 76.7% & 80%) had poor body position (mother and newborn) respectively compared to no one of them had good body position. In addition, the largest proportion (86.7%, 90% & 80%) of the three groups respectively had a poor attachment, compared to no one of them having a good attachment with no statistically significant difference was observed in the baseline time day among the three groups. This agreed with Kaur & Singh, (2015) who performed a study about" Effect of Planned Teaching Programme on Knowledge regarding Prevention of Nipple Sore among Postnatal mothers in Gian Sagar Medical College and Hospital, Ram Nagar, Rajpura, Punjab" Who found that less than three quarters of postnatal mothers were having average knowledge about the cracked nipple. This finding is not in congruence with a study conducted in Egypt by Abdallah et al. (2018) who investigated Breast and nipple problems encountered among puerperal primipara women in Zagazig. Their findings revealed that

mothers were aware that correct positioning could help in the prevention of breast and nipple problems but a partially similar percentage was unaware of correct attachment of the baby's mouth.

This study compared the effect of applying nursing intervention to the relief of cracked nipple among the two case groups, and the normal routine management for the control group. There was no statistically significant difference between the three study groups regarding their demographic data, and 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 breastfeeding, and wrong position and technique. In consideration of these causes, the similarity between the groups was assured.

Regarding pain intensity, the present study revealed that there was no statistically significant difference among the study groups regarding the pain intensity in the control, peppermint water, and expressed milk groups before the intervention (pretest) in which the majority of them had severe (unbearable pain). This comes in agreement with Ismail et al. (2019) who investigated the effectiveness of expressed breast milk, peppermint water, and breast shell on the treatment of traumatic nipple in puerperal lactating mothers in El-Beheira, Egypt. Their findings revealed that no statistically significant difference was observed between the three groups which assure homogeneity of the three researchable groups.

The present study found that after the intervention (7thday& 14thday) there was a highly statistically significant difference after using peppermint water in combination with using brochure (about breastfeeding benefits

& techniques) was effective in reducing nipple trauma. Regarding the reduction of the cracked nipple in terms of pain, nipple soreness, and nipple trauma more than those who use routine care. This effect could be attributed to the calming and numbing effect and the antibacterial activity of peppermint water leading to the reduction of irritation and nipple discomfort. Peppermint water is popularly used as a natural remedy for the prevention of nipple pain and damage. It possesses antibacterial activity.

Peppermint water is named Mentha piperita. It has antiseptic, calming, and numbing effects and has been used externally for skin anesthetic, burns, wounds, itching, inflammation, and relieves skin irritations and makes it resistant to cracks. It attacks microorganisms and inflammatory factors and thus prevents damage to tissue cells. Menthol has a pain-killing activity. It affects k-opioid receptors and thus restrains flow and transmission of pain signals and leads to less feeling of pain (Resmy & Jenifer, 2019).

The findings of the present study were similar to a study conducted in Egypt by Naser et al. (2017) conducted study on the effect of peppermint water on the prevention of nipple trauma in lactating primiparous women, 100 primiparous participate in this study. In addition, these findings were supported by a similar study conducted in Iran by Bolourian et al. (2020) who investigated the effectiveness of peppermint on the treatment of nipple fissure during breastfeeding: a systematic review. Who concluded that peppermint can have beneficial effects on treating nipple fissure problems. The present study found that there was a very highly statistically significant difference after using peppermint water regarding the reduction of the

cracked nipple in terms of pain than those who use routine care. This comes in agreement with Ismail et al., (2019) who investigated the effectiveness of expressed breast milk, peppermint water, and breast shell on the treatment of traumatic nipple in puerperal lactating mothers in El-Beheira, Egypt. Their findings revealed that the peppermint water group showed lower pain scores on the 7th and 14th day of intervention respectively in comparison to the breast milk and the breast shell groups.

The present study found that there was a very highly statistically significant difference after using peppermint water regarding the reduction of the cracked nipple in terms of nipple soreness and nipple trauma than those who use routine care. It was supported by a similar study conducted in Tehran, Iran by Akbari et al., 2014 to investigate the effectiveness of menthol essence and breast milk on the improvement of nipple fissures in breastfeeding women. They found that the rate of wound healing in the menthol essence group was reported to be higher than that of the breast milk group. Dissimilar to the findings of the present study, Gharakhani Bahar et al. (2018) compared the effects of mint tea bag, mint cream, and breast milk on the treatment of cracked nipple during the lactation period. They found that the severity of nipple pain was significantly lower in breast milk than in the peppermint tea and peppermint cream groups.

The present study found that after the intervention (7thday& 14thday) there was a very highly statistically significant difference after using expressed breast milk in combination with using brochure (about breastfeeding benefits & techniques) regarding the reduction of the cracked nipple in terms of pain, nipple soreness and nipple trauma more than those

who use routine care. This effect could be attributed to breast milk containing numerous antioxidants such as bilirubin albumins, uric acid, cysteine, coenzyme Q10 glutathione, lactoferrin proteins, carbohydrates, lipids, and molecules with bioactivity, such as vitamins and immunoglobulin which play a role in raising the immunity reaction. Expressed breast milk has immune globulin content and healing elements such as growth factors, anti-inflammatory, and antimicrobial substances. It is widely used for the prevention and treatment of sore nipple.

Expressed breast milk (EBM) is recommended as a palliative breastfeeding practice that manages nipple pain to support and foster the breastfeeding experience with its numerous benefits to the mother and infant (Vieira et al., 2017). Evidence suggests that utilization of some drops of expressed breast milk can be a facilitator of moist and healing nipple tissue among breastfeeding women. Expressed breast milk is a treatment for nipple pain as it works as a barrier that avoids losing the natural moistness of deeper skin layers. Thus, cellular growth is increased and nipple trauma is prevented. Also, it can be used as a non-invasive and plentiful source of cells from the lactating breast to differentiate tissue during lactation by the effect of stem cells which are found in the breast milk components and have a great role in the regeneration of cells in the case of breast difficulties during lactation (Coca et al., 2019).

Expressed breast milk (EBM), recommended for nipple trauma as an alternative to nipple creams or ointments, is readily available, free, and has antibacterial properties, but is not appropriate if there is broken skin, as EBM dries quickly and does not provide moist wound healing (Mustafa et al., 2021). This study finding is supported by a randomized clinical trial, which was conducted at a maternity ward in an accredited hospital in the middle-western region of Brazil by Vieira et al, 2017. The randomized trials involved one hundred women complaining of nipple pain and were randomized into two equal groups. Group one applied anhydrous lanolin daily after each breastfeeding. While group two applied some drops of expressed breast milk on the nipple after each breastfeeding. Both groups were instructed about the proper position and latch on during breastfeeding. 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.

The present study found that there was a very highly statistically significant difference after using expressed breast milk regarding the reduction of the cracked nipple in terms of nipple soreness and nipple trauma more than those who use routine care. This finding was in harmony with Essa & Ebrahim, 2017 who investigated the effect of breast milk versus therapeutic honey (apical) on cracked nipple' healing in Alexandria, Egypt. Their findings revealed that using breast-milk completely relieved nipple bleeding and redness (100.00%) by the third visit (after three weeks), and pain by the fourth visit (after four weeks). And maximum relief of fissure (97.5%) was achieved by the fourth visit.

The present study revealed that statistically significant differences were observed regarding the positive effect of the two methods in relieving the cracked nipple which is favor more in expressed breast milk group. Expressed breast milk was more effective than peppermint water as it

relieves cracked nipple in terms of breast pain, nipple soreness, and nipple trauma after its application. The effectiveness of breast milk may be related to the breast milk having healing elements such as antibodies, anti-inflammatory, anti-microbial substances, and epidermal growth factors which may potentially promote the growth and repair of skin cells. Breast milk was more beneficial, convenient, inexpensive, and nonmedicinal. There is no need for washing and no secondary nipple trauma in using it locally. Therefore, breast milk is natural and biological for the body and is always available without side effects. It can be used in all social and economic groups in society.

The findings of the present study are in agreement with Gharakhani Bahar et al. (2018) who investigated the effectiveness of mint tea bags, mint cream, and breast milk on the treatment of cracked nipple during the lactation period. They found that the severity of nipple pain was significantly lower in breast milk than in the peppermint tea and peppermint cream groups. 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. This finding is in congruence with a study conducted by Ismail et al., (2019) who investigated the effectiveness of expressed breast milk, peppermint water, and breast shell on the treatment of traumatic nipple in puerperal lactating mothers in El-Beheira, Egypt. Their findings revealed that the peppermint water group showed lower pain scores on the 7th and 14th day of intervention in comparison to the breast milk and the breast shell groups.

Based on the present findings, the three hypotheses of this study were accepted.

Conclusions

According to the findings of the present study, it can be concluded that: There was a highly statistically significant difference after using expressed breast milk in the reduction of the cracked nipple in terms of pain, nipple soreness, and nipple trauma than those who use routine care. This supported the first study hypothesis.

Also, the present study showed that there was a highly statistically significant difference after using peppermint water in the reduction of the cracked nipple in terms of pain, nipple soreness, and nipple trauma than those who use routine care. This supported the second study hypothesis.

In addition, the present study showed that expressed breast milk was more effective than peppermint water as it relieves cracked nipple in terms of pain, nipple soreness, and nipple trauma after its application. This supported the third study hypothesis. Thus, the present findings support the study hypotheses and fail to accept the null hypothesis.

Recommendations

In light of the study findings, the following recommendations are proposed: -

1- Incorporating preventive measures and taking care of cracked nipples within antenatal counseling to reduce cracked nipple after delivery.

2- Nurses should encourage mothers to initiate and sustain exclusive breastfeeding with correct positions and techniques to prevent cracked nipple.

3- Encouraging the use of non-pharmacological measures such

as expressed breast milk as it was safe and less expensive for those who have cracked nipple.

Suggestions for future studies: -

- Conducting a similar study in different maternity settings on a large scale.

- Comparing the effect of expressed breast milk and other types of non-pharmacological measures on the cracked nipple.

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