

Effect of Reflexology on Postpartum Comfort and Lactation after Cesarean Delivery among Primiparous Mothers

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Abstract

Background: Reflexology is the practice of an alternative or additional therapy of applying direct pressure to certain locations on the feet, hands, and ears for promoting natural healing that enhances comfort and increases lactation in mothers. **Aim:** This study aimed to evaluate effect of reflexology on postpartum comfort and lactation after cesarean delivery among primiparous mothers. **Methods:** A quasi-experimental design (experimental and control groups) was adopted at the obstetric department at Mansoura University Hospitals, Mansoura City, Egypt. A purposive sample of 100 primiparous post-cesarean delivery mothers was divided into experimental and control groups (50 per group). Data were collected using a structured Interview Questionnaire, Postpartum Comfort Questionnaire, Breastfeeding Charting System, Visual Analogue Scale, and Visual Analogue Satisfaction Patient Scale. **Results:** The postpartum comfort mean scores in the experimental group were significantly higher than the control group. The first lactation period in the experimental group was shorter than the control, and the mean scores of the breastfeeding chart system and breastfeeding satisfaction in the experimental group were considerably higher than the control group. Breast signs of lactation mean scores on day 2 in the experimental group significantly outperformed the control group. **Conclusion:** Reflexology is a successful technique that improved postpartum comfort, induced lactation earlier, and supported breastfeeding in primiparous mothers who had cesarean deliveries. **Recommendations:** Reflexology should be used during postpartum as a non-pharmacological technique to increase postpartum comfort and encourage primiparous mothers to breastfeed earlier.

Keywords: Reflexology, Postpartum Comfort, Lactation, Cesarean Delivery, Primiparous Mothers.

Introduction

Cesarean delivery is a technique used to deliver the baby by an incision over the mother's abdomen and uterus (Sung & Mahdy, 2022). It is common in both developed and developing countries. Globally, its prevalence rate is on the rise, reaching 32.1% in 2021 (Hamilton, Martin, Osterman, 2022). This increase made cesarean delivery a significant public health concern around the world (Sung, 2019).

According to World Health Organization, cesarean delivery rates are significantly high in Egypt, Egypt comes fourth in the world with 51.8% (WHO, 2021). While cesarean delivery can be lifesaving, if it is performed without medical indications, it can cause short- and long-term health complications such as the need for blood transfusion, organ injury, infection, thromboembolism, asthma, and uterine rupture in subsequent pregnancies (Bablad, 2021).

Becoming a mother is a significant experience in a woman's life (Tsai, & Wang, 2019). Even though it is the happiest movement, mothers go through significant progressive biopsychosocial changes (Alqathama, Alhomoud, Alsadiq, Almeahmadi, Fallatah, Alharbi, & Alluqmani, 2023). Difficulties from surgery and anesthesia associated with cesarean delivery can cause physical and psychosocial issues (Mahmoud, 2022).

Postpartum comfort among cesarean delivery mothers is lower than those who deliver vaginally due to incision site pain, exhaustion, sleeplessness, trouble caring for the newborn, activity intolerance, anesthesia effects, abdominal tension, and gases (Mihaelov, 2022; Sun, & Pan, 2019). Lack of maternal bonding, concern over body image distortion, and guilt related to cesarean delivery are psychological difficulties that are most typically experienced. Those factors adversely influence postpartum comfort and delay

the initiation of lactation (**Hemalatha & Vimala, 2019**).

Primiparous mothers frequently experience a lack of milk supply in the initial post-operative phase (**Anbarasi, Kalabarathi, & Priya, 2022**). So, it is very important to foster postpartum care to speed up the recovery period, help initiate and maintain lactation, strengthen maternal bonding, and ensure postpartum comfort. This can be achieved by prevention and/or early management of mothers' complications and by satisfying their care needs (**Karim, et al., 2019**).

Lactation is defined as the production of colostrum and milk in the woman's breast under the control of prolactin and oxytocin. It is affected by the baby-sucking and emotional status of the mother (**Hannan, Elajnaf, Vandenberg, Kennedy, & Thakker, 2023**). Lactation in the first postpartum days is very important due to colostrum which is rich in nutrients and antibodies that protect the newborn from infections/diseases and promote his health. It also encourages maternal bonding when starts within the first hour after birth (**Nabi, Zahoor, & Muzamil, 2023**).

The essential right of a baby is to be breastfed. There are no replacements for breast milk in terms of health benefits for both mother and baby. Bottle feeding as an alternative to breast milk has disadvantages such as taking time and effort to prepare, and the lactation devices need regular sterilization to avoid bacterial infection (**Sultania, Agrawal, Rani, Dharel, Charles, & Dudani, 2019**). Early introduction of complementary feeding reduces the production of milk and affects the family's income (**Kotowski, Fowler, Hourigan, & Orr, 2020**).

There is a variety of complementary and alternative therapy available to initiate lactation and promote postpartum comfort which helps to reduce the need for pharmaceutical interventions and lowers the likelihood of complications in the future (**Machhi, & Tiwari, 2020**). One of these therapies is reflexology, commonly referred to as zone therapy, whose origins can be traced more than 5000 years ago to ancient China. The reflexology philosophy is based on the Chinese meridian theory (**Affifi et al., 2017**).

Reflexology is a simple, non-pharmacological, non-invasive therapeutic

approach that involves applying direct pressure to certain points on the feet, hands, and ears that correspond to different parts of the body (**Mohammadpour et al., 2018**). The hands and feet reflect an image of the breast, eyes, nose, stomach, and neck according to the zones and reflex areas system (**Sung, 2019**). Reflexology, like other forms of massage, enhances comfort and relaxation. By applying pressure to the toe during postpartum, the pituitary is stimulated, oxytocin is produced, endorphins and enkephalins are released, postpartum comfort is promoted, and lactation is initiated (**Hemalatha & Vimala, 2019**).

Earlier studies applied reflexology among women in labor, post-cesarean delivery mothers, students with premenstrual syndrome, and postpartum women and confirmed reduction of the level of pain, improvement of lactation, reduction of premenstrual syndrome, and improvement of the quality of sleep respectively (**Dhanalakshmi, Dash, Chitra, Jayanthi, 2019; Baljon, Romli, Ismail, Khuan & Chew, 2022; Afifi et al., 2017; Li, Chen, Li, Gau, & Huang, 2019**). This stimulates the current study to evaluate effect of reflexology on postpartum comfort and lactation after cesarean delivery among primiparous mothers.

Significance of the study

The primary objective of postpartum care for mothers is to provide comfort and minimize their discomfort (**Simonds, Abraham, & Spitznagle, 2022**). Reflexology is a drug-free method that can be used after cesarean delivery to promote postpartum comfort, reduce the need for pharmacological drugs, promote milk flow, start early lactation, and decrease the costs and risks of formula feeding (**Basyouni et al., 2018; Mohammadpour et al., 2018**). It can help balance hormonal production and reduce the incidence of postpartum depression (**Selvi & İlkay, 2022; Dehghanmehr, Sargazi, Biabani, Nooraein, & Allahyari, 2019**).

Cesarean-delivery mothers should be provided with accurate, concise, and evidence-based information on reflexology and its benefits during postpartum. Healthcare providers should deliver reflexology, especially for primiparous mothers (**Mirzainajmabadi, Makvandi, Mirteimoori, & Sadeghi, 2018**). Thus, this study was conducted to evaluate effect of reflexology

on postpartum comfort and lactation after cesarean delivery among primiparous mothers.

Aim of the study

This study aimed to evaluate the effect of reflexology on postpartum comfort and lactation after cesarean delivery among primiparous mothers.

Operational definition

Reflexology: refers to applying direct pressure to certain points on the mother's feet.

Research hypotheses

1. Cesarean delivery primiparous mothers who receive reflexology exhibit increased postpartum comfort than those who don't.
2. Cesarean delivery primiparous mothers who receive reflexology start lactation earlier than those who don't.

Subjects and Method

Study design

A quasi-experimental design with experimental and control groups was adopted.

Study setting

This study was carried out in the obstetric department at Mansoura University Hospitals, Mansoura City, Egypt which serves the most populated region with a high prevalence of patients.

Subjects and sampling

This study included a purposive sample of 100 primiparous mothers, divided into two equal groups (50 in the experimental and 50 in the control group). On the first postoperative day following the cesarean section, primiparous mothers were assigned to one of the groups. The

researcher applied reflexology to the experimental group, and the scales were filled out by the researcher by questioning the mothers who matched the following inclusion criteria and exclusion criteria:

Inclusion criteria:

- Post-cesarean delivery primiparous mothers.
- Aged more than 18 years.

Exclusion criteria:

- Multiple pregnancies.
- Foot amputation or injuries.
- Mothers who had babies in the critical care unit.
- Chronic illnesses, mental diseases, and/or chronic pain.

Sample size

Based on data from a study by **Anwar, Mohamed, Elsayed, Tawfik & Ebrahim, (2022)** considering the level of significance of power analysis of 0.95 ($\beta=1-0.95=0.5$) at alpha .05 (one-sided) with a large effect size of 0.5 was used as a significance, and 0.001 was used as a high significance. Accordingly, the sample size required per group was 50.

Groups' allocation

To recruit a total sample of 100 primiparous mothers, 107 eligible mothers were invited to share in this study. Seven mothers refused to share, and 100 mothers were allocated to either the control or the experimental group (n=50 per group). Six mothers (4 in the control group and 2 in the experimental group) withdrew from the study. They were replaced and the statistical analysis was done on 100 mothers. A flowchart of the study participation is shown in **Figure 1**.

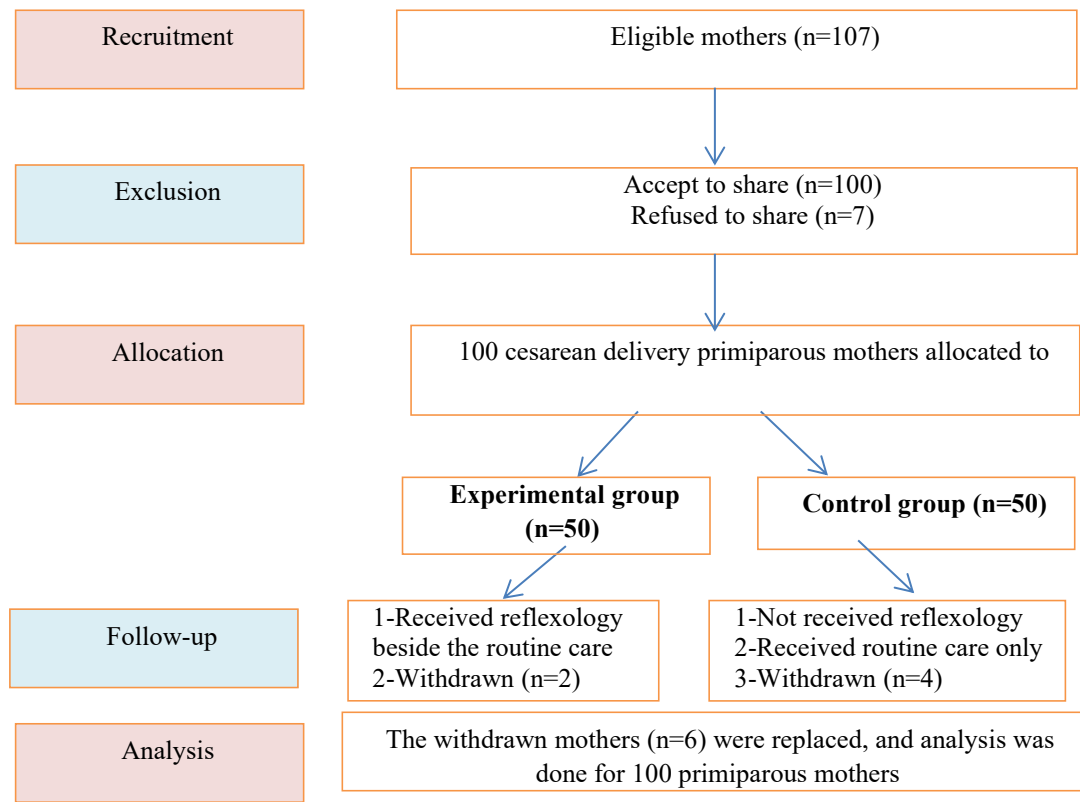


Figure 1. Flowchart of the study participation

Data collection tools

Five tools were used for data collection:

Tool I: A structured Interview Questionnaire

It was created by the researchers based on the literature (Karakaplan & Yldz, 2010; Logeshwari et al., 2014; Regan et al., 2013). It consisted of 2 parts: Part I concerned the mother's demographic characteristics such as age, employment status, and level of education, and Part II concerned the obstetric and medical history such as gravidity, parity, breastfeeding status, and reasons for CS delivery.

Tool II: Postpartum Comfort Questionnaire (PPCQ)

It is a 34-item questionnaire adopted from Karakaplan & Yldz (2010) and used to measure mothers' comfort after cesarean section in terms of their bodily, psychological, spiritual, and sociocultural well-being. It depends on General Comfort Scale, the Turkish version translated by Kuguoglu & Karabacak

(2008). The responses were estimated on a 5-point Likert system of agreement with 5 (strongly agree) being the highest level and 1 (strongly disagree) being the lowest. The items with negative statements were subjected to reverse coding. The scale's minimum and maximum scores range from 34 to 170. Scores of about 170 imply high degrees of comfort.

Tool III: Breastfeeding Charting System (LATCH)

It is an assessment method developed by Jensen, Wallace, & Kelsay (1994) used to monitor and chart breastfeeding based on the Apgar score system. It offers a systematic technique to gather information about unique breastfeeding sessions. It has 5 subgroups (Latch onto the breast, Audible swallowing, Type of nipple, Comfort, and Hold the breast). To identify the essential elements of breastfeeding, the approach assigns a score between 0 and 5. Based on the final score, each nursing session is evaluated. If the overall score is less than 10, mothers should receive

support.

Tool IV: Visual Analogue Scale (VAS)

It was a self-report scale used to assess the signs of the onset of lactation through breast changes (breast tightness, a rise in breast heat, and breast pain). It was used in a study carried out by **Mauri et al., (2015)**. Scores were graded on a scale from 0 (no signs) to 10 (the strongest signs).

Tool V: Visual Analogue Satisfaction Patient Scale (VASPS)

It was developed by **Klnçer & Zileli, (2006)** and used to assess the mother's satisfaction with breastfeeding. It has a flat line at each end with a face; the face at the left end represents the highest level of unhappiness, while the face at the right end represents the exact opposite. According to the level of satisfaction, the mother crosses out the line. The researcher specifies a score between 0 and 3 during scoring (0=completely unsatisfied, 1-2=little satisfied, 3-4=satisfied, and 5=completely satisfied).

Validity and Reliability of the tools

The content validity of the tools was examined by 5 experts in maternity/obstetric nursing. Taking into account the experts' assessments of the sentence structure, relevance of the material, and item order, no modifications were made to the tools. The reliability of tools was tested using Cronbach's alpha, it was 0.87 for tool II, 0.94 for tool III, 0.91 for tool IV, and 0.87 for tool V.

Pilot study

It was carried out on 10% of the sample (10 primiparous mothers) to determine the most efficient and thorough method of gathering the required data by evaluating the feasibility and application of various tool items. The main study sample did not include the pilot study participants.

Ethical consideration

To conduct this study, official approval was taken from the director of the selected hospital, and ethical approval was obtained from the research ethics committee of the Faculty of Nursing, Mansoura University (P.0444). The researcher introduced herself to

the mothers, explained the study's aim and procedure, and then got the mothers' consent to participate in the study. The collection of data was entirely voluntary and private. It was confirmed that mothers had the option to decline the study at any time.

Research process

This study was conducted throughout three phases: preparation and assessment, implementation, and evaluation phase.

1. Preparation and assessment phase:

- The researchers reviewed the available relevant literature (**Baljon, Romli, Ismail, Khuan & Chew, 2022; Khoonphet, 2022**).
- The mothers of both groups were individually interviewed to gather their demographic and obstetrical data.
- The control group received standard hospital treatment. To prevent sample contamination, the researcher started with the control group and continued until the target number was attained.
- Data were gathered from March 2023 to May 2023 across three months. The researcher visited the study setting on Sunday, Tuesday, and Thursday from 9:00 am to 1:00 pm.

2. Implementation phase:

Application for the experimental group

Preparation of the mothers

- Mothers' families and/or friends were asked to go out of the room to give mothers enough space, and a comfortable room was constructed for the mothers.
- Mothers were asked to have bare feet after making sure their feet were properly groomed and free from any cream or lotion.
- Every mother was positioned in a semi-sitting position, and the researcher held her foot while seated. A tiny cushion was put beneath the mother's knee to maintain a 45-degree angle on the foot used for reflexology and to prevent fatigue.

The procedure time

Reflexology was applied according to the

following steps (Kapikiran, & Özkan, 2021):

- Before the procedure, the researcher cleaned and heated her hands.
- On the right foot, 2 minutes were spent on warm-up and relaxation exercises.
- Reflexology was applied for 8 minutes to the reflex points on the right foot according to the reflexology map (Figure 2): brain, pituitary gland, thyroid and parathyroid glands, diaphragm, lungs, chest, adrenal glands, liver, and lymph nodes to eliminate the negative effects of anesthesia and exhaustion.
- Then, it was done on the left foot on the points attributed to the brain and pituitary gland (2 minutes), thyroid and parathyroid glands (2 minutes), lungs (2 minutes), chest and upper lymph nodes (2 minutes), lower lymph nodes (2 minutes), adrenal glands and liver (2 minutes), large and small intestines (2 minutes). For 5 minutes, the pressure was placed on the ovaries, fallopian tubes, and bladder's reflex points.
- Mothers were asked to express their level of comfort while receiving reflexology. To help the body eliminate toxins following reflexology, it was advised that they consume a lot of water that day.

Application for the control group

- Reflexology was not administered to the control group. They received only routine nursing care including aid with breastfeeding, neonatal care, and physical examinations of the mothers.

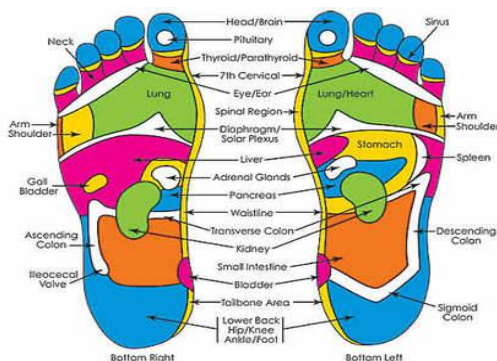


Figure 2. Reflexology map

Academy of Natural Health Sciences (2020): Foot reflexology program. Available at <https://anh-school.com/foot-reflexology.html>.

3. Evaluation phase:

- The level of postpartum comfort was assessed after 30 minutes of every session and the signs of the onset of lactation were evaluated 24 hours and 48 hours after delivery. The breastfeeding satisfaction level was evaluated during the first two days after delivery using the same previous tools.

Statistical analysis

The collected data were coded, categorized, and input into a computer. The social science statistical software version 26.0 (SPSS, Chicago, IL) was employed for analysis. To establish the central tendency of observations and measure the dispersion of data around the mean for quantitative variables, the arithmetic mean and standard deviation were used. A one-way analysis of variance (ANOVA) test was employed for comparisons involving more than two variables and continuous quantitative data, and a student's t-test was employed for comparisons involving just two variables and continuous quantitative data. The Chi-square [X²] test was utilized for variables' comparison using categorical data. The p-value <0.05 was used to determine statistical significance.

Results

Table 1 reveals that the mean age of primiparous women in the experimental group and control group was 23.33 ± 9.45 and 24.65 ± 8.45 years respectively. Regarding education, it is evident that more than half (56% and 52%) of the experimental and control groups had a higher education level, respectively. It is shown that 66% of primiparous mothers in the experimental group were housewives, as opposed to 62% in the control group. In terms of residence, 82% of the experimental group and 80% of the control group were from urban. There was no statistically significant demographic characteristics variation between groups ($p > 0.05$).

According to Table 2, there was no discernible difference in the obstetrical history

of the two groups. Regarding gravidity, 68% of the experimental group and 64% of the control group had gravida 2. Moreover, the parity of 74% and 62% of the experimental and control groups was more than 3 respectively. It is shown that 68% of the experimental group and 70% of the control group started breastfeeding after the first thirty minutes following CS. Abnormality in amniotic fluid was the most medical cause for CS deliveries reported by 40% and 38% of the experimental and control groups respectively.

Physical, psycho-spiritual, and socio-cultural domains were revealed to be the mothers' primary categories of postpartum comfort, and their mean ratings are shown to be considerably higher in the experimental group than in the control group with a highly statistically significant ($p < 0.001$) (Table 3).

The experimental breastfeeding ratings on days 1 and 2 were shown to be considerably higher ($p < 0.001$) in comparison to the control group. The mean of LATCH increased ($p < 0.001$) on days 1 and 2 in both groups independently. The difference between the two groups was evident in the advanced analysis,

and a significant rise was observed on day 2 compared to day 1 ($p < 0.001$) (Table 4).

On the first postpartum day following cesarean delivery, the mean of the breast signs of lactation showed no differences ($p > 0.05$) in both groups. On day 2, the experimental group had considerably greater mean scores than the control group ($p < 0.001$). A significant difference was discovered on days 1 and 2 ($p < 0.001$) in both groups when the changes in signs of lactation during the first three days of each group were analyzed individually. In both groups, it was found that the signs of lactation grew each day (day 1 through day 2). When days in pairs in the advanced analysis (day 1 < day 2) were examined, all items significantly differed in both groups ($p < 0.05$) (Table 5).

On days 1 and 2, it was revealed that the experimental group had greater mean breastfeeding satisfaction scores than the control group (Table 6). The satisfaction levels on day 2 were significantly higher than on day 1 in both groups on all the days measured in pairs. The experimental group showed higher mean scores for satisfaction ($t = 7.136$, $p < 0.001$) than the control group.

Table (1): Demographic characteristics of primiparous mothers

Demographic characteristics	Experimental group (n=50)		Control group (n=50)		X ²	p-value
	No.	%	No.	%		
Age						
-18 < 30	28	56.0	31	62	1.56	>0.05
-30 ≤ 40	22	44.0	19	38		
Mean ±SD	23.33 ± 9.45		24.65 ± 8.45			
Level of education						
-Basic education	11	22.0	13	26	2.00	>0.05
-Secondary education	28	56.0	26	52		
-University education	11	22.0	11	22		
Employment status						
-Working	17	34	19	38	0.17	>0.05
-Housewife	33	66	31	62		
Residence						
-Urban	41	82	40	80	0.28	>0.05
-Rural	9	18	10	20		

NS-non-significant >0.05

Table (2): Obstetric history of primiparous mothers

Obstetric history	Experimental group (n=50)		Control group (n=50)		X2	P-value
	No.	%	No.	%		
Gravidity						
-1	16	32	18	36	1.29	0.523
-≥ 2	34	68	32	64		
Parity						
-1 < 3	13	26.0	34	38.0	1.27	0.182
-> 3	37	74.0	66	62.0		
Breastfeeding status						
-Within the first 30 minutes after CS	16	32.0	15	30.0	2.00	0.467
-After the first 30 minutes CS	34	68.0	35	70.0		
Reasons for CS delivery						
-Abnormalities in amniotic fluid	20	40.0	19	38.0	1.76	0.356
-Delayed progression of birth	14	28.0	14	28.0		
-Breech birth	16	32.0	17	34.0		

NS-non-significant >0.05

Table (3): Postpartum comfort questionnaire scores in the experimental and control groups

PPCQ and sub-dimensions	Experimental Group (n = 50)		Control Group (n = 50)		Test	
	Lowest-Highest (Median)	Mean (SD)	Lowest-Highest (Median)	Mean (SD)	T	p
Physical comfort	47–70 (62)	61.9 (4.4)	30–66 (47.8)	47.5(6.4)	13.400	<0.001
Psych-spiritual comfort	46–50 (50)	49.5 (1.1)	41–50 (49)	48.0(2.3)	4.110	<0.001
Sociocultural comfort	40–50 (45.3)	45.3 (2.4)	28–42 (35.7)	35.7(3.1)	18.004	<0.001
The total score of PPCQ	139–170 (156.6)	156.6 (5.5)	107–151 (131.1)	131.2(8.4)	18.426	<0.001

*Statistically significant level at p<0.001

Table (4): Breastfeeding charting system scores in the experimental and control groups

Breastfeeding characteristics (LATCH)	Experimental Group (n = 50)		Control Group (n = 50)		Test	
	Lowest-Highest (Median)	Mean (SD)	Lowest-Highest (Median)	Mean (SD)	T	p
1 st day	4.0–10.0 (7)	7.1 (1.5)	5.0–8.0 (6)	6.1(0.9)	4.386	<0.001
2 nd day	5.0–10.0 (9)	9.1 (0.9)	6.0–10 (8)	8.1(1.2)	4.926	<0.001
F	67.87		80.21			
P	<0.001		<0.001			

*Statistically significant level at p<0.001

Table (5): Breasts signs of lactation in the experimental and control groups

Breasts signs of lactation	Experimental Group (n = 50)		Control Group (n=50)		Test	
	Lowest-Highest (Median)	Mean (SD)	Lowest-Highest (Median)	Mean (SD)	U	P
Tension						
1 st day	0–2 (0.0)	0.1 (0.4)	0–1(0.0)	0.1(0.3)	1382.0	0.553
2 nd day	0–10 (6.0)	5.3 (2.3)	0–5(1.0)	1.7(1.6)	313.0	<0.001
F	102.03		69.76			
P	<0.001		<0.001			
Difference	1 < 2 < 3		1 < 2 < 3			
Heat						
1 st day	0–3 (0.0)	0.2 (0.5)	0–1(0.0)	0.1(0.3)	1358.0	0.456
2 nd day	0–10 (6.0)	5.2 (2.3)	0–5(1.0)	1.7(1.4)	283.0	<0.001
F	101.51		67.95			
P	<0.001		<0.001			
Difference	1 < 2 < 3		1 < 2 < 3			
Pain						
1 st day	0–3 (0.0)	0.2 (0.5)	0–1(0.0)	0.2(0.4)	1422.0	0.936
2 nd day	0–10 (6.0)	5.2 (2.3)	0–5(1.0)	1.8(1.5)	323.5	<0.001
F	102.12		66.97			
P	<0.001		<0.001			
Difference	1 < 2 < 3		1 < 2 < 3			

*Statistically significant level at p<0.001

Table (6): Scores of breastfeeding satisfaction in the experimental and control groups

Breastfeeding satisfaction *	Experimental Group (n = 50)		Control Group (n = 50)		T	p
	Lowest-Highest (Median)	Mean (SD)	Lowest-Highest (Median)	Mean (SD)		
1 st day	1–4 (2)	2.5(0.6)	1–3 (2)	2.1 (0.7)	3.153	0.002
2 nd day	3–5 (4)	4.2(0.6)	2–5 (3)	3.4 (0.6)	7.136	<0.001
F		146.36		159.48		
P		<0.001		<0.001		

*Breastfeeding satisfaction was evaluated between 1–5

*Statistically significant level at p<0.001

Discussion

Reflexologists assert that by applying pressure to certain organs, typically the feet, energy is triggered, and pain blockages are released (Sung, 2019).

This study aimed to evaluate the effect of reflexology on postpartum comfort and lactation after cesarean delivery among primiparous mothers. This aim was attained through the study findings that revealed that mean ratings of domains of postpartum comfort (physical, psycho-spiritual, and socio-cultural) were considerably higher in the experimental group compared to the control group which indicates that the experimental group had high levels of comfort and relaxation. This finding supported the first study hypothesis "Cesarean delivery primiparous mothers who receive reflexology exhibit increased postpartum comfort than those who don't".

This result agrees with Sharifi, Bahri, Hadizadeh-Talasaz, Azizi, Nezami, & Tohidinik, (2022) who assessed in an Iranian randomized clinical trial the effect of foot reflexology during the fourth stage of labor on uterine afterpain and revealed a significant decrease in the mean total afterpain score in the reflexology group in the four hours postpartum. They reported that reflexology was effective in relieving uterine afterpains after labor.

Along the same line, a Turkish study was done by Çankaya, & Ratwisch, (2020) to test the effect of reflexology on lactation and postpartum comfort in primiparas cesarean-delivery reported that the mean scores of the Postpartum Comfort in the intervention group were significantly higher than the control. Additionally, an RCT Saudi Arabian study by Baljon, Romli, Ismail, Khuan & Chew, (2022) conducted to evaluate the effectiveness of foot reflexology on maternal and newborn outcomes among primigravidae mentioned the lower level of labor pain intensity during and after contraction after the intervention.

Hassan, Ahmed, & El-Tantawy, (2022) approved that foot massage was very effective in reducing pain among mothers after cesarean section. These similarities among the finding of the present study may be attributed to the positive impact of reflexology on decreasing

pain and increasing comfort among postpartum mothers, which is evoked from literature (Baljon, Romli, Ismail, Khuan & Chew, 2022)

The present study revealed that the experimental group had considerably higher breastfeeding scores than the control group on days 1 and 2. This finding supported the second hypothesis "Cesarean delivery primiparous mothers who receive reflexology start lactation earlier than those who don't". This finding can be attributed to the scientific evidence that reflexology stimulates the central nervous system and causes deep relaxation and blood flow improvement. This in turn can promote breast milk production and enhance lactation (Khoonphet, 2022).

This finding match with that of an Iranian randomized control trial titled "Impact of reflexology on breast milk volume of mothers with premature infants" conducted by Mohammadpour et al., (2018). Its results indicated the beneficial effect of reflexology on breast milk volume. Dhanalakshmi, Dash, Chitra, & Jayanthi, (2019) carried out a quasi-experimental study to evaluate the effect of reflex zone therapy on pain and lactation among post-cesarean mothers at Puducherry and proved the effectiveness of reflex zone therapy in improving lactation among mothers in the experimental group. Similarly, Deepthi, (2018) applied reflex stimulation to improve lactation among 13 post-cesarean mothers in each control and experimental group at Coimbatore using a pre-and post-test research design and demonstrated that the experimental group exhibits higher lactation levels than the control group. The same findings were reported by other studies (Niven & Basyouni, 2018; Danasu, 2015; Abd El Fattah, Metwaly, & Khedr, 2015) demonstrating the usefulness of reflexology in enhancing lactation in postpartum mothers.

It was discovered in the current study that the experimental group had considerably higher breast signs of lactation mean scores and produced first milk on average for a much shorter period than the control group. Compared to mothers in the control group, mothers in the experimental group were seen to exhibit lactation-related symptoms earlier on

day 2. This finding is supported by the fact that reflexology stimulates colostrum secretion more rapidly. It helps start early lactation by making mothers experience higher degrees of breast tension, heat, and pain.

This finding is congruent with **Çankaya, & Ratwisch, (2020)** whose results revealed that the study group had a shorter first lactation period and greater mean scores of breast signs of lactation on days 2 and 3 than the control. In a randomized controlled study that evaluated the effect of reflexology which was applied for 20 minutes on lactation in 60 postpartum cesarean section mothers on the first and second days after delivery. The results explained that most mothers started breastfeeding within 60 min after delivery and the intervention group had higher scores of breast signs of lactation compared to the control group (**Aksu, & Karaca, 2021**).

This finding is also supported by **Farag, Tayel, & Alam, (2019)** who assessed the start of breastfeeding after the foot massage session in a study involving 80 women delivered by cesarean section. They found that more than half and more than two-fifths of the massage group started breastfeeding after 2-3 hours and after one hour respectively.

The present study highlighted that the mothers in the experimental group had higher mean breastfeeding satisfaction scores than the control group. From the researchers' perspective, it proved that reflexology was effective in raising mothers' pleasure. This is expected because reflexology promoted postpartum comfort and relaxation by releasing endorphins that reduce stress and consequently increase breastfeeding satisfaction.

This result is similar to the finding of **Baljon, Romli, Ismail, Khuan & Chew, (2022)** who concluded that foot reflexology increased maternal satisfaction. In a quasi-experimental study, the effect of foot reflexology on satisfaction among 200 parturient women was examined and confirmed the effectiveness of foot reflexology as a non-pharmacological method in enhancing women's satisfaction (**Mostafa & Mohamed, 2022**). Furthermore, **Allam (2019)** highlighted the positive effect of the reflexology strategy on the mother's satisfaction.

Conclusion

Depending on the present results, it was concluded that reflexology is a successful non-pharmacological technique that induced lactation earlier, supported the breastfeeding process, and improved postpartum comfort for primiparous mothers who had cesarean deliveries.

Recommendations

Depending on the findings of this study, the following are suggested:

1. Reflexology should be used during postpartum as a non-pharmacological technique to encourage primiparous mothers to breastfeed earlier and boost their postpartum comfort.
2. Primiparous mothers should be equipped with evidence-based knowledge regarding reflexology.
3. Replication of the current study on a larger sample in other settings to confirm and generalize results.

References

- Abd El Fattah, H., Metwaly, S., & Khedr, N., (2015). Outcomes of foot reflexology on the pain and certain features of the labor for the primiparous women. *Life Science Journal*.12 (6), 206-216.
- Academy of Natural Health Sciences (2020): Foot reflexology program. Available at <https://anhhs-school.com/foot-reflexology.html>.
- Afifi OA, Fahmy NM, Omran AAH, Elmoniem OA. (2017). Effect of self-feet reflexology on relieving premenstrual syndrome. *Meno Nurs Jour*. 2 (2), 1 - 19.
- Aksu, S., & Karaca, P. P. (2021). The effect of reflexology on lactation in women who had cesarean section: A randomized controlled pilot study. *Complementary Medicine Research*, 28(4), 336-343.
- Allam, N. A. (2019). Effects of reflexology strategy on the mothers' breast milk volume and their premature weight gain. *Asian Journal of Pediatric Research*, 2(4), 1-14.

- Alqathama, A., Alhomoud, F., Alsadiq, Y., Almeahmadi, A., Fallatah, W., Alharbi, O., ... & Alluqmani, R. (2023). Complementary and alternative medicine from the perspective of pregnant and lactating women. *European Journal of Integrative Medicine*, 58, 102217.
- Anbarasi, E., Kalabarathi, S., & Priya, D. P. (2022). Effectiveness of oxytocin massage on promoting lactation among postpartum mothers at Saveetha medical college and Hospital, Thandalam, Chennai. *Cardiometry*, (25), 197-203.
- Anwar Aly, A., Mohamed Abdelhamed, H., Elsayed Shrief, S., & Tawfik Elmanzalawy, S. (2022). Effect of Foot Massage on Pain and Anxiety Levels among Patients underwent Laparoscopic Cholecystectomy. *Egyptian Journal of Health Care*, 13(3), 605-614.
- Bablad, A. (2021). Cesarean Section in Primiparous Women: A Retrospective Study. *Journal of South Asian Federation of Obstetrics and Gynaecology*, 13(1), 15-17.
- Baljon, K., Romli, M. H., Ismail, A. H., Khuan, L., & Chew, B. H. (2022). Effectiveness of breathing exercises, foot reflexology and massage (BRM) on maternal and newborn outcomes among primigravidae in Saudi Arabia: a randomized controlled trial. *International Journal of Women's Health*, 279-295.
- Basyouni NR, Gohar IE, Zaied NF. (2018). Effect of foot reflexology on post-cesarean pain. *IOSR Jour Nur Heal Sci*. 7 (14): 1 - 19.
- Çankaya, S., & Ratwisch, G. (2020). The effect of reflexology on lactation and postpartum comfort in cesarean-delivery primiparous mothers: A randomized controlled study. *International Journal of Nursing Practice*, 26(3), e12824.
- Capik, A., Özkan, H., & Apay, S. E. (2014). Determination of affecting factors and postnatal comfort levels of postpartum women. *DEUHYO Ed*, 7(3), 186–192.
- Danasu R (2015). Effectiveness of Reflex Zone Therapy on initiation and maintenance of lactation among lactation failure mothers at SMVMCH. *Asi. J. of Nurs*, 5(4).
- Deepthi N. (2018). Effect of reflex zone stimulation on lactation among post-cesarean mothers. *Repositorynmgmu.ac*. 7(4), 1-19.
- Dehghanmehr, S., Sargazi, G. H., Biabani, A., Nooraiein, S., & Allahyari, J. (2019). Comparing the effect of acupressure and foot reflexology on anxiety and depression in hemodialysis patients: A clinical trial. *Medical-Surgical Nursing Journal*, 8(4).
- Dhanalakshmi, N., Dash, M., Chitra, F., Jayanthi, S. (2019). Effectiveness of Reflex Zone Therapy on Pain and Lactation among the Post Caesarean Mothers at selected hospital, Puducherry. *Journal of Nursing Science Practice, Research, and Advancements*, 2(1), 17-24.
- Farag, W. K., Tayel, A. A., & Alam, T. H. (2019). Effect of foot and hand massage on post-cesarean pain intensity and initiation of breastfeeding. *Int J Novel Res Healthc Nurs*, 6(2), 1255-71.
- Hannan, F. M., Elajnaf, T., Vandenberg, L. N., Kennedy, S. H., & Thakker, R. V. (2023). Hormonal regulation of mammary gland development and lactation. *Nature Reviews Endocrinology*, 19(1), 46-61.
- Hassan, I., Ahmed, G., & El-tantawy, F. (2022). EFFECT OF FOOT AND HAND MASSAGE ON RELIVING POST CESAREAN SECTION AFTER PAIN. *Port Said Scientific Journal of Nursing*, 9(2), 334-349.
- Hemalatha, Vimala. (2019). Effectiveness of Reflex Zone Therapy on Lactation Between Normal Vaginal Delivery and Lower Segment Cesarean Section in Tiruvallur Government Hospital at Tiruvallur. *Int Jour Res Eng, Sci, and Management*, 2 (10): 2581 - 92.
- Hamilton BE, Martin JA, Osterman MJK (2022). Births: Provisional data for 2021. *Vital Statistics Rapid Release*; no 20. Hyattsville, MD: National Center for Health Statistics.

- Jensen, D., Wallace, S., & Kelsay, P. (1994). LATCH: a breastfeeding charting system and documentation tool. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 23(1), 27–32.
- Kapıkıran, G., & Özkan, M. (2021). The effect of foot reflexology on pain, comfort and beta endorphin levels in patients with liver transplantation: A randomized control trial. *European Journal of Integrative Medicine*, 45, 101344.
- Karakaplan, S., & Yıldız, H. (2010). A study on developing a postpartum comfort questionnaire. *Maltepe University Journal of Nursing Science and Art*, 3: 55-65.
- Karim, F., Khan, A. N. S., Tasnim, F., Chowdhury, M. A. K., Billah, S. M., Karim, T., ... & Garnett, S. P. (2019). Prevalence and determinants of initiation of breastfeeding within one hour of birth: An analysis of the Bangladesh Demographic and Health Survey, 2014. *PloS one*, 14(7), e0220224.
- Klınçer, C., & Zileli, M. (2006). Visual analog patient satisfaction scale. *Balkan Medical Journal*, 23(3), 113–118.
- Khoonphet, C. (2022). Effects of Southern Thai Traditional Massage and Warm Compression in the Early Postpartum on Lactation and Breast Engorgement Among Primiparous Mothers (Doctoral dissertation, Prince of Songkla University).
- Kotowski, J., Fowler, C., Hourigan, C., & Orr, F. (2020). Bottle-feeding an infant feeding modality: An integrative literature review. *Maternal & child nutrition*, 16(2), e12939.
- Kuguoglu, S., & Karabacak, U. (2008). Turkish version of the General Comfort Questionnaire. *Istanbul University Florence Nightingale School of Nursing Journal*, 16, 16–23.
- Li, C. Y., Chen, S. C., Li, C. Y., Gau, M. L., & Huang, C. M. (2019). Randomized controlled trial of the effectiveness of using foot reflexology to improve quality of sleep amongst Taiwanese postpartum women. *Midwifery*, 27(2), 181–186.
- Logeshwari K, Sumathi G (2014). Effectiveness of reflex zone therapy among primiparas at selected hospitals. *J. of sci.*, 4(12).
- Machhi, N., & Tiwari, A. (2020). Effect of Foot Reflexology on Lactation. *Indian Journal of Public Health Research & Development*, 11(4).
- Mahmoud, O. E. (2022). Effect of Nursing Intervention Program for Women post-Caesarean Section regarding Self-Care on their Psychological status and Postoperative Pain. *Assiut Scientific Nursing Journal*, 10(29), 10-22.
- Mauri, P. A., Contini, N. N. G., Giliberti, S., Barretta, F., Consonni, D., Negri, M., & Di Benedetto, I. (2015). Intrapartum epidural analgesia and onset of lactation: A prospective study in an Italian birth center. *Maternal and Child Health Journal*, 19(3), 511–518.
- Mihaelov, L. (2022). NURSING PROCESS IN THE POSTPARTUM PERIOD AFTER DELIVERY BY CESAREAN SECTION. Doctoral dissertation, scientific Repository of I.Horbachevsky Ternopil National Medical University.
- Mirzaiinajmabadi, K., Makvandi, S., Mirteimoori, M., & Sadeghi, R. (2018). An update on the effect of massage and inhalation aromatherapy with lavender on labor pain relief: A systematic review and Meta-analysis. *Journal of Obstetrics, Gynecology, and Cancer Research*, 3(1), 29- 37.
- Mohammadpour A, Valiani M, Sedeghnia A, Talakoub S. (2018). Investigating the effect of reflexology on the breast milk volume of preterm infant mothers. *Iran J Nurs Midwifery Res*, 23 (5): 371 - 5.
- Mostafa Ahmed, W., & Mohamed Tosson, M. (2022). Effect of Foot Reflexology on Relieving Labor Pain and Enhancing Satisfaction among Parturient Women. *Egyptian Journal of Health Care*, 13(1), 940-957.

- Niven R & Basyouni. (2018). Effect of foot reflexology on post-cesarean pain. *IOSR J. of Nurs. And Hea. Sci.*, 7(4), 1-19.
- Nabi, S., Zahoor, N., & Muzamil, F. (2023). Knowledge, awareness, and practices towards exclusive breastfeeding among lactating mothers in Kashmir, North India: a hospital-based cross-sectional study. *International Journal of Community Medicine and Public Health*, 10(3), 1191.
- Regan, J., Thompson, A., & De Franco, E. (2013). The influence of mode of delivery on breastfeeding initiation in women with a prior cesarean delivery: a population-based study. *Breastfeeding Medicine*, 8(2), 181–185.
- Selvi, N., & İlkay, B. O. Z. (2022). Effects of Reflexology on Postpartum Sleep Quality: A Randomized Controlled Trial. *Akdeniz Hemşirelik Dergisi*, 1(1), 9-18.
- Sharifi, N., Bahri, N., Hadizadeh-Talasaz, F., Azizi, H., Nezami, H., & Tohidinik, H. R. (2022). A randomized clinical trial on the effect of foot reflexology performed in the fourth stage of labor on uterine afterpains. *BMC Pregnancy and Childbirth*, 22(1), 57.
- Simonds, A. H., Abraham, K., & Spitznagle, T. (2022). Clinical practice guidelines for pelvic girdle pain in the postpartum population. *Journal of Women's Health Physical Therapy*, 46(1), E1-E38.
- Sultania, P., Agrawal, N. R., Rani, A., Dharel, D., Charles, R., & Dudani, R. (2019). Breastfeeding knowledge and behavior among women visiting a tertiary care center in India: A cross-sectional survey. *Annals of Global Health*, 85(1).
- Sun, K. W., & Pan, P. H. (2019). Persistent pain after cesarean delivery. *International Journal of Obstetric Anesthesia*, 40, 78-90.
- Sung A. (2019). What is Reflexology? It's more than just a foot massage! [Online]. Jul 17; Available from: URL: <https://www.spafinder.com/blog/healing/reflexology-treatment-benefits/>
- Sung, S., & Mahdy, H. (2022). Cesarean section. In *StatPearls* [Internet]. StatPearls Publishing.
- Tsai, S. S., & Wang, H. H. (2019). Role changes in primiparous women during 'doing the month' period. *Midwifery*, 74, 6-13.
- WHO, 2021. Cesarean section rates continue to rise, amid growing inequalities in access. <https://www.who.int/news/item/16-06-2021-caesarean-section-rates-continue-to-rise-amid-growing-inequalities-in-access>.