DOI: https://doi.org/10.46811/apjnh/9.2.4

Empowering Post-Cesarean Breastfeeding: A Dual-Intervention Protocol for Flat Nipples and lactation massage via Breastfeeding Tracker Application

Suryani Hartati[1]*, Sofwatunnisa[2], Musripah[3]

[1]Nursing Study Program, Hermina Health Institute, Indonesia

**Correspondence*

Suryani Hartati

Nursing Study Program, Hermina Health Institute, Indonesia.

E-mail: suryanihartati4@gmail.com

Abstract

Cesarean section may lead to delayed breast milk production due to postoperative pain, anesthesia effects, and limited maternal mobility. Inverted nipples can further aggravate this condition. They interfere with infant latch and can result in suboptimal breast stimulation, inadequate milk production, and poor milk ejection. This study aimed to describe the use of the Hoffman technique and breast massage to improve breast milk production. The Breastfeeding Tracker application was used for monitoring in post-cesarean section mothers with inverted nipples. This study used a descriptive design with a case study approach using postpartum nursing care carried out for post-SC mothers at Hermina Hospital, Depok, from April 6 to 8, 2026. The nursing diagnosis was ineffective breastfeeding related to inverted nipples. The intervention included the Hoffman technique and breast massage to stimulate the release of prolactin and oxytocin. This aimed to enhance milk production and ejection. Monitoring, conducted using the Breastfeeding Tracker application, objectively documented lactation progress. By the third day, evaluation showed an increase in milk production from 0 mL to 2 mL, indicated by visible milk ejection. The infant's ability to breastfeed also improved. This was demonstrated by a better latch, more effective sucking and swallowing reflexes, a 10–15 minute feeding duration, and a calm state after breastfeeding. In conclusion, the Hoffman technique and breast massage are effective in improving breast milk production and breastfeeding performance in post-cesarean section mothers. Nurses are recommended to use these interventions and the Breastfeeding Tracker application for continuous lactation monitoring.

Keywords: Cesarean section, inverted nipples, ineffective breastfeeding, Hoffman technique, breast massage, Breastfeeding Tracker.

Introduction

A Caesarean Section (CS) delivery is a surgical procedure performed by making an incision in the mother's abdominal wall and uterus to deliver the fetus when vaginal delivery is not possible or poses a high risk to the safety of the mother or fetus. This procedure is undertaken based on specific maternal or fetal medical indications. One fetal indication that requires immediate surgical intervention is an abnormal fetal position or lie, such as an oblique lie[1].

World Health Organization data show that Caesarean section deliveries account for around 21% of total births worldwide and are projected to rise by 2030 to 29% [2]. WHO In Indonesia, the results of the Indonesia Health Survey [3] SKI recorded a Cesarean section delivery rate of 25.9%, with fetal malpresentation accounting for 3% of the indications [4]. The research results of [5] show that as many as 82% of mothers with the SC delivery method experienced problems with the smooth production of breast milk. Post-Caesarean Section patients often experience postoperative pain that triggers an increase in the hormones cortisol and adrenaline. These hormones act as inhibitors that hinder the action of the hormone oxytocin, thereby disrupting the breast milk ejection reflex (let-down reflex) and inhibiting the lactogenesis. This obstacle is further exacerbated if the mother has pathological breast conditions, such as inverted nipples or flat nipples that risk preventing the baby's latch-on process. As a result, the baby's sucking stimulation becomes less effective, and the release of colostrum and breast milk is significantly delayed, especially during the first 24–72 hours postpartum. One of the main physical interventions to address the structural problem of inverted nipples is the Hoffman technique. The advantage of the Hoffman technique lies in its non-pharmacological method, cost efficiency, and its ability to mechanically break adhesions beneath the areola to stretch smooth muscle tissue so that the nipple protrudes more [6].

Efforts to improve breastfeeding success in this digital era are no longer limited to conventional approaches; currently, the [7] has developed digital breastfeeding teleconsultation platforms, one of which is through self-recording applications such as Breastfeeding Tracker. The advantage of this application is that it provides an objective, real-time, and accurate monitoring platform through recording the volume, duration, and frequency of breastfeeding, thereby increasing mothers' independence (self-care). Although the effectiveness of the Hoffman technique, lactation massage, and digital monitoring applications has been widely studied separately, there is still a clear research GAP in the current nursing literature. The purpose of this study to present a comprehensive clinical overview of the effectiveness of implementing a combination of the Hoffman technique and lactation massage in addressing ineffective breastfeeding problems in post-cesarean section patients.

LITERATURE REVIEW

Cesarean Section (CS) delivery is performed based on certain maternal or fetal indications to prevent complications that may threaten the safety of the mother and baby. Some indications for performing a Cesarean Section include CVD, placenta previa, fetal distress, twin pregnancy, breech presentation, as well as fetal malposition such as transverse or oblique lie [8]. Post-Cesarean section patients are clinically vulnerable to experiencing various severe barriers in the process of initiating early breastfeeding. The emergence of complaints of severe pain at the surgical incision site, limitations in physical mobility, residual effects of anesthetic agents, physical fatigue, and postpartum emotional stress can physiologically inhibit the process of lactogenesis and the secretion of the hormones prolactin and oxytocin [9].

Implementation for postpartum mothers with Caesarean Section experiencing breastfeeding problems can be carried out with the Hoffman technique and lactation massage. The Hoffman technique is performed by placing the thumb and index finger at the base of the nipple, pressing into the tissue, then pulling them apart. Research by [6] states that administering the Hoffman technique for 4 days after childbirth affects changes in nipple shape. Based on the research results of [10], lactation massage affects the breast milk production of postpartum mothers who underwent Caesarean section, with the results showing that before the intervention, breast milk production was 2.73 mL and after the intervention it increased to 28.73mL on the fifth day.

To measure the success of the intervention, special monitoring is needed, one of which is using a breastfeeding tracker application [11] . This is a technology-based innovation that functions to monitor and evaluate the breastfeeding process by recording the frequency, duration, and patterns of infant breastfeeding. This application works with a self-tracking system that allows mothers to record breastfeeding activities, which are then analyzed by the system to provide feedback in the form of recommendations and reminders. This is supported by research [5] that the use of breastfeeding applications can increase the success of exclusive breastfeeding, boost mothers' self-confidence, and prevent postpartum depression.

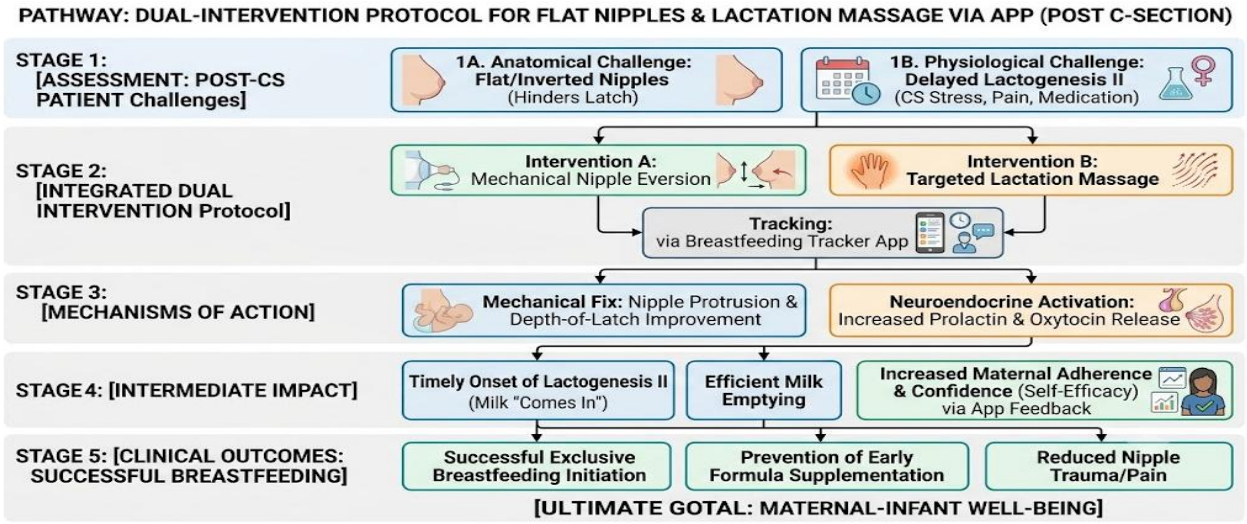

Figure 1: Dual Intervention Protocol for Flat Nipples & Lactation Massage Via App

Sumber : [8,9,11,12, 13]; [9]
Row 1: Assessment: The chart begins with the unique challenges of post-Cesarean section patients (surgical stress, pain, risk of Delayed Lactogenesis), along with the anatomical challenge of flat nipples. [12, 13];
Row 2: Dual Intervention & App: Displays two main interventions: Nipple Eversion Correction and Lactation Massage. Both interventions are actively tracked (Logged) and guided (Guided) through the Breastfeeding TrackerApplication [11]
Row 3: Mechanisms of Action: This section shows how this protocol works. Nipple eversion mechanically improves latch. Massage triggers nerve stimulation to release the hormones Prolactin and Oxytocin (Neuroendocrine). [8,9]
Row 4 & 5: Impact & Outcomes: The synergy of these mechanisms leads to accelerated abundant breast milk production (Lactogenesis II), prevention of early formula feeding, and increased maternal self-confidence(Figure 1).

METHOD

Research Design

This study uses a descriptive research design with a clinical case study method. The participant who was the subject of this study was a postpartum mother after a Caesarean section. The inclusion criteria for subjects comprised first- and second-day post-Caesarean section patients who encountered the nursing issue of ineffective breastfeeding, presented with the anatomical condition of inverted nipples, and expressed their willingness in writing to engage fully in lactation nursing care. The research location is in the Kamala Room on the 3rd floor of Hermina Jatinegara Hospital on April, 2026. Data collection was carried out through direct interviews with patients and families, observation of the patient's condition, physical examination of the patient, and data collection from medical records. (https://afya-ikn.herminahospital.com This research has also received permission from Hermina Hospital.

Population and the methods of sampling Instrumentation (sample of questions, scoring method, and psychometric properties (validity and reliability))
This research employed a case study design using non-probability purposive sampling, focusing on patients who met all the required clinical criteria. The clinical data collection instruments included a maternity nursing assessment form, the LATCH breastfeeding attachment scale observation sheet, a breast pump or syringe to measure colostrum volume (in milliliters), and a smartphone equipped with the "Breastfeeding Tracker" application for the objective recording of daily lactation data.
Procedures and if relevant, the time frame
This study was conducted in the maternal inpatient ward of the hospital. The intervention and data collection took place over a three-month period, from April to July 2026. The nursing procedure was performed twice dail in the morning and afternoon with each session lasting approximately 15 minutes. The procedure begins with the Hoffman technique, which involves placing both thumbs on opposite sides of the areola, pressing inward into the breast tissue, and then stretching the tissue outward both horizontally and vertically to stimulate the protrusion of an inverted nipple. This is followed by a lactation massage, which involves gentle massage of the neck, back (oxytocin massage), and breasts (using a circular motion)to stimulate the release of prolactin and oxytocin. After each intervention session, the patient is guided to record the frequency of breastfeeding and the volume of expressed breast milk in the Breastfeeding Tracker app. Data analysis was conducted using a descriptive-narrative approach, comparing the progression of the patients' clinical conditions at baseline (pre-intervention) and following the intervention on the first, second, and third days. Trends in the increase of recorded breast milk volume and breastfeeding duration were analyzed. Ethical research principles were strictly adhered to throughout the study, ensuring the provision of informed consent, the guarantee of anonymity, and the observance of the principles of beneficence and justice for the research subjects.

RESULTS AND DISCUSSION

Results

Clinical Data Assessment and Analysis
The initial nursing assessment for Mrs. E was conducted on April 6, 2026 (Post-Cesarean Day 1). Anamnesis revealed that the patient had not yet produced any breast milk, despite expressing a strong desire to exclusively breastfeed her infant. Physical examination of the breasts showed that both nipples were inverted; palpation indicated the breast tissue remained soft, and there were no visible signs of colostrum leakage or secretion. Clinical Data Assessment and Analysis. Based on the data analysis, the priority nursing diagnosis formulated by the researcher—in accordance with the Indonesian Nursing Diagnosis Standards—is Ineffective Breastfeeding, related to an inadequate oxytocin reflex and anatomical barriers in the form of inverted nipples.

Implementation of Nursing Interventions and Evaluation

The nursing care plan was implemented over a period of three days, integrating the Hoffman technique, lactation massage, and digital lactation tracking. Progress regarding breastfeeding success indicators was evaluated and recorded on a daily basis, as presented in Table 1.

Table 1: Clinical Progression of Breast Milk Production and Breastfeeding Ability

No	Day / Date	Breast Milk Output (Volume)	Nipple & Breast Characteristics	Baby's Suction & Latch Ability
1	Day-1	0 mL (It hasn't come out at all yet)	Inverted nipples, soft-feeling breasts, colostrum (-)	The baby is unable to achieve an effective latch and has a weak suck.
2	Day-2	± 0,3 mL	The nipples begin to protrude after stimulation, and the breasts begin to feel firm.	Attachment improves, the baby begins to be able to suck rhythmically.
3	Day-3	± 2,0 mL (Breast milk appears to be spraying)	Persistent protruding nipples, firm breasts, smooth milk flow when expressed	Strong/adequate latch, effective breastfeeding duration of 10–15 minutes, baby calm.

Based on records compiled from the statistical graph data of the Breastfeeding Tracker application, there was an upward trend in breastfeeding frequency from initially only 1-2 passive latching attempts on the first day, increasing to 6-8 effective breastfeeding sessions on the third day. Breast milk volume showed a progressive increase from the absence of fluid to a volume sufficient to meet the initial needs of the newborn, accompanied by the baby's calmness after breastfeeding.

Discussion

Nursing Care for Post-Caesarean Section Cases

The Cesarean Section (CS) surgical procedure carries its own physiological consequences for the lactation response of a postpartum mother [1]. Major surgery in the abdominal area causes significant tissue trauma, which then manifests as complaints of acute postoperative pain [5]. This pain condition stimulates the release of stress hormones such as cortisol and adrenaline through the hypothalamic pathway.Biochemically, high levels of stress hormones in the mother's blood act as natural inhibitors of the secretion of the hormone prolactin from the anterior pituitary gland and the hormone oxytocin from the posterior pituitary. As a result, the lactogenesis II phase, characterized by a dramatic increase in breast milk production, often experiences obstruction or a delayed onset in the first 24 hours. This case is complicated by the mechanical obstruction of inverted nipples (inverted nipples); inverted nipples can prevent the sensory nerve endings in the breast from receiving adequate tactile stimulation from the baby's mouth, thereby functionally disrupting the prolactin-oxytocin circulation reflex pathway

Effectiveness of a Combined Hoffman Technique and Digital App-Based Lactation Massage

Consistent application of the Hoffman technique has been proven to provide a very good mechanical effect in stretching the fibrous tissue attachments that pull the nipple inward into the breast. Regular pressure and pulling on the areolar area are able to loosen the contraction of the breast's supporting tissue, thereby gradually bringing the nipple to project outward. When the anatomical structure of the nipple has been successfully corrected, the baby can achieve the correct latch-on position, in which the nipple is positioned deep within the baby's soft palate. The success of this anatomical correction is then synergized with lactation massage. Lactation massage, which includes stimulation of the vertebral column area and the breasts, works by sending afferent sensory impulses to

the supraoptic and paraventricular tracts in the hypothalamus.This mechanical stimulation triggers the massive release of the hormone oxytocin into the bloodstream, which stimulates the contraction of the myoepithelial cells surrounding the mammary alveoli. This process triggers the let-down reflex, causing the colostrum and breast milk that have been produced within the alveolar lumen to be smoothly propelled out through the lactiferous ducts. This underlies the clinical finding in the mother, where on the third day the breast milk was observed to be able to spray out.

The utilization of digital technology in the form of the Breastfeeding Tracker application makes a crucial contribution to modern nursing care management (rehabilitative). Through the visualization of daily graph data on the frequency and volume of breast milk, patients receive positive reinforcement feedback (positive reinforcement). Seeing the graph showing an increase in breast milk production from ±0.3 mL to ±2 mL has been visually proven to reduce mothers' psychological anxiety, increase self-confidence (maternal self-efficacy), and suppress cortisol production, which ultimately facilitates the secretion of endogenous oxytocin. The combination of physical interventions and digital lactation monitoring technology has proven effective in comprehensively addressing the nursing problem of ineffective breastfeeding.

CONCLUSION

The combination of nursing interventions specifically the Hoffman technique and lactation massage demonstrated positive clinical outcomes in addressing ineffective breastfeeding in a post-Caesarean mother with inverted nipples. Over a three-day implementation period, these interventions led to progressive nipple protrusion, improved breast softness, enhanced infant latching and sucking abilities, and an increase in breast milk production from 0 mL on Day 1 to approximately 0.3 mL on Day 2 and 2.0 mL on Day 3, accompanied by visible milk ejection. By the third day, the infant exhibited an effective latch, proper sucking and swallowing patterns, a feeding duration of 10–15 minutes, and a calm demeanor post-feeding.

Furthermore, integrating lactation monitoring via the "Breastfeeding Tracker" digital application facilitated accurate, objective, and systematic recording of breastfeeding frequency, duration, and milk volume, enabling continuous evaluation of lactation progress. Visualizing this development may also provide positive feedback that enhances maternal motivation, confidence, and self-efficacy. Overall, combining the Hoffman technique, lactation massage, and digital lactation monitoring represents a promising nursing approach for post-Caesarean mothers experiencing ineffective breastfeeding due to inverted nipples. However, given that this study employed a descriptive single-patient case design, further research with larger sample sizes and controlled methodologies is needed to confirm the effectiveness and generalizability of these interventions.

REFERENCES

1. Indryani, Asuhan Kebidanan Persalinan Dan Bayi Baru Lahir. Maros: Cv. Sarana Ilmu Indonesia, 2024.
2. Who, “Cesarean Section Rates Continue T O 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#:~:Text=Caesarean Sections Can B E Essential,Surgeries%2c They Can Have Risks.
3. Ski, “Survei Kesehatan Indonesia (Ski),” 2023.
4. Kemenkes Ri, “Laporan Survei Kesehatan Indonesia (Ski) 2023,” Jakarta, 2023.
5. Y. P. Widiastuti And R. P. Jati, “Kelancaran Produksi Asi Pada Ibu Post Partum Dengan Operasi Sesar,” Jurnal Keperawatan Dan Kesehatan Masyarakat Cendekia Utama, 2020;9(3): Doi: 10.31596/Jcu.V9i3.633.
6. H. Lacey, N. Jain, And I. C. C. King, Hoffman’s Exercise For Breastfeeding Support Among Postnatal Mothers With Nipple Defects: A Scoping Review And Exploratory Meta-Analysis, Breast J., Vol. 2026, No. 1, Jan. 2026, Doi: 10.1155/Tbj/2162565.
7. Kemenkes Ri, “Telekonseling Menyusui,” Kementrian Kesehatan Indonesia.
8. M. Brockway, K. Benzies, And K. A. Hayden, Interventions To Improve Breastfeeding Self-Efficacy And Resultant Breastfeeding Rates: A Systematic Review And Meta-Analysis, Journal of Human Lactation, Aug. 2017; 33(3):486-499.
9. N. Agustia And R. Camelia, “Effect Of Lactation Massage And Oxytocin Massage On Milk Production In Postpartum Women: A Quasi-Experimental Study,” Lentera Perawat, 2026;6(2):355–361.
10. A. B. C. Romadhoni, A. Prastyoningsih, And D. E. Widyastuti, “Efektivitas Lactation Massage Terhadap Kelancaran Produksi Asi

Pada Ibu Nifas," Jurnal Kesehatan Kusuma Husada, 2023;14(1):67–72.

11. K. Dienelt, C. J. Moores, J. Miller, and K. Mehta. An Investigation Into The Use of Infant Feeding Tracker Apps By Breast feeding Mothers, Health Informatics J., 2020;26(3):1672–1683.
12. W. Lian, J. Ding, T. Xiong, J. Liuding, and L. Nie, "Determinants Of Delayed Onset Of Lactogenesis Ii Among Women Who Delivered Via Cesarean Section At A Tertiary Hospital In China: A Prospective Cohort Study," Int. Breastfeed. J., 2022; 17(1): Doi: 10.1186/S13006-022-00523-3.
13. M. Nabulsi, R. Ghanem, M. Abou-Jaoude, And A. Khalil, "Breastfeeding Success With The Use of The Inverted Syringe Technique For Management of Inverted Nipples In Lactating Women: A Study Protocol For A Randomized Controlled Trial," Trials, 2019;20(1):737.

Source of Support: Nil
Conflict of Interest: Nil