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The Relationship between Post-Cesarean Section Pain Intensity and Breast Milk Production in Postpartum Mothers

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ABSTRACT

Introduction: Post-cesarean pain is a common post-operative condition that may interfere with early breastfeeding initiation and continuation. Pain can inhibit oxytocin release, disrupt the let-down reflex, and ultimately reduce breast milk production. In addition, maternal discomfort may limit early mobilization and mother–infant interaction, further affecting lactation success. This study is aimed to examine the relationship between post-cesarean section pain intensity and breast milk production.

Methods: A quantitative analytic correlational study with a cross-sectional design. From a population of 54, a sample of 36 respondents was selected using purposive sampling based on the Slovin formula. Pain intensity was measured using the Numeric Rating Scale (NRS), while breast milk production was assessed using a closed-ended questionnaire. Data were analyzed using Binary Logistic Regression.

Results: Most respondents were aged 20–35 years, had secondary education, were housewives, and were multiparous. The majority experienced moderate pain and had adequate breast milk production. Binary logistic regression analysis demonstrated a significant association between post-cesarean pain intensity and breast milk production (OR = 0.266; 95% CI: 0.072–0.981; p = 0.047), indicating that higher pain intensity was associated with reduced likelihood of adequate breast milk production.

Conclusion: Post-cesarean pain intensity was significantly associated with breast milk production, with higher pain intensity linked to lower odds of adequate milk production. These findings highlight the importance of effective pain management and supportive midwifery care, including early mobilization, breastfeeding assistance, and continuous

postpartum monitoring to optimize lactation outcomes.

Keywords: Breast Milk Production, Breastfeeding, Pain Intensity, Post-Cesarean Section, Postpartum Mothers

INTRODUCTION

Exclusive breastfeeding and proper breastfeeding practices are essential strategies for developing high-quality human resources, as breast milk is the first and primary source of nutrition before infants are introduced to solid foods (Irawan, 2018; Sari and Sunarsih, 2020).

The benefits of breastfeeding for mothers extend beyond fostering emotional bonding; it also reduces postpartum hemorrhage, accelerates maternal recovery, delays subsequent pregnancies, lowers the risk of breast cancer, and promotes a sense of well-being in mothers (Ginting et al., 2019). However, breastfeeding rates remain below the levels required to adequately protect the health of women and children globally. During the 2013–2018 period, only 43% of newborns initiated breastfeeding within the first hour after birth, and merely 41% of infants under six months of age were exclusively breastfed. Meanwhile, approximately 70% of women continued breastfeeding for at least one year. By the age of two years, the breastfeeding rate declined to 45% (UNICEF and WHO, 2019).

In Indonesia, the rate of exclusive breastfeeding has shown a consistent upward trend, reaching 66.4% in 2024, an increase from 52% in 2017. Despite this improvement, the coverage has not yet met the global targets. At the provincial level, East Java has achieved an exclusive breastfeeding coverage rate of 74%. Specifically, in Lamongan Regency, the coverage of exclusive breastfeeding in 2023 reached 75.9%, which remains slightly below the national target of 80%. These figures indicate that further interventions are still required to enhance mothers' knowledge, skills, and support systems to enable the optimal practice of exclusive breastfeeding (UNICEF and WHO, 2019).

A decline in breastfeeding rates among infants can be influenced by maternal psychological conditions, such as stress, lack of self-confidence, sadness, anxiety, and various forms of emotional tension. These conditions may inhibit the function of the prolactin and oxytocin hormonal systems, both of which play critical roles in the secretion and regulation of breast milk. Consequently, emotional distress can lead to a reduction in breast milk volume and, in severe cases, may result in the complete cessation of milk production (Salat, 2019).

Mothers who undergo cesarean section often experience delays in the initiation of breastfeeding. The effects of anesthesia may further delay the onset of lactation. Additionally, post-operative abdominal incisions and pain associated with surgical wounds often lead mothers to prioritize rest and physical recovery before initiating breastfeeding (Aidha, 2019).

Several studies have shown that mothers who undergo cesarean section delivery are less likely to initiate breastfeeding early and tend to have poorer breastfeeding outcomes compared to mothers with vaginal delivery. A systematic review and meta-analysis reported that cesarean section delivery was

associated with a 79% lower likelihood of timely breastfeeding initiation (OR = 0.21; 95% CI: 0.16–0.28). In Ethiopia, mothers who delivered by cesarean section were four times more likely to experience delayed breastfeeding initiation compared to vaginal delivery (AOR = 4.06; 95% CI: 2.66–6.20). Another study in Canada found that mothers with planned cesarean sections were more likely not to initiate breastfeeding (4.3%) compared to mother with vaginal delivery (1.8%) (Kusuma et al., 2023)

Based on a preliminary survey conducted in the Melati Ward of RSUD Dr. Soegiri Lamongan, among 20 mothers who delivered by cesarean section, 5 mothers (25%) experienced inadequate or delayed breast milk production. These findings indicate that problems related to breast milk production among post-cesarean mothers are still commonly encountered. Postoperative pain following cesarean section may contribute to discomfort, limited maternal mobility, and impaired breastfeeding processes, which can ultimately affect the smoothness of breast milk production. Therefore, it is important to further investigate the relationship between post-cesarean pain intensity and breast milk production in postpartum mothers undergoing cesarean delivery.

Post-operative pain following cesarean section is generally classified as moderate to severe, which can delay recovery and prolong hospital stays. High pain scores during the early post-operative period have also been associated with the development of chronic pain. Pain management in post-cesarean patients differs from that of other surgical procedures, particularly because women require a faster recovery to adequately care for their newborns (Artana, 2019).

Therefore, this study is aimed to examine the relationship between post-cesarean section pain intensity and breast milk production in postpartum mothers who underwent cesarean delivery.

METHOD

This study used a quantitative approach with an analytic correlational design and a cross-sectional method, in which the independent and dependent variables were measured simultaneously (Swarjana, 2015; Made, 2021; Nurdin & Hartati, 2019). The independent variable was post-cesarean pain intensity, while the dependent variable was breast milk production.

The population in this study consisted of all mothers who delivered via cesarean section during the period of November to December 2025, totalling 54 mothers.

The sample size was determined using purposive sampling and determined by the Slovin formula. Based on this calculation, a total of 36 respondents were included in the study.

The inclusion criteria in this study were mothers in the first to third day postpartum following cesarean section, those who were willing to participate as respondents, those who were able to read, write, and hear, and those who practiced rooming-in with their infants. The exclusion criteria included mothers with post-cesarean complications, such as hemorrhage, sepsis, uterine rupture, and other related conditions, as well as mothers who provided formula milk to their infants.

Data were collected using a structured pain scale questionnaire and a questionnaire to assess breast milk production. The pain instrument employed

a Numerical Rating Scale (NRS) ranging from 0 to 10, where respondents rated their perceived pain intensity. The scores were then categorized into no pain (0), mild (1–3), moderate (4–6), and severe (7–10), and subsequently coded as 0, 1, 2, and 3, respectively, to facilitate statistical analysis. Breast milk production was measured using an observation sheet consisting of maternal and infant indicators. The scoring was based on the number of fulfilled indicators, where breast milk production was categorized as adequate if ≥3 infant indicators and ≥3 maternal indicators were met, and inadequate if <3 indicators were fulfilled in either category. The total scoring was calculated by summing the observed indicators, and the final category was determined based on the predefined cut-off points for adequate and inadequate breast milk production.

Primary data were collected directly from respondents after obtaining official permission from the hospital and ethical clearance from the Ethics Committee. Eligible participants were identified based on the inclusion criteria, and the study procedures were clearly explained before written informed consent was obtained. Data were collected using self-administered questionnaires to assess pain intensity and breast milk production. The confidentiality and anonymity of all participants were strictly maintained throughout the study. Participants had the right to withdraw from the study at any time without any consequences to their care.

Data were analyzed using IBM SPSS statistics version 25.0. Univariate analysis was performed to describe respondent characteristics and the distribution of the study variables, while binary logistic regression analysis was conducted to examine the association between post-cesarean pain intensity and breast milk production. Results were reported as regression coefficients (B), odds ratios (OR), 95% confidence intervals (CI), and p-values. Statistical significance was set at $p < 0.05$.

Ethical approval for this study was obtained from the Ethics Committee of RSUD dr. Soegiri, Lamongan (No. 000.9.2/157.38/413.209/2025). All participants provided written informed consent after being fully informed about the study's purpose, procedures, risks, and benefits. Confidentiality and anonymity were ensured throughout the research process.

RESULTS

Univariate analysis was performed to describe the characteristics of the respondents and the distribution of the study variables. The results presented in Table 1 indicate that most respondents were aged 20–35 years, had senior education, were housewives, and were multiparous.

Tables 2 shows that most respondents experienced moderate pain (52.8%), followed by mild (27.8%) and severe pain (19.4%). In terms of breast milk production, the majority of mothers had adequate production (75%), while 25% experienced inadequate milk production. These findings indicate that moderate pain was the most common pain intensity, while most respondents were still able to achieve adequate lactation.

Table 3 presents the cross-tabulation between post-cesarean pain intensity and

breast milk production among mothers undergoing cesarean delivery. Among mothers with mild pain, the proportion with adequate breast milk production (25.0%) was higher than that with inadequate production (2.8%). Similarly, in the moderate pain group, adequate breast milk production (41.7%) was more prevalent than inadequate production (11.1%). In contrast, among mothers with severe pain, the proportion of inadequate breast milk production (11.1%) exceeded that of adequate breast milk production (8.3%). Overall, the cross-tabulation indicates a tendency for the proportion of adequate breast milk production to decrease as post-cesarean pain intensity increases.

Following the univariate analysis, which described the distribution of study variables using frequencies and percentages, bivariate analysis was conducted using Binary Logistic Regression to examine the association between post-cesarean pain intensity and breast milk production.

As presented in Table 4, the binary logistic regression model was expressed as $\ln[p/(1-p)] = 3.823 - 1.324X$, where p represents the probability of achieving adequate breast milk production and X represents post-cesarean pain intensity. The analysis showed that post-cesarean pain intensity was significantly associated with breast milk production ($p = 0.047$). The negative regression coefficient ($B = -1.324$) indicates that increasing pain intensity was associated with a decrease in the likelihood of achieving adequate breast milk production.

Table 1. Demographic Data of Responden

Variable	n	(%)
Age		
< 20	1	2.78%
20-35	26	72.22%
> 35	9	25%
Total	**36**	**100%**
Education		
Middle	6	16.67%
Senior	21	58.33%
Bachelor	9	25%
Total	**36**	**100%**
Occupation		
Housewife	25	69.44%
Civil Servant	6	16.66%
Private Employee	5	13.9%
Total	**36**	**100%**
Parity		
Primapara	6	16.66%
Multipara	30	83.34%
Grand-multipara	0	0%
Total	**36**	**100%**

Table 2. The Distribution of Respondents Based on Pain Intensity and Breast Milk Production

Variable	n	(%)
Pain Intensity		
Mild	10	27.8%
Moderate	19	52.8%
Severe	7	19.4%
Total	**36**	**100%**
Breast Milk Production		
Adequate	27	75%
Inadequate	9	25%
Total	**36**	**100%**

Table 3. Cross-Tabulation of Post-Cesarean Pain Intensity and Breast Milk Production Among Mothers Undergoing Cesarean Delivery

Pain Intensity	Breast Milk Production			
	Inadequate	(%)	Adequate	(%)
Mild	1	2.8%	9	25.0%
Moderate	4	11.1%	15	41.7%
Severe	4	11.1%	3	8.3%
Total	**9**	**25%**	**27**	**75%**

Table 4. Binary Logistic Regression Analysis of Post-Cesarean Pain Intensity on Breast Milk Production

Variable	B	Sig	Exp(B)	95% CI	
				Upper	Lower
Pain Intensity	-1.324	.047	.266	.072	.981
Constant	3.823	0.011	45.739	-	

The odds ratio (OR = 0.266; 95% CI: 0.072–0.981) further demonstrated that mothers with higher pain intensity had lower odds of adequate breast milk production compared with those experiencing lower pain intensity. Conversely, mothers with lower pain intensity were approximately 3.76 times more likely to achieve adequate breast milk production.

The model explained 18.1% of the variation in breast milk production (Nagelkerke R^2 = 0.181), indicating that post-cesarean pain intensity contributed to breast milk production but accounted for only a limited proportion of its variability.

DISCUSSION

The findings showed that most respondents experienced moderate post-cesarean pain. Postoperative pain following cesarean section is a common physiological response resulting from tissue injury, inflammatory processes, and uterine involution during the postpartum period. According to the International Association for the Study of Pain (IASP), pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Following cesarean delivery, pain may arise from the surgical incision, manipulation of abdominal tissues, and uterine contractions as the uterus returns to its pre-pregnancy size (Kintu et al., 2019). The predominance of moderate pain observed in this study is consistent with previous studies reporting that post-cesarean mothers commonly experience mild to moderate pain during the early postpartum period (Ahmad & Taufik, 2021; Hussen et al., 2022).

In the authors' opinion, the predominance of moderate pain may be influenced by respondents' characteristics. Most participants were aged 20–35 years, had secondary education, were housewives, and were multiparous. Women within the optimal reproductive age range generally demonstrate better physiological adaptation and postpartum recovery than younger or older mothers

(Cunningham et al., 2022). Furthermore, previous childbirth experience among multiparous women may improve coping abilities, reduce anxiety, and enhance psychological preparedness for postoperative discomfort, resulting in lower perceived pain intensity (Lowdermilk et al., 2020). Educational attainment may also contribute to better understanding of postoperative care and pain management strategies, thereby facilitating more effective pain control. These factors may explain why most respondents in the present study experienced moderate rather than severe pain following cesarean delivery.

The present study found that most post-cesarean mothers had adequate breast milk production. This finding indicates that despite undergoing cesarean delivery, the majority of respondents were able to establish effective lactation during the postpartum period. According to lactation theory, breast milk production is primarily regulated by the hormones prolactin and oxytocin. Prolactin is responsible for milk synthesis in the mammary glands, whereas oxytocin facilitates milk ejection through the let-down reflex (Wambach & Spencer, 2021).

Breastfeeding success is influenced by several maternal and environmental factors, including previous breastfeeding experience, maternal self-confidence, and social support. Mothers with previous breastfeeding experience (multiparous mothers) generally demonstrate better adaptation to breastfeeding and a smoother onset of lactation than first-time mothers. Supporting this finding, Piesesha et al. (2018) reported that primiparous mothers were 7.277 times more likely to experience delayed onset of lactation compared with multiparous mothers. Earlier initiation of lactation may facilitate more effective breastfeeding and contribute to improved lactation outcomes during the postpartum period.

Furthermore, support from healthcare providers and family members has been identified as an important factor in promoting successful breastfeeding through emotional support, breastfeeding education, and practical assistance (World Health Organization [WHO], 2017).

In the authors' view, the predominance of adequate breast milk production in this study may have been facilitated by favorable maternal characteristics and supportive postpartum care. Most respondents were within the optimal reproductive age range, had previous childbirth experience, and possessed adequate educational backgrounds, all of which may enhance maternal confidence, breastfeeding self-efficacy, and understanding of lactation practices. In addition, support from healthcare providers and family members may have contributed to successful breastfeeding practices, thereby promoting adequate breast milk production during the early postpartum period.

The main finding of this study was the significant association between post-cesarean pain intensity and breast milk production. Binary logistic regression analysis demonstrated that mothers with higher pain intensity had significantly lower odds of achieving adequate breast milk production than those experiencing lower pain intensity ($p = 0.047$; OR = 0.266; 95% CI: 0.072–0.981). These findings indicate that post-cesarean pain intensity is an important factor influencing

lactation outcomes among postpartum mothers.

This finding is consistent with the physiological theory of lactation, which emphasizes the essential roles of prolactin and oxytocin in milk synthesis and milk ejection. Postoperative pain and stress can activate the sympathetic nervous system and increase the secretion of stress hormones such as cortisol and catecholamines, thereby inhibiting oxytocin release and disrupting the milk ejection (let-down) reflex (Uvnäs-Moberg et al., 2020; Wambach & Spencer, 2021). Consequently, mothers experiencing greater postoperative pain may encounter difficulties in breastfeeding due to reduced milk transfer and breastfeeding effectiveness. Furthermore, pain may limit maternal movement, decrease breastfeeding frequency, increase maternal fatigue, and interfere with mother–infant interaction, all of which can negatively affect lactation outcomes (Kusuma et al., 2023). These findings are in line with previous studies reporting that effective pain management following cesarean delivery is associated with improved breastfeeding success and a greater likelihood of achieving adequate breast milk production (Sari, 2022; Novianti, 2021; Rahmawati, 2023).

In the authors' opinion, the significant relationship observed in this study reflects the complex interaction between physiological and psychological processes during the postpartum period. Mothers experiencing lower pain intensity are generally more comfortable during breastfeeding, more willing to perform early mobilization, and better able to maintain frequent breastfeeding sessions, all of which support optimal lactation (Kusuma et al., 2023; Sari, 2022). This relationship may also be influenced by maternal characteristics identified in this study, including optimal reproductive age, adequate educational background, non-physically demanding occupations, and multiparity, which may enhance postpartum recovery, breastfeeding readiness, and maternal confidence (Cunningham et al., 2022; Lowdermilk et al., 2020). However, the Nagelkerke R^2 value of 0.181 indicates that pain intensity explained only a limited proportion of the variability in breast milk production. This finding suggests that breast milk production is a multifactorial process that cannot be explained solely by pain intensity. Other factors, including maternal psychological well-being, hormonal regulation, breastfeeding technique, early initiation of breastfeeding, skin-to-skin contact, and support from healthcare providers and family members, may also contribute substantially to lactation success (Wambach & Spencer, 2021; World Health Organization [WHO], 2017). Prior research has demonstrated that early initiation of breastfeeding and continuous mother-infant contact play a crucial role in stimulating prolactin and oxytocin, which play important roles in milk synthesis and improving milk production (Lestari, 2021; Wahyuni, 2020; Febrianti, 2022). Therefore, comprehensive post-cesarean care should incorporate effective pain management, breastfeeding assistance, maternal education, early mobilization, and continuous family support to optimize breastfeeding outcomes and promote successful lactation.

CONCLUSION

In conclusion, this study demonstrates that post-cesarean pain intensity is significantly associated with breast milk production among postpartum mothers. Lower levels of pain are linked to more optimal lactation outcomes, highlighting the important role of effective pain management in supporting the breastfeeding process.

The study also indicate that favorable maternal characteristics—such as optimal reproductive age, adequate education, non-physically demanding occupations, and prior childbirth experience—contribute to both lower pain perception and improved lactation. In addition, appropriate clinical management, including analgesic administration, early mobilization, and lactation support, further enhances breastfeeding success.

Therefore, comprehensive and timely pain management, combined with adequate breastfeeding guidance and supportive care environments, is essential to optimize breast milk production in post-cesarean mothers, particularly during the early postpartum period.

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