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Early Mobilisation and Maternal Pain Intensity After Caesarean Section: A Study at the Eduardo Ximenes Regional Hospital in Baucau, Timor-Leste

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ABSTRACT

Caesarean section is a major surgical procedure that commonly results in postoperative pain and may delay maternal recovery. Early mobilisation is a nonpharmacological strategy intended to support functional recovery and potentially reduce pain intensity. This study examined the association between mobilisation timing and pain reduction among mothers after caesarean section at Eduardo Ximenes Regional Hospital, Baucau, Timor-Leste. A cross-sectional correlational design was used. Sixty-eight post-caesarean mothers were recruited through quota sampling from April 7 to June 23, 2025. Early mobilisation was defined as initiation of gradual physical activity within 4 to <10 hours after surgery, while delayed mobilisation occurred within 10 to <24 hours. Pain intensity was assessed using the Numeric Rating Scale before and after mobilisation. Descriptive statistics and Fisher's exact test were applied. Most participants initiated mobilisation early (89.7%), and 97.1% experienced pain reduction. Pain reduction occurred in 60 of 61 mothers (98.4%) in the early-mobilisation group and 6 of 7 mothers (85.7%) in the delayed group. However, the association between mobilisation timing and pain reduction was not statistically significant ($p = 0.197$). Maternal age and parity were also not significantly associated with mobilisation timing or pain reduction. All participants received analgesia, and the delayed-mobilisation group was small; therefore, the observed difference should be interpreted cautiously and not causally. These findings suggest that early mobilisation may be incorporated as one component of post-caesarean recovery care, while pain

outcomes should be interpreted alongside concurrent analgesic, clinical, and psychosocial factors.

Keywords
Early Mobilisation
Caesarean Section
Maternal Pain
Postoperative Recovery
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Introduction

Caesarean section (CS) is a surgical intervention that can be lifesaving for both mothers and babies when it is performed for clinically justified medical reasons. However, a considerable number of caesarean births are performed without a clear clinical indication, which can increase the risk of both immediate and longer-term health complications for mothers and infants [1]. According to recent WHO data, the global rate of caesarean deliveries continues to increase, representing more than one in five births (21%) worldwide. This upward trajectory is expected to continue over the next decade, with nearly one-third (29%) of all births projected to occur via caesarean section by 2030 [2].

Caesarean section delivery is associated with various maternal and neonatal consequences. A study reported that approximately 25.5% of women experience chronic post-caesarean pain within three months after surgery. The primary risk factors identified include preoperative anxiety, smoking, and severe pain during the first seven days following the procedure. The authors emphasised the importance of preventive strategies, particularly effective pain management and anxiety control [3]. Meanwhile, evidence on the long-term risks and benefits of caesarean section indicates that, while CS may lower mothers' risk of urinary incontinence and pelvic organ prolapse, it is also linked to higher risks of asthma and obesity in children and to complications in subsequent pregnancies, including placenta previa and placental abruption. Taken together, these findings underscore the importance of a comprehensive understanding of both the immediate and long-term risks associated with caesarean delivery for mothers and infants [4].

According to World Bank classifications, Timor-Leste is a lower-middle-income country (LMIC). In low- and middle-income settings, maternal mortality following caesarean delivery has been reported to be as much as 100 times higher than in high-income countries, and roughly one-third of neonatal deaths occur in these contexts, based on data from more than 12 million pregnancies. These substantial inequities were also underscored by a large systematic review that examined 196 studies across 67 low- and middle-income countries [5]. Furthermore, research indicates that post-caesarean pain management in low-income

countries remains inadequate; for example, suboptimal post-caesarean pain management has been reported in a tertiary hospital in Uganda [6].

Poorly controlled post-caesarean pain can result in serious consequences for mothers, including persistent pain that may adversely affect daily functioning and quality of life. Poor pain control may also contribute to psychological complications, including postpartum depression [7]. Pain management is therefore important for reducing discomfort that interferes with daily activities and supporting functional recovery after surgery.

The primary goals of pain management are to reduce pain, restore function, and improve overall quality of life. Pain management strategies are generally grouped into two main categories: pharmacological and non-pharmacological. Pharmacological management uses medications to control pain, whereas non-pharmacological management includes interventions that do not depend on drugs [8].

Non-pharmacological pain management may reduce reliance on medications and complement pharmacological analgesia. Approaches used after surgery include physical activity and early mobilisation, relaxation techniques, and psychological support. Early mobilisation may promote functional recovery and has been associated with reductions in post-caesarean pain in previous studies [9].

A preliminary assessment at Eduardo Ximenes Regional Hospital, Baucau, Timor-Leste, indicated that early mobilisation was commonly practised, although no standardised written early-mobilisation protocol was available. Mobilisation was generally implemented according to physicians' instructions. This study therefore aimed to investigate the association between mobilisation timing and pain reduction among mothers recovering from caesarean section at Eduardo Ximenes Regional Hospital, Baucau, Timor-Leste.

Materials and Methods

A. Study Design, Setting, and Participants

This study employed a cross-sectional correlational design to examine the association between mobilisation timing and pain reduction among mothers following caesarean section (CS). The study was conducted at Eduardo Ximenes Regional Hospital, Baucau, Timor-Leste, from April 7 to June 23, 2025. The target population consisted of 180 post-CS mothers on the first postoperative day, based on hospital records from July to December 2024. The sample size was calculated using Slovin's formula with a 10% margin of error, resulting in a minimum sample of 65 respondents. Participants were recruited using quota sampling according to predetermined eligibility criteria.

Women were eligible if they were aged 18-46 years, were within 4-24 hours after CS, remained hospitalised, were in a stable clinical condition, and were able to communicate effectively and provide verbal responses regarding their pain intensity. Participants with

medical conditions that could substantially affect pain perception, including infection or neurological disorders, were not eligible. Mothers experiencing severe postoperative complications, such as massive haemorrhage, or receiving additional analgesic medication beyond the standard hospital protocol that could influence pain assessment were excluded.

The primary independent variable was mobilisation timing, and the primary outcome was change in pain intensity following mobilisation. Maternal age and parity were examined as potentially relevant maternal characteristics. Early mobilisation was defined as gradual physical activity initiated within 24 hours after recovery from anaesthesia, beginning with lateral positioning and progressing stepwise towards independent ambulation under the supervision of a midwife. Based on initiation time, mobilisation was categorised as early (4 to <10 hours after CS) or delayed (10 to <24 hours after CS).

B. Measurements and Data Collection

Pain intensity was assessed using the Numeric Rating Scale (NRS), ranging from 0 to 10, with higher scores indicating greater pain intensity. Changes in NRS scores following mobilisation were classified as pain reduction or no pain reduction. The NRS has demonstrated strong construct and concurrent validity, with reported correlation coefficients ranging from 0.73 to 0.95, as well as excellent test-retest reliability in postoperative populations, with an intraclass correlation coefficient of 0.95.

Data were collected using a structured questionnaire that recorded participants' sociodemographic and clinical characteristics, including age and parity, as well as mobilisation timing. The NRS was used to assess pain intensity, while a written informed consent form documented participants' voluntary agreement to participate. Data collection was conducted with the assistance of senior midwives working in the postpartum ward. Potentially eligible participants were identified through ward records and screened according to the study criteria. After receiving an explanation of the study procedures, eligible mothers provided written informed consent before enrolment. Questionnaires and pain assessments were administered directly to participants, while relevant secondary information was obtained from hospital registration and medical records.

C. Statistical Analysis and Ethical Considerations

All data were entered, processed, and analysed using SPSS. Univariate analyses described the distribution of study variables using frequencies and percentages as appropriate. Because several 2 × 2 contingency tables contained expected cell counts below 5, Fisher's exact test was used to examine associations between mobilisation timing and pain reduction and to assess the relationships of maternal age and parity with mobilisation timing and pain reduction. Statistical significance was defined as $p < 0.05$.

Ethical approval was obtained from the Ethics Committee of Universitas 'Aisyiyah Yogyakarta (Approval No. 4264/KEP-UNISA/II/2025) and the National Institute of Public Health Timor-Leste—Research Ethics and Technical Committee (INSP-RETC) (Approval No. 251/INSP-TL/UEPD-AL/IV/2025). All participants provided written informed consent before enrollment. The study was conducted in accordance with the ethical principles of beneficence, nonmaleficence, respect for autonomy, justice, and confidentiality. Participant information was handled confidentially and used exclusively for research purposes.

Results and Discussion

A. Univariate Analysis

Univariate analyses were performed to describe the characteristics of each study variable. Frequencies and percentages were reported for categorical variables, including pain outcome, mobilisation timing, maternal age, and parity. These analyses summarised the dataset before the bivariate analyses.

Table 1. Characteristics of Study Respondents (n = 68)

Variable	Category	Frequency	Percentage
Mother's age	Adult	64	94.1
	Adolescent	4	5.9
Parity	Multiparous	49	72.1
	Primiparous	19	27.9
Mother's occupation	Domestic worker	65	95.6
	Nurse	1	1.5
	Private sector	1	1.5
	Teacher	1	1.5
Analgesic administration	Yes	68	100
Early initiation of breastfeeding (EIB)	Yes	44	64.7
	No	24	35.3

Based on Table 1, the majority of respondents were classified as adults (94.1%) and were multiparous (72.1%). Most respondents were recorded as domestic workers (95.6%), and all respondents (100%) received postoperative analgesics following caesarean section. Early initiation of breastfeeding (EIB) was reported by 64.7% of mothers, while 35.3% did not initiate breastfeeding early.

Table 2 summarises mobilisation timing among 68 post-caesarean mothers. Most mothers initiated mobilisation early (89.7%), whereas 10.3% had delayed mobilisation.

Table 2. Frequency Distribution of Post-Caesarean Mobilisation (n = 68)

Category	Frequency	Percentage
Early	61	89.7
Delayed	7	10.3

Most participants (89.7%) initiated mobilisation early, while 10.3% had delayed mobilisation.

Table 3 summarizes post-caesarean pain outcomes among 68 respondents. Most participants experienced pain reduction after mobilization, accounting for 97.1% of the sample. In contrast, only 2.9% reported no reduction in pain. These findings indicate that pain reduction was the predominant postoperative outcome among the mothers studied during the study period.

Table 3. Frequency Distribution of Post-Caesarean Pain Outcomes (n = 68)

Category	Frequency	Percentage
Pain Reduction	66	97.1
No Pain Reduction	2	2.9

The majority of respondents (97.1%) experienced pain reduction following mobilisation, whereas 2.9% experienced no pain reduction.

B. Bivariate Analysis

Table 4 presents the association between mobilisation timing and post-caesarean pain outcomes. It compares the numbers of mothers with and without pain reduction across early and delayed mobilisation groups and reports Fisher's exact p-value.

Table 4. Relationship Between Mobilisation Timing and Post-Caesarean Pain Reduction

Mobilisation	Pain Reduced	No Reduction	Total	% Reduced	Fisher's Exact p
Early	60	1	61	98.4	0.197
Delayed	6	1	7	85.7	
Total	66	2	68		

Pain reduction was observed in 98.4% of mothers in the early-mobilisation group and 85.7% of mothers in the delayed-mobilisation group. Fisher's exact test showed that this difference was not statistically significant (p = 0.197).

Table 5 presents the relationship between mobilisation timing and parity among post-caesarean mothers. It compares primiparous and multiparous participants across the early and delayed mobilisation groups and reports Fisher's exact p-value.

Table 5. Relationship Between Mobilisation Timing and Parity

Mobilisation	Primiparous	Multiparous	Total	% Multiparous	Fisher's Exact p
Early	17	44	61	72.1	1.000
Delayed	2	5	7	71.4	
Total	19	49	68		

The distribution of primiparous and multiparous mothers was similar across mobilisation groups. Fisher's exact test indicated no statistically significant association between parity and mobilisation timing (p = 1.000).

Table 6 presents the relationship between mobilisation timing and maternal age among post-caesarean mothers. It compares adolescent and adult participants across early and

delayed mobilisation groups. The analysis used Fisher's exact test to determine whether age was significantly associated with mobilisation timing, providing an appropriate assessment for small cell frequencies.

Table 6. Relationship Between Mobilisation Timing and Maternal Age

Mobilisation	Adolescent	Adult	Total	% Adult	Fisher's Exact p
Early	3	58	61	95.1	0.359
Delayed	1	6	7	85.7	
Total	4	64	68		

Adults comprised 95.1% of the early-mobilisation group and 85.7% of the delayed-mobilisation group. Fisher's exact test showed no statistically significant association between maternal age and mobilisation timing ($p = 0.359$).

Table 7 presents the relationship between parity and post-caesarean pain outcomes. It compares pain reduction among primiparous and multiparous mothers and reports Fisher's exact p-value.

Table 7. Relationship Between Parity and Pain

Parity	No Pain Reduction	Pain Reduction	Total	% Pain Reduction	Fisher's Exact p
Primiparous	0	19	19	100	1.000
Multiparous	2	47	49	95.9	
Total	2	66	68		

All primiparous mothers (100%) and 95.9% of multiparous mothers experienced pain reduction. Fisher's exact test showed no statistically significant association between parity and pain reduction ($p = 1.000$).

Table 8 presents the relationship between maternal age and post-caesarean pain outcomes. It compares pain reduction between adolescent and adult mothers and reports Fisher's exact p-value.

Table 8. Relationship Between Maternal Age and Pain

Age	No Pain Reduction	Pain Reduction	Total	% Pain Reduction	Fisher's Exact p
Adolescent	0	4	4	100	1.000
Adult	2	62	64	96.9	
Total	2	66	68		

All adolescent mothers (100%) and 96.9% of adult mothers experienced pain reduction. Fisher's exact test showed no statistically significant association between maternal age and pain reduction ($p = 1.000$).

C. Characteristics of Post-Caesarean Mothers and Factors Related to Pain Management and Early Mobilisation

Overall, 97.1% of mothers experienced pain reduction after mobilisation, and 89.7% initiated mobilisation early. Because all participants received postoperative analgesics, pain

outcomes should be interpreted in the context of concurrent pharmacological pain management. Current enhanced-recovery and procedure-specific guidelines emphasize multimodal analgesia as a core component of post-caesarean recovery, together with early ambulation and breastfeeding support [26]-[28]. A randomized trial also demonstrated that effective post-caesarean analgesia was associated with earlier initiation of ambulation and breastfeeding [29].

Most respondents were adults (94.1%) and multiparous (72.1%). However, neither maternal age nor parity was significantly associated with mobilisation timing or pain reduction in the present analyses. These characteristics should therefore be interpreted primarily as features of the study sample rather than as determinants of recovery. Previous research has nevertheless shown that post-caesarean functional recovery is multifactorial and may vary across maternal, clinical, and contextual characteristics [13], [14], [30]. Psychosocial characteristics, including relationship and employment status as indicators of social support, have also been associated with postpartum pain experiences [31]. Furthermore, prospective research indicates that inpatient recovery is related to subsequent pain, functional recovery, anxiety, and other patient-reported outcomes after discharge [32]. Most respondents were recorded as domestic workers (95.6%); because occupation was not included in the bivariate analyses, its relationship with mobilisation or pain reduction cannot be inferred from this study.

All participants received postoperative analgesia under the hospital's standard protocol. Previous studies have reported effective post-caesarean analgesia with tramadol-based regimens [15], [16]. Contemporary evidence supports multimodal postoperative pain management rather than interpreting recovery in relation to a single intervention [28]. Because analgesic exposure was universal in this sample, the observed pain reduction cannot be attributed solely to mobilisation. Other factors, including physical readiness, previous experience, sleep quality, emotional support, anxiety, and stress, may also influence recovery and pain perception [10], [17], [30], [31], [33]. Early initiation of breastfeeding was reported by 64.7% of participants. Breastfeeding after caesarean delivery may be affected by postoperative pain, physical limitations, emotional vulnerability, and the availability of professional and family support [29], [34].

Overall, post-caesarean recovery is influenced by interacting physical, psychological, social, and clinical factors. Current enhanced-recovery recommendations similarly conceptualize mobilisation, analgesia, breastfeeding support, nutrition, and other postoperative practices as interconnected components of maternal recovery [26], [27], [35]. Recent prospective evidence also demonstrates that severe post-caesarean pain is associated with impaired mobilisation, breastfeeding, and overall quality of recovery [37]. The findings therefore support interpreting

mobilisation as one component of a broader postoperative recovery process rather than as the sole explanation for pain reduction [19].

D. Relationship Between Mobilisation Timing, Pain, Age, and Parity

Fisher's exact test did not show a statistically significant association between mobilisation timing and pain reduction ($p = 0.197$). Descriptively, pain reduction occurred in 60 of 61 mothers (98.4%) who initiated mobilisation early and in 6 of 7 mothers (85.7%) with delayed mobilisation. Observed decreases in NRS scores ranged from 1 to 4 points. Because the delayed-mobilisation group was small, this difference should be interpreted cautiously and should not be considered evidence of a causal effect.

Although the present study did not demonstrate a statistically significant association, previous studies have reported reductions in post-caesarean pain following early mobilisation [20]–[23]. Early mobilisation is also incorporated into contemporary enhanced-recovery recommendations for caesarean delivery [27], [35]. More recently, a randomized controlled study found that a structured postoperative mobilisation programme reduced pain and improved several recovery outcomes, including breastfeeding performance [36]. Similarly, a nationwide prospective cohort study reported that severe postoperative pain was associated with poorer independent mobilisation and breastfeeding following caesarean delivery [37].

No statistically significant associations were found between pain reduction and maternal age or parity in this study. These findings indicate that age and parity alone did not explain the observed pain outcomes in this sample [24]. Large multicentre and systematic-review evidence suggests that post-caesarean pain and functional impairment reflect multiple clinical and modifiable factors, including analgesic management, anxiety, anaesthetic characteristics, and postoperative care practices [30], [33].

The absence of a standardised written SOP for early mobilisation at the study site may have contributed to variability in implementation, as mobilisation was primarily guided by physician instructions. Current enhanced-recovery guidance supports structured postoperative pathways that incorporate early ambulation alongside standardized analgesia and other recovery measures [26], [27], [35]. Evidence from structured mobilisation programmes also suggests that systematic guidance may improve postoperative recovery outcomes [35]. Cultural norms, family support, analgesic use, and emotional conditions may additionally influence post-caesarean recovery according to previous literature [25], [31], [33]. However, these contextual factors were not directly measured in the present study and should therefore be treated as possible explanations rather than observed determinants.

Conclusion

This study found that most post-caesarean mothers at Eduardo Ximenes Regional Hospital, Baucau, Timor-Leste initiated mobilisation within 4 to <10 hours after recovery from

anaesthesia. Pain reduction was more frequent in the early-mobilisation group (98.4%) than in the delayed-mobilisation group (85.7%); however, Fisher's exact test did not show a statistically significant association (p = 0.197). Maternal age and parity were also not significantly associated with mobilisation timing or pain reduction. These findings should be interpreted in light of the small delayed-mobilisation group, universal postoperative analgesic use, the subjective nature of NRS assessment, and the cross-sectional design. Further research with larger and more balanced groups, standardised mobilisation protocols, and better control of analgesic and psychosocial factors is recommended.

Conflict of Interest

The authors declare no conflicts of interest.

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