

## Post Cesarean Pain Intensity and Wound Healing in ERACS and Conventional Method

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### Abstract

Cesarean section is a common delivery method in Indonesia, with a prevalence of 17.6%. This method is used when vaginal delivery is not possible or in emergency cases, in an effort to prevent maternal and infant fatalities. Enhanced Recovery After Cesarean Surgery (ERACS) is a new method whose effectiveness has not been widely studied. The aim of this study was to compare post-cesarean pain intensity and wound healing in patients receiving ERACS and cesarean conventional methods at Bandung Kiwari General Hospital. This cross-sectional study used an analytic observational design and accidental sampling with 52 post-cesarean patients as the subjects during the three-months of study. Pain intensity was observed using the NRS instrument and wound healing was observed using the REEDA scale instrument on days one, two, and six post-surgery. The t-test analysis showed that the ERACS method had better pain intensity post-cesarean than the conventional method with a p-value of 0.000. However, there was no difference in wound healing between ERACS and conventional methods with a p-value of 0.136.

**Keywords:** Cesarean, enhanced recovery after cesarean surgery, pain intensity, wound healing

### Introduction

Delivery is the process of expelling the conception result that can live extrauterine through the vagina or other means. Cesarean delivery, is the delivery of the baby through the abdomen and uterus.<sup>1</sup> The prevalence of cesarean delivery in the USA in 2017 increased to 32%, while in Indonesia, cesarean operations increased from 7% in 2007 to 17% in 2017. In West Java, the cesarean prevalence also increased to 15.5%.<sup>2,3</sup> Cesarean indications include prolonged delivery, cephalo-pelvic disproportion, contracted pelvic, fetal distress, malpresentation, impending uterine rupture, and other indications. Cesarean operation is necessary when vaginal delivery is not possible and in emergency obstetric conditions. Thus, cesarean is an essential effort to decrease maternal and infant mortality rates.<sup>4</sup> In Indonesia, cesarean section with the Enhanced

Recovery After Cesarean Surgery (ERACS) method is a perioperative program that offers many benefits, including reduced hospitalization duration, lower risk of anxiety and depression, decreased post-operation infection risk, and faster body recovery.<sup>5</sup> Perioperative care is crucial for patients to recover quickly and be motivated to care for their baby, while healthcare workers can reduce the use of medical resources and healthcare costs.<sup>6</sup> ERACS is a post-cesarean program that can speed up functional recovery, minimize complications, and shorten hospitalization duration. Another benefit of ERACS is the reduced exposure to opioids.<sup>7</sup> Urinary catheter removal is performed six hours after the operation.<sup>8</sup> Pain is an essential physical sensation that occurs when pain sensory nerves are stimulated and results in an unpleasant reaction, distress, or suffering. Pain intensity is critical for diagnosing the source of pain, enabling medical workers to provide appropriate treatment, and evaluate, and adjust the treatment according to the patient's response.<sup>9</sup>

Research on the effectiveness of the ERACS method in treating pain intensity and wound

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healing hasn't been widely performed. Liu et al. researched the length of stay in the hospital using the ERACS protocol, which resulted in a decrease of 7.8% or 4.86 hours in total. The ERACS preparation begins with education and counseling during antenatal care about the procedure and what will be expected during the operations, pain management plan, feeding, and early ambulation.<sup>10</sup> Other information includes pregnancy nutrition information, breastfeeding, time of hospitalization, and discharge criteria.<sup>11</sup> Pain occurs in the acute phase and must be treated with pain management immediately using pharmacology and non-pharmacology approaches. These interventions will be successful if performed before the patient feels moderate pain and if the intervention is done simultaneously.<sup>12</sup>

The wound is the impairment of body tissue. There are several wound healing phases, first the coagulation and inflammation (0–3 days) indicated by redness, skin warmth, edema, and pain for three days, second the proliferation or reconstruction phase (2–24 days) marked by reddish wound that shows granulation with good vascularization, new skin epithelization marked by pinkish color at the edge of the wound and the wound begin to cover, and the next phase is remodeling or maturation. The end of the wound healing process is the form of scar tissue.<sup>13</sup>

According to a survey conducted at Bandung Kiwari Hospital, there were 1,180 cesarean cases out of a total of 2,189 deliveries from January to June 2022. However, data on pain intensity and wound healing between the ERACS method and the conventional method are not available. While the ERACS method offers many benefits, limited research has been conducted on its effectiveness. Therefore, it is crucial to study the pain intensity and wound healing between the ERACS method and the conventional method to provide better information for healthcare workers and educate pregnant women who will undergo cesarean deliveries.

## Methods

The study used a cross-sectional design, with pain intensity and wound healing as independent variables, and ERACS cesarean and conventional cesarean as dependent variables. The population will consist of 107 individuals who have undergone post-cesarean operations. The sample size will be calculated using the Slovin formula with a precision value of 0.1, resulting

in 52 samples. The samples will be divided into two groups: 26 post-ERACS cesarean and 26 post-conventional cesarean, selected through accidental sampling. The research samples will be taken from inpatients based on their hospitalization dates, and these patients will be followed up on day six at the outpatient clinic for observation of wound healing.

The inclusion criteria are post-cesarean women who are communicative, alert, and willing to participate, and who have used conventional dressing on day one and modern dressing on day two. The exclusion criteria include subjects with emergency conditions following the operation, diabetes, and contraindications for early mobilization, such as heart disease, pulmonary disease, femur fractures, spine fractures, and other conditions that require total bed rest. Data collection will be conducted from January to March 2023.

In this study, both the conventional and ERACS cesarean methods will be observed on day one, six hours after the operation, in the patient's room for pain intensity evaluation as the first assessment. On day two, both methods will be observed again in the patient's room for the second evaluation. Additionally, wound healing will be assessed on day two when the patient's wound dressing is changed from conventional to modern dressing. Finally, on day six, wound healing will be evaluated at the obstetrics outpatient clinic as the final assessment.

Pain intensity data will be collected through interviews with the subjects using the Numeric Rating Scale (NRS), with scores ranging from 0 to 10. This data will be gathered on day one and day two following the cesarean operation in the inpatient room. Wound healing will be assessed by examining the wound condition on day two and day six after the cesarean operation using the REEDA scale, which measures redness, edema, ecchymosis, discharge, and approximation, with scores ranging from 0 to 10. The ERACS cesarean method will be coded as '1' for 'yes' and '2' for 'no,' and the conventional cesarean method will be coded similarly. The data will be analyzed using univariate and bivariate tests, including T-tests. If the p-value is less than 0.05, the hypothesis will be accepted, indicating a significant difference in pain intensity and wound healing between the ERACS and conventional cesarean methods at Bandung Kiwari Hospital.

## Results

The study findings show that out of 26

**Table 1 Pain Intensity and Wound Healing Post-ERACS Cesarean**

Subject	n	Mean	Min	Max	SD
Pain Intensity					
Day 1	26	0.8077	0.00	1.00	0.40192
Day 2	26	1.6538	1.00	2.00	0.48516
Wound Healing					
Day 2	26	0.00	0.00	0.00	0.00
Day 6	26	0.4615	0.00	5.00	1.33359

Info: n=nominal, Min minimal, Max=maximal, SD=standard deviation

respondents, the mean pain intensity on day one post-ERACS cesarean was 0.8077, indicating the absence of pain, while on day two, the mean was 1.6538, indicating mild pain, similar to mosquito bites. Among the respondents, 11 were first-time mothers, one was 35 years old, and eight had a history of previous cesarean operations.

According to the research, out of 26 respondents, the mean wound healing score on day two is 0.00, indicating that all respondents had a REEDA scale of zero, meaning there was no redness, no edema, no ecchymosis, no discharge, and the wound edges were approximated. On day six, the mean score increased to 0.4615. This indicates that one respondent had a REEDA scale of 3, with redness of 0.25 cm on both sides of the incision, edema under 1 cm from the incision, and serum discharge. Another respondent had a REEDA scale of 4, with redness of 0.25 cm on both sides of the incision, edema under 1 cm from the incision, and serosanguineous discharge. One respondent had a REEDA scale of 5, with redness of 0.25 cm on both sides of the incision, edema under 1 cm from the incision, and serosanguineous discharge. Twenty-three respondents had a REEDA scale of zero. Overall, there was an improvement in post-ERACS cesarean wound healing between days two and six after the operation.

In this study, 26 respondents who underwent

conventional cesarean reported a pain intensity of 3.2692 on day one, which was tolerable but comparable to the sensation of a punch to the nose that causes a nosebleed or an injection by a doctor. On day two, the pain intensity increased to 4.5769, which was considered intense, similar to the pain of a toothache or a bee sting. Of the 26 respondents, 22 had more than two previous pregnancies, five were over 35 years old, placing them in the high-risk pregnancy category, and five had a history of previous cesarean operations. There was a significant increase in pain intensity between day one and day two after the conventional cesarean.

In this study, 26 respondents who underwent conventional cesarean reported a pain intensity of 3.2692 on day one, which was tolerable but comparable to the sensation of a punch to the nose causing a nosebleed or an injection by a doctor. On day two, the pain intensity increased to 4.5769, which was considered intense, similar to the pain of a toothache or a bee sting. Of the 26 respondents, 22 had more than two previous pregnancies, five were over 35 years old, placing them in the high-risk pregnancy category, and five had a history of previous cesarean operations. A significant increase in pain intensity was observed between day one and day two post-conventional cesarean.

For the 26 respondents who underwent post-

**Table 2 Pain Intensity and Wound Healing Post-Conventional Cesarean**

Subject	n	Mean	Min.	Max.	SD
Pain Intensity					
Day 1	26	3.2692	3.00	4.00	0.45234
Day 2	26	4.5769	4.00	5.00	0.50383
Wound Healing					
Day 2	26	0.00	0.00	0.00	0.00
Day 6	26	1.3462	0.00	7.00	2.39904

Note: n=total number of subjects; Min=minimum value; Max=maximum value; SD=standard deviation

**Table 3 Pain Intensity of the ERACS and the Conventional Cesarean**

Pain Intensity	n	Mean Rank	P-value
ERACS	26	13.50	0.000
Conventional	26	39.50	

**Table 4 Wound Healing of the ERACS and the Conventional Cesarean**

Wound Healing	n	Mean Rank	P-value
ERACS	26	24.35	0.136
Conventional	26	28.65	

conventional cesarean, the mean wound healing score on day two was 0.00. All respondents had a REEDA scale of zero, indicating no redness, no edema, no ecchymosis, no discharge, and the wound was well approximated. On day six, the mean REEDA score was 1.3462. Two respondents had a REEDA scale of three, with redness of 0.25 cm on both sides of the incision, edema under 1 cm from the incision, and serous discharge. One respondent had a REEDA scale of four, with redness of 0.25 cm on both sides of the incision, edema under 1 cm from the incision, and serosanguinous discharge. One respondent had a REEDA scale of six, with redness of 0.5 cm on both sides of the incision, edema 1–2 cm from the incision, and serosanguinous discharge. Two respondents had a REEDA scale of six, with redness of 0.5 cm on both sides of the incision, edema under 1 cm from the incision, and blood discharge. One respondent had a REEDA scale of seven, with redness of 0.5 cm on both sides of the incision, edema 1–2 cm from the incision, and blood discharge. Nineteen respondents had a REEDA scale of zero. There was an increase in wound healing on the REEDA scale between days two and six post-conventional cesarean.

Before conducting bivariate analysis, we performed a normality test using the Shapiro-Wilk method. The results showed that the pain intensity post-ERACS cesarean (0.000) and the pain intensity post-conventional cesarean (0.000) were not normally distributed. Similarly, the wound healing of post-ERACS cesarean (0.000) and post-conventional cesarean (0.000) were also not normally distributed. Therefore, we used the Whitney test to analyze the difference between the two groups and calculated using SPSS version 24.0 for Windows. The mean rank of post-ERACS was lower than conventional. The results of this research showed that the

significant value (0.00) was less than  $\alpha$  (0.05), indicating that there is a significant difference in pain intensity post-ERACS cesarean and post-conventional cesarean.

Although the mean rank for wound healing was lower for post-ERACS cesarean compared to conventional cesarean, the Mann-Whitney test yielded a p-value of 0.136, which is greater than  $\alpha$  (0.05), indicating no significant difference in wound healing between the two groups.

## Discussion

After observing patients who underwent ERACS cesarean at Bandung Kiwari Hospital, it was noted that they were able to mobilize immediately after the operation and were moved to the inpatient room after 2 hours. The catheter was removed 6 hours after the operation, while the infusion was stopped 6 hours after the operation or after the analgesic infusion stopped on day two. Lactation was initiated 2–6 hours after the operation. However, there was an increase in pain intensity between day one and day two of post-ERACS cesarean. In terms of premedication, patients were administered one gram of intravenous analgesic paracetamol, as well as one ampule of intravenous ranitidine and metoclopramide. The spinal anesthesia started to wear off 6–8 hours post-operation.

In contrast to ERACS cesarean, conventional cesarean does not involve analgesics in premedication. However, post-operation analgesia is given, which includes paracetamol 4x1 gram orally 6 hours after the operation, ketorolac 3x1 ampule intravenously 24 hours after the operation, or paracetamol 3x1 gram orally, and tramadol 3x50 mg orally 6 hours after the operation. Tramadol and pethidine infuse

are given 24 hours after the operation. Similar to ERACS cesarean, there is an increase in pain intensity between days one and day two of post-conventional cesarean.

Research of the conventional and ERACS has mild pain at 20%, moderate pain at 66.7%, and severe pain at 13.3%.<sup>14</sup> Research on pain intensity in early ambulation post-cesarean showed that the subjects had decreased pain scales from moderate to mild pain.<sup>15</sup> Santoso et al. researched the effect of early mobilization on pain intensity of cesarean operations with case and control groups.<sup>16</sup> This research result is appropriate to the research by Sunengsih et al.<sup>17</sup> that is the pain scale average after early mobilization was 2.97, the moderate pain scale (4–6) was the most pain scale for 51.4% with T dependent test, with a p-value of 0.000 ( $p\text{-value} < \alpha = 0.05$ ), and concluded that there are differences of pain intensity post cesarean between before and after early mobilization.

The wound healing of the ERACS cesarean has increased the REEDA scale between day two and day six post-operation, which correlates with the research about factors influencing the wound healing process, general and local factors. General factors include age, complications, health disease, nutrition, psychology, and medicine. Local factors are wound hydration, wound treatment, foreign objects, and mobilization.<sup>18</sup>

The wound healing of post-conventional cesarean has a REEDA scale increased from day two to day six, and correlates with the research on wound healing that shows that cesarean wound healing has good healing at 81.3% and bad healing at 18.7%, and the wound treatment and how to clean the wound are involved in the wound healing process.<sup>19</sup>

The research findings are significant (0.00  $< \alpha$  (0.05) and indicate a difference in pain intensity between post-ERACS cesarean and post-conventional cesarean. Bivariate analysis shows that pain intensity differs between the two methods, while wound healing does not show a significant difference.

This research does not contradict the findings by Eriyani et al., which show a significant difference in wound healing post-cesarean with a p-value  $< 0.05$  using the Whitney test.<sup>20</sup> Additionally, Ferinawati et al. show that early mobilization is significantly correlated with good wound healing, with 65.6% of patients having early mobilization and 68.8% having good wound healing.<sup>21</sup>

Several factors can influence wound healing, including low protein intake, which may stem

from inadequate knowledge or the community belief that high protein consumption negatively impacts the wound-healing process. While this study did not identify a significant difference in wound healing between post-ERACS cesarean and conventional methods, it was noted that the mean healing time for conventional cesarean was longer than that for post-ERACS cesarean. A limitation of the study is that it did not examine other influencing factors such as cesarean history, nutritional intake, and psychological factors.

In conclusion, the study found a significant difference in pain intensity between post-ERACS cesarean and conventional methods, with a p-value of 0.000. However, no significant difference was observed in wound healing between the two methods, with a p-value of 0.136.

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