ORIGINAL ARTICLE

# ENHANCED RECOVERY AFTER CAESAREAN SECTION – AN IMPROVED PATHWAY THAN CONVENTIONAL CARE FOR REDUCING HOSPITAL STAY

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**Background:** With the help of an evidence-based approach called "Enhanced Recovery After Surgery" (ERAS), patients can receive standardised perioperative care and recover more quickly. Many surgical specialities, such as orthopaedics, gynaecological onco-surgery, breast surgery, urology, and colorectal surgery, use ERAS protocols extensively. Improved postoperative recovery is beneficial in lowering hospital stays, and costs, and increasing patient satisfaction. This study sought to determine whether the application of an enhanced recovery after surgery (ERAS) protocol for patients having an elective caesarean section would improve the patient's postoperative status regarding pain management, length of stay in the hospital and expenses associated with complications. **Methods**: A prospective study was conducted in PAF Hospital Faisal, Karachi. Women scheduled for elective caesarean sections were enrolled in the cross-sectional study from February 2023 to July 2023, and they were compared to women who had caesarean sections during the same period and received conventional perioperative care. Patients with medical or surgical comorbidities, as well as women who had emergency or urgent caesarean sections, were excluded. The surgical method was the same in both ERAS and non-ERAS arms. Intravenous hydration was used to achieve a specific purpose. After 4 hours, liquids were introduced, followed by solids after 6 hours. Intravenous paracetamol and intramuscular diclofenac were given regularly. After 6-8 hours, the Foley catheter was withdrawn. The conventional care group fasted for 6 hours before and after surgery. The catheter was left in place for 24 hours, and 2500 ml of intravenous fluids were administered on the first day, followed by 1000 ml on the second. The length of hospital stay was determined by clinical criteria and the discretion of the care providers. **Results**: In contrast to the conventional care group, the ERAS arm experienced a much shorter post-operative hospital stay. ($p$-value= 0.001; 33.42 vs. 61.30 hours). The patient quickly recovered due to early eating, early ambulation, early catheter removal, multimodal pain management, and pre-emptive analgesia and antibiotic administration. **Conclusion**: The ERAS protocol is beneficial in lowering postoperative pain and nausea, the average cost of hospitalization, and improving patient satisfaction. It seems to be worth implementing this protocol widely among patients undergoing elective caesarean sections.

**Keywords:** Enhanced recovery; Caesarean section; Improved pathway; Conventional care

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## INTRODUCTION

With the help of an evidence-based approach called "Enhanced Recovery After Surgery" (ERAS), patients can receive standardised perioperative care and recover more quickly. Many surgical specialities, such as orthopaedics, gynaecological onco-surgery, breast surgery, urology, and colorectal surgery, use ERAS protocols extensively. Improved postoperative recovery is beneficial in lowering hospital stays, and costs, and increasing patient satisfaction.[1–4]

Despite efforts to reduce the percentage in both the public and private sectors, Pakistan's private sector still has a very high caesarean section rate similar to its neighbouring country India which reports a rate of 30–40%.[5] Thus, it is crucial to apply ERAS routes to shorten hospital stays and enhance perioperative care. Most women who have caesarean sections are in good health, have a quick recovery period, and may go back to their regular lives as soon as possible to care for the baby. While the ERAS protocol has been widely used in developed nations to enhance patient care and lower overall healthcare costs, the idea is also making its way

into poor nations. After looking over the body of research, we were able to conclude that this prospective study is the first in Pakistan to use this novel idea in obstetrics.[6]

It is the idea of enhancing the body's healing from the stress reaction to the procedure. Patient education, preoperative hydration, caloric intake, haemoglobin optimization, lactation assistance, and readiness are all considered preoperative measures. Preventing hypotension and the accompanying symptoms of nausea, vomiting, thromboprophylaxis, bacterial prophylaxis, oxytocin regulation, and delayed cord clamping are all part of intraoperative care. Early oral intake, consistent oral and multimodal analgesia, early mobilization, early urine catheter removal, and early discharge are all considered post-operative components.[7–10]

A handful of these components—perioperative nutritional care, multimodal analgesia, early catheter removal, ambulation, and early discharge—were the focus of this investigation. Our goal was to determine how much the ERAS protocol contributed to improving different post-operative care phases and how much it shortened the duration of hospital stays following surgery.

## MATERIAL AND METHODS

This is a prospective study carried out in PAF Hospital Faisal Karachi from February to July 2023. The study included pregnant women who were scheduled for elective and scheduled caesarean sections without any comorbidities. These patients were compared to those who received conventional perioperative care and had caesarean sections within the same time frame. Women who had urgent or emergency caesarean sections were not included. Excluded from the study were patients who needed thorough monitoring for coexisting medical conditions or surgical complications (e.g., postpartum haemorrhage, organ damage, paralytic ileus, heart illness, severe preeclampsia, eclampsia, placenta accrete or percreta, uncontrolled overt diabetic mellitus, autoimmune diseases). Additionally omitted were women who were kept in the hospital for the care of their unborn child. Before the procedure, during prenatal appointments, appropriate counselling of the study's protocols was given, and then informed consent was obtained.

The patient was admitted on the day of surgery. Preoperative investigations are carried out in the outpatient department two hours before the surgery, the women in the study group were given 200 ml of a drink high in carbohydrates. Following the administration of premeditations such as intravenous ranitidine 50 mg and metoclopramide 10 mg, a caesarean section was performed under regional anaesthesia. To avoid spinal hypotension, 500 ml of intravenous crystalloid solution was injected simultaneously. Half an hour before the procedure, the surgical site was prepared using a chlorhexidine solution, and cefuroxime 1.5 mg was used for antibiotic prophylaxis. 1.3 millilitres of 0.75% hyperbaric bupivacaine were used as the spinal anaesthetic agent. To prevent the bias of opioids impacting early recovery, no number of opioids were administered to both groups. The same surgical technique was used on both arms. Regional anaesthesia (spinal)was used for the surgery. A ten-unit bolus of oxytocin was administered at the time of placental delivery, and a twenty-unit infusion began right after at a rate of five units each hour. 1500 ml of crystalloids were given post-operatively over 24 hours at a rate of 100 ml per hour. After the patient was moved to the recovery care unit, breastfeeding was initiated as soon as possible in both groups. After four hours, oral feeding was initiated with liquids, and then with solids after six hours in ERAS group. For 24 hours following surgery, patients received intravenous paracetamol 1 gm every 8 hours and intramuscular diclofenac every 12 hours. Oral paracetamol was administered soon on postoperative day once oral allowed. The Foleys catheter was placed right before the procedure and taken out 6–8 hours after surgery. The patients were urged to start walking as soon as they could. After surgery, discharge was scheduled based on wound healing, ambulation, and pain reduction after 48 hours. Eight hours of fasting for solid foods was required before and following surgery as part of standard perioperative care. Six hours following surgery, solid food and oral fluids were commenced.

In the conventional care group, admission is carried out a day before surgery. The method of the procedure remains the same in both arms of the study. Pain control was done with intravenous paracetamol (1 g, 8 hours per day) and intramuscular diclofenac as needed. After surgery, the Foley catheter was kept in place for 24 hours. The standard care regimen called for the liberal use of intravenous crystalloids: 2000–2500 ml of crystalloids were given for the first 24 hours at a rate of 100 ml/hour, and then 1000 ml on the second postoperative day. If the patient's clinical status was deemed satisfactory, discharge was scheduled on the 2nd to 3rd postoperative day. The patient's suitability for discharge was determined after evaluations for pain management, ambulation, spinal headache, voiding issues, delayed bowel movement, pyrexia, and wound status in both groups.[11]

Based on the study by Teigen *et al*.[12], the mean and SD of postoperative hospital stay in the ERAS group was 73.67 hours ±1.60 and 75.17 hours±1.16 in the standard recovery group in women

who underwent caesarean section, thus, the minimal sample size in each group for our study was calculated to be 50 with 5% margin of error and 95% confidence interval. Data was obtained using a proforma that included demographic information as well as other post-operative care variables. SPSS 23 software was used for statistical analysis. The independent samples T-test was performed to determine the statistical significance of the difference in different parameters between the two groups taking a *p*-value less than 0.05 as statistically significant. The Two-way ANOVA test for repeated measures was used to determine the significance of the difference in the proportion of different post-operative variables across ERAS and non-ERAS groups at 10 and 20 hours.

## RESULTS

We had a total of 206 caesarean sections at our facility between February 2023 and July 2023. 106 of them were excluded because they met one or more of the exclusion criteria, whereas 100 were included in our study. In the ERAS pathway, 50 women underwent lower segment caesarean section (LSCS), while 50 received conventional care. Both groups shared demographic parameters including age, parity, and gestational age and indication for LSCS. See Table 1.

When ERAS was used during caesarean delivery, the post-operative length of stay was significantly less in the ERAS group (30 h) than in the traditional care group (70 h). [33.42±SD 7.746 vs 61.30±SD 10.426, *p*=0.001] Table 2.

Drinking a high-calorie, high-carbohydrate beverage up to four hours before surgery has been demonstrated to help patients in the ERAS group feel less hungry, anxious, and thirsty before the procedure while they received oral feedings six hours later following surgery. Gastrointestinal issues such as nausea and vomiting were experienced by the non-ERAS group at 10 hours which settled between both groups at 20 hours. [1.08±0.27 vs 1.22±0.41 at 10 hours, *p*=0.000 at 10 hours; 1.04±SD 0.19 vs 1.06±SD0.23, *p*=0.363 at 20 hours]. Figure 1.

In the conventional care group, the installation of a urinary catheter following a caesarean delivery is a commonly acknowledged practice that was maintained 24 hours after surgery. Catheters were withdrawn from ERAS group patients 6-8 hours after surgery, and no urinary problems were seen in this group at 10 and 20 hours. [1.08 ± SD 0.27 vs 1.24±SD 0.43,*p*=0.000 at 10 hours; 1.00±SD 0.00 vs 1.14±SD0.35, *p*=0.000 at 20 hours]. Figure 2.

When comparing the ERAS group to the conventional group, all of the women received multimodal and pre-emptive analgesia; of them, 11 (45.83%) received NSAIDs on a need-basis, and 4 of them received additional dosages of opioids. Pain score was recorded at 10 and 20 hours using visual analogue scores. [ 4.99±SD 1.77 vs 6.66±SD 1.72, *p*=0.000 at 10 hours; 2.32±SD 1.15 vs 4.36±SD 1.71, *p*=0.000 at 20 hours]. Figure 3.

When comparing the ERAS group to patients receiving conventional care, the fundamental elements—early feeding, prompt urine catheter removal, and efficient post-operative analgesia—have considerably shortened the ambulation time. ERAS patients experienced a considerably shorter time to resume bowel movement when compared to the traditional group. This was likely due to early oral intake and pre-emptive analgesia, which facilitated early ambulation.

Patients receiving traditional treatment were given 2500 ml on the first day of surgery and 1000 ml on the second. On the first day, patients in the ERAS arm were given 1500 ml and advised to drink enough water. In both groups, there was no recorded incidence of spinal headache.

There was no discernible difference in the timing of the antibiotic administration between the two groups, and neither group experienced any complaints of fever or wound infections. [1.08±SD 0.34 vs 1.12±SD 0.32, *p*=0.278 at 10 hours; 1.00±SD 0.00 vs 1.02±SD 0.14, *p*=0.044 at 20 hours]. Figure 4.

No woman required rehospitalization, and there were no readmissions due to surgical or medical problems in either group.

**Table-1: Frequency of demographic characteristics of patients (n=100)**

| Demographics | Frequency(%) |
|---|---|
| Age (20–30 years: 31–40 years) | 69 (69): 31 (31) |
| Parity (primigravida:multigravida) | 22(22): 78 (78) |
| Indication of LSCS: Previous 1 scar | 35 (35) |
| Indication of LSCS:Previous 2 scar | 27(27) |
| Indication of LSCS:Previous 3 scar | 10 (10) |
| Indication of LSCS:Breech position | 13 (13) |
| Other reasons such as maternal wish etc | 15 (15) |

**Table-2: Post-operative care variables measured in both groups (n=100)**

| Post-operative care variables | Mean±SD ERAS Group n=50 | Mean±SD Non-ERAS Group n=50 | *p*-value |
|---|---|---|---|
| Pain score at 10 hours | 4.99±1.77 | 6.66±1.72 | **0.000** |
| Pain score at 20 hours | 2.32±1.15 | 4.36±1.71 | **0.000** |
| Fever at 10 hours | 1.08±0.34 | 1.12±0.32 | 0.278 |
| Fever at 20 hours | 1.00±0.00 | 1.02±0.14 | **0.044** |
| Urinary problem at 10 hours | 1.08±0.27 | 1.24±0.43 | **0.000** |
| Urinary problem at 20 hours | 1.00±0.00 | 1.14±0.35 | **0.000** |
| Nausea at 10 hours | 1.08±0.27 | 1.22±0.41 | **0.000** |
| Nausea at 20 hours | 1.04±0.19 | 1.06±0.23 | 0.363 |
| Length of stay (hours) | 33.42±7.74 | 61.30±10.42 | **0.001** |
| Breastfeeding | 2.02±0.68 | 2.82±0.82 | **0.007** |

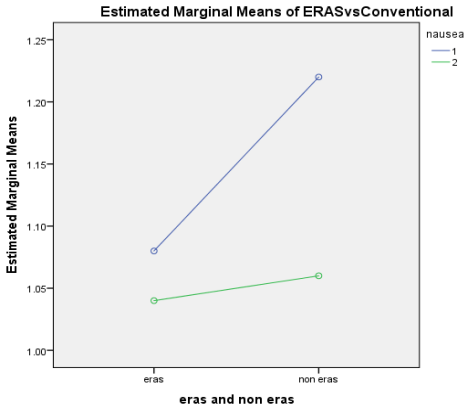


**Figure-1: Nausea and vomiting measured at 10 and 20 hours between ERAS group and conventional group patients**

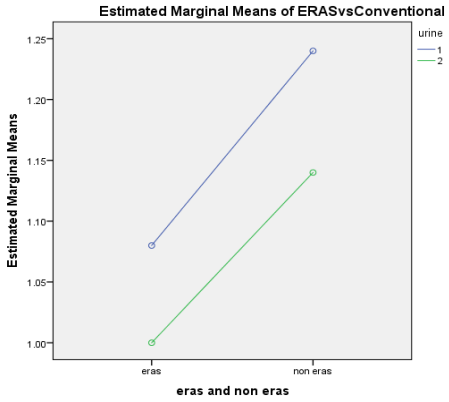


**Figure-2: Urinary problems measured at 10 and 20 hours between ERAS group and conventional group patients**

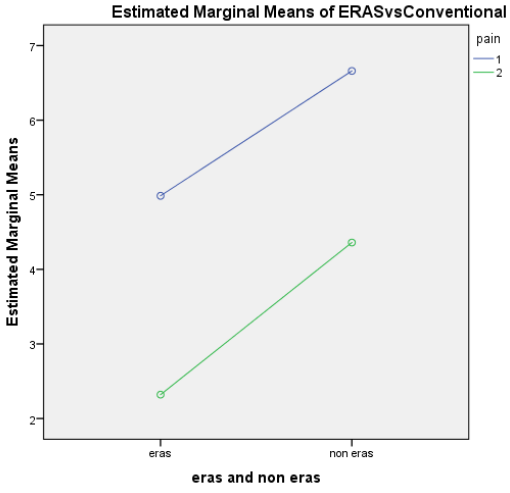


**Figure3: Pain score measured at 10 and 20 hours between ERAS group and conventional group patients**

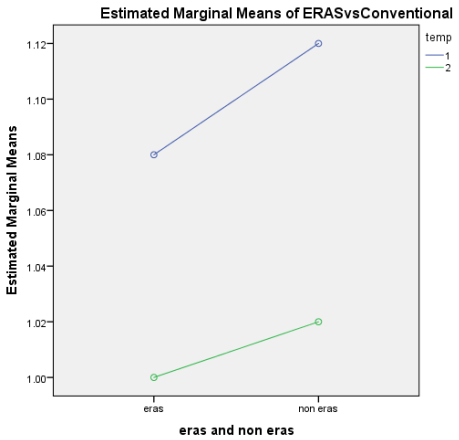


**Figure-4: Temperature (fever) measured at 10 and 20 hours between ERAS group and conventional group patients**

## DISCUSSION

Compared to women who received traditional protocol, those who were given ERAS protocol had a significantly shorter length of stay after surgery. Tramadol was used less frequently when multimodal analgesia was used. Bowel activity returned early since a regular diet was established at an early age. Early ambulation in the ERAS arm was a result of catheter removal occurring 6–8 hours after surgery.

The implementation of the ERAS pathway in obstetric surgeries resulted in a higher number of post-operative day 1 discharges, according to numerous observational studies, and a reduction in post-operative hospital stays (1.9 hours and 18.5 hours) according to structured randomised controlled trials by Teigen *et al*.[12] and Baluku *et al*.[13]. Day 1 discharge was 1.6% on the first day of implementation; after two years, there was a sharp increase to 25.2%.[14] Similarly, the Fast Track approach, which was implemented by Bowden *et al*.[15], showed a decrease in the average length of stay over the study period, from 3 days to 1.31 days. In addition to their clinical suitability for discharge, the women in the ERAS arm of our trial received excellent counselling, and their expectations and those of the service providers matched concerning the date of departure. Extended duration of catheterization, intravenous hydration, and postponed feeding were factors contributing to the lengthier stay in the standard care group. There would have been a substantial difference in the length of stay if the standard procedure of discharging patients on post-operative days 3 or 4 had been followed, in addition to patient expectations. The fear of contracting COVID-19 while in the hospital aided in the counselling process. Hospital stays can be further reduced by using the ERAS pathway in conjunction with appropriate prenatal counselling.

Better safety and efficacy can be achieved by pre-emptively administering a combination of paracetamol and diclofenac as a standard post-operative treatment, even before the effects of spinal anaesthesia wears off. To ensure safety and effectiveness for the acute regulation of postoperative analgesia, both are additive [16]. In our study, acetaminophen and diclofenac were given to all women in the ERAS group, while only 45% of the women in the conventional group received acetaminophen and diclofenac. During the recovery phase following surgery, the use of opioids may cause nausea, vomiting, and reduced gastrointestinal motility hence, opioids are avoided. An alternative method of analgesia that can provide long-lasting relief and lessen the need for opioids is neural blocks such as transverse abdominis plane block, but it requires anaesthesiologist competence and ultrasound guidance supervision.[17] When compared to alternative approaches, the combination of acetaminophen and diclofenac is more affordable and effective.

When a caesarean section is performed, the bladder is either drained right before the procedure or an indwelling catheter is used, which can be removed anywhere from right after the procedure to 24 hours later. While the Society for Obstetric Anaesthesia and Perinatology (SOAP) standards advocate removal after 6–12 hours of operation, the ERAS society has suggested rapid removal.[18] Longer initial voiding times, longer ambulation times, and dysuria are potential side effects of an indwelling catheter [19]. Early removal is linked to fewer episodes of haematuria, fewer urination episodes, and shorter hospital stays.[20] 6–8 hours passed after the catheter was removed in our trial, and neither group of women needed to have their catheters changed. However, early removal aided in the ERAS group's early ambulation. Walking for ten minutes and independent toileting were made possible by the early removal of the catheter, even if patients are required to sit in bed after four hours and are mobilized out of bed after eight hours.

Another important component of the ERAS route is the limitation of the length of fasting. A high-carbohydrate beverage four hours before the surgery, together with an early return to fluids and foods by four and six hours, significantly speed up the recovery of gastrointestinal activity. The ERAS society advises following surgery with a regular diet two hours afterwards. Early feeding is beneficial in several studies. In several studies, fluids were provided 4–24 hours following surgery, followed by solids as tolerated. Early feeding has shortened hospital stays, increased mother happiness, and caused bowel movements to return sooner.

## CONCLUSION

The use of the ERAS pathway following a caesarean section considerably shortened the time of post-operative hospital stay. The ERAS approach has greatly aided early recovery by minimizing fasting length, opioid use, early catheter removal, early restart of bowel motion, and early ambulation. Early recovery allows patients to enjoy the arrival of a new baby with their attendants at home along with minimization of post-operative complications. Secondary benefits will be observed by the hospital for the restoration of human resources and hospital budget.

**Limitations of study**

This is the first prospective study conducted in Pakistan that complies with the ERAS society's recommendations for post-operative care following a caesarean section. Other secondary outcomes such as a survey on the experiences of mothers with satisfaction, early recovery and initiation of breastfeeding would have been a valuable addition to this research.

**Conflict of interest:** Nil

## AUTHORS' CONTRIBUTION

UA: Conception of study, Experimentation/ Study conduction. UA, FEKF: Analysis/interpretation/Discussion. UA, MK: Manuscript Writing. ZR, RM: Critical Review and Proofreading. SA: Facilitation and Material analysis

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