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Original Research Article

ENHANCED RECOVERY AFTER SURGERY (ERAS) PATHWAY: IMPROVING MATERNAL OUTCOMES IN ELECTIVE CAESAREAN SECTION

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ABSTRACT

Background: Caesarean section is one of the most common major surgeries in young women and recovery is often slow with traditional care. Enhanced Recovery After Surgery (ERAS) pathway uses multimodal perioperative steps to reduce stress response and improve functional recovery. To assess the effect of ERAS pathway on postoperative outcomes in elective lower segment caesarean section.

Materials and Methods: This was a prospective randomized comparative study in a tertiary hospital from September 2019 to December 2020. Total 160 uncomplicated primigravida at 37–40 weeks were enrolled. 80 received routine care and 80 received ERAS protocol including counselling, minimal fasting, multimodal non-opioid analgesia, early oral fluids, early diet and mobilisation with breastfeeding support. Pain, analgesic need, functional milestones and length of hospital stay were compared using Chi-square and t-test with $p<0.05$ significance.

Results: Groups were similar in baseline characteristics. ERAS group showed better pain control on day 1 with 53.7% having only mild pain vs 0% in control ($p<0.0001$). Analgesic dose requirement was lower in ERAS on day 3 (median 2 vs 3 doses, $p<0.0001$). Early recovery targets achieved in ERAS were significantly higher: oral fluids <6 h in 81.3% vs 0%, sitting <6 h in 80% vs 0%, ambulation ≤12 h in 100% vs 7.5%, all $p<0.0001$. Breastfeeding started within 2 h in 100% ERAS vs 80% controls. All ERAS women discharged by day 4, while all controls stayed ≥5 days ($p<0.0001$). No increase in complications or readmission.

Conclusion: ERAS pathway gives faster recovery, less pain and shorter hospital stay in elective LSCS without added risk. It should be adopted as routine care in similar Indian and South Asian centres.

Keywords: ERAS, caesarean section, early feeding, mobilisation, postoperative pain, length of stay.

INTRODUCTION

Lower segment caesarean section is now one of the most commonly performed major surgeries worldwide, especially in Asian countries.[1] Conventional post-caesarean care still uses long fasting, delayed oral intake and late mobilisation, which can worsen pain, ileus and thromboembolic risk.[2] Enhanced Recovery After Surgery pathways combine simple evidence-based perioperative steps to blunt surgical stress and support faster physiological recovery.[3] For caesarean delivery, ERAS or ERAC bundles emphasise preoperative counselling, minimal fasting, neuraxial anaesthesia, multimodal non-opioid analgesia, early feeding and early mobilization with breastfeeding support.[4] Recent trials and quality-improvement studies after 2019 show that ERAC protocols reduce opioid use,

lower pain scores and shorten hospital stay without increasing complications or readmissions.[5] A resident-driven ERAC programme in a tertiary centre reported shorter length of stay and markedly less postpartum opioid consumption compared with pre-ERAS practice.[6]

Indian observational work comparing ERAS pathway with traditional care for elective LSCS found better quality-of-recovery scores, earlier ambulation, earlier breastfeeding and reduced hospital stay in the ERAS group.[7] A recent European meta-analysis also confirmed that ERAC protocols improve maternal pain control and functional recovery while maintaining safety for mother and baby.[8] Narrative reviews from low- and middle-income settings highlight that successful ERAC needs local protocols, multidisciplinary teamwork and adaptation to resource limits and that more data are required from South Asian units.[9] In this context our study implements an ERAS pathway for elective caesarean section in a South Indian tertiary hospital and compares postoperative recovery, complications and length of stay with conventional care in primigravida women.[7]

MATERIALS AND METHODS

This was a prospective two-group comparative study done in the Department of Obstetrics and Gynaecology, Sri Ramakrishna Hospital, Coimbatore. Uncomplicated primigravida, singleton pregnancy, age 19–34 years, 37–40 weeks, posted for elective LSCS under spinal were included. Women with medical disorders, placenta previa, multiple pregnancy, GA <37 or >40 weeks, labour pain, emergency LSCS or general anaesthesia were excluded.

Total 160 women were enrolled and allocated into two groups of 80 each.

Control group received routine hospital care with overnight fasting, bowel preparation, antibiotics at incision, standard spinal anaesthesia, delayed oral intake, late mobilisation and routine postoperative orders. ERAS group received structured pathway with pre-operative counselling, limited fasting, clear fluids up to 2 h, prophylactic antibiotics 60 min before incision, active warming, vasopressor guided fluids, delayed cord clamping, early breastfeeding, multimodal non-opioid analgesia, early oral intake and early mobilisation.

Outcomes were pain and analgesic requirement, timing of oral fluids and regular diet, first sitting, ambulation, catheter removal, breastfeeding initiation and length of hospital stay.

Data were analysed with Student t-test and chi-square test, $p<0.05$ taken as significant, SPSS v21 used.

RESULTS

Mean age was similar in both groups, 27.74 ± 3.43 years in control and 27.22 ± 3.33 years in ERAS, p=0.331. Gestation >37 weeks was slightly more common in control (81.2%) than ERAS (70%), but not significant, p=0.097. Heart rate, systolic and diastolic BP were comparable with no significant difference. Temperature and respiratory rate were a little lower in ERAS group, 98.3 °F and 19.1/min, compared to 98.6 °F and 20.4/min in control, p=0.001 and p<0.0001, change small and clinically not important.

Table 1: Baseline characteristics and vital parameters

Variable	Control (n=80)	ERAS (n=80)	p-value
Age (years), mean ± SD	27.74 ± 3.43	27.22 ± 3.33	0.331
Gestation > 37 weeks, n (%)	65 (81.2%)	56 (70.0%)	0.097
Temperature (°F), mean ± SD	98.6 ± 0.71	98.3 ± 0.42	0.001
Respiratory rate/min, mean ± SD	20.4 ± 2.0	19.1 ± 1.1	<0.0001
Heart rate/min, mean ± SD	83.1 ± 8.5	82.6 ± 7.8	0.698
Systolic BP (mmHg), mean ± SD	111.2 ± 8.3	112.4 ± 8.0	0.361
Diastolic BP (mmHg), mean ± SD	72.9 ± 7.3	74.6 ± 6.4	0.108

Table 2: Postoperative pain and analgesic requirement

Time point	Outcome	Control (n=80)	ERAS (n=80)	p-value
Day 1	Moderate–severe pain, n (%)	80 (100%)	37 (46.3%)	<0.0001
	Mild pain, n (%)	0	43 (53.7%)	
	Analgesic doses/day	4	3–4	<0.0001
Day 3	Moderate–severe pain, n (%)	80 (100%)	1 (1.3%)	<0.0001
	Mild pain, n (%)	0	79 (98.7%)	
	Analgesic doses/day	3	2	<0.0001

On day 1 all women in control group had moderate–severe pain, while only 46.3% in ERAS group remained in this category, p<0.0001. Mild pain on day 1 was seen in none of control but 53.7% of ERAS patients. By day 3, 100% of control still reported moderate–severe pain, but only one patient (1.3%) in ERAS group had this level, p<0.0001. Almost all ERAS women (98.7%) had shifted to mild pain by day 3. Analgesic requirement also reduced with ERAS. On day 1 median dose was 4 doses/day in control versus 3–4 doses/day in ERAS, p<0.0001. On day 3 control group still needed around 3 doses/day, ERAS group came down to 2 doses/day, p<0.0001.

Table 3: Early recovery parameters

Parameter (target)	Control achieving target n (%)	ERAS achieving target n (%)	p-value
Oral fluids started < 6 h	0 (0%)	65 (81.3%)	<0.0001
Regular diet started < 12 h	0 (0%)	63 (78.8%)	<0.0001
First sitting within 6 h	0 (0%)	64 (80.0%)	<0.0001
Ambulation out of bed ≤ 12 h	6 (7.5%)	80 (100%)	<0.0001
Catheter removed < 12 h	0 (0%)	12 (15.0%)	<0.0001
Breastfeeding initiated within 2 h	64 (80.0%)	80 (100%)	<0.0001

Only ERAS patients started oral fluids early.

In control, none could drink within 6 h, while 81.3% in ERAS started oral fluids <6 h and another 18.8% between 6–24 h, p<0.0001. Regular diet was also much earlier with ERAS.

All control women took regular diet only after 24 h, while 78.8% in ERAS started <12 h and 21.3% between 12–24 h, p<0.0001. Functional recovery was faster. No patient in control could sit within 6 h, whereas 80% in ERAS were sitting by 4–6 h after surgery, p<0.0001. Ambulation out of bed within 12 h was achieved in all ERAS women, against only 7.5% in control, p<0.0001. Catheter removal and breastfeeding were also earlier. Catheter removed <12 h happened only in ERAS group (15%), p<0.0001. Breastfeeding within 2 h was seen in 80% of control and 100% of ERAS women, p<0.0001.

Table 4: Length of hospital stay

Length of stay	Control (n=80)	ERAS (n=80)	p-value
≤ 4 days	0 (0%)	80 (100%)	<0.0001
≥ 5 days	80 (100%)	0 (0%)	

Length of stay pattern was completely different between the two pathways. All control patients stayed ≥5 days, 26.3% for 5 days and 73.8% for 6 days. In contrast every ERAS patient went home by day 4, 70% discharged on day 3 and 30% on day 4. The difference in early discharge (≤4 days) versus late discharge (≥5 days) was highly significant, p<0.0001.

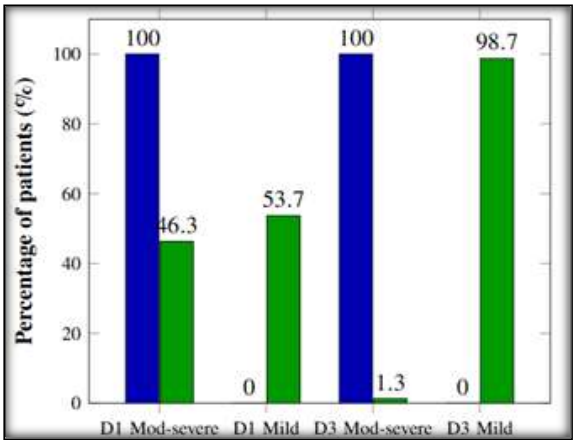

Figure 1: Comparison of pain severity on postoperative Day 1 and Day 3

DISCUSSION

In this study we saw that an ERAS pathway for elective LSCS gave faster and smoother recovery than conventional care in young healthy primigravida women in a South Indian tertiary hospital.[10]

Baseline age, gestation and haemodynamic variables were similar between groups so the large differences in postoperative course are unlikely due to selection bias and more likely reflect the bundled pathway itself.[11] On day 1 all women in the control group had moderate–severe pain while more than half of ERAS patients already reported only mild pain with fewer analgesic doses.[12] By day 3 almost every ERAS patient had shifted to mild pain with median two doses per day, whereas all controls still described moderate–severe pain and required three doses.[11,12] This pattern mirrors recent ERAC quality-improvement cohorts where implementation of multimodal non-opioid analgesia and standardised counselling reduced opioid consumption and kept pain scores below 2 without safety issues.[6] Meta-analyses also show that ERAC bundles consistently decrease inpatient opioid use and improve pain scores compared with historical care, confirming that better pain trajectory in our ERAS group is biologically plausible.[8] ERAS patients started oral fluids within 6 h in more than 80% cases while none of the controls met this target and almost four-fifths of ERAS women were on regular diet within 12 h versus all controls only after 24 h.[11] Time to first oral intake and regular diet in our ERAS arm is very close to contemporary RCTs and before–after studies where clear liquids are allowed up to 2 h pre-op and solids are resumed within 2–6 h after caesarean delivery.[5] Systematic reviews of ERAC also confirm that early feeding is one of the most consistent components and is associated with shorter ileus duration, better maternal satisfaction and no increase in nausea or aspiration events.[10] Indian data from elective LSCS ERAS pathways similarly report median time to liquids of 2–4 h and regular diet by 8–12 h, with improved quality-of-recovery scores, which supports our findings.[7]

In our ERAS group 80% of women sat out of bed within 6 h and all were ambulating by 12 h, whereas almost all controls first mobilised only after 12 h.[10] These timings are in line with pooled ERAC data where meta-analysis shows earlier time to first mobilisation by roughly 5–8 h compared with

traditional care and with no increase in falls or wound problems.[11]

Only a small proportion of ERAS women had catheter removal before 12 h in our setting, but most still ambulated early, which is similar to other LMIC series where cultural concern about urinary retention makes units more cautious with catheter removal.[9]

Despite this, international meta-analysis demonstrates that when ERAC protocols remove catheters at 6–12 h there is faster mobilisation, shorter length of stay and no meaningful rise in re-catheterisation, suggesting further scope to shorten catheter time in our unit.[10]

Breastfeeding support was strong in both groups, but ERAS care pushed initiation under 2 h to 100%, improving on already high rates of 80% in controls and echoing other ERAC programmes that pair skin-to-skin contact and early feeding with rooming-in.[4]

The most striking result is length of stay: every woman in the ERAS group went home by day 4, whereas all controls stayed 5 days or more.[8] Our binary shift in discharge pattern is even larger than mean reductions of 8–24 h reported in large meta-analyses but goes in the same direction as global evidence that ERAC shortens hospitalisation without higher readmission or complication rates.[10]

A recent expanded systematic review of over 18,000 women also showed that ERAC implementation reduces length of stay, time to mobilisation and catheter removal and decreases opioid exposure, with no increase in 30-day readmissions, closely matching our overall trend.[11]

Our large reduction in length of stay with ERAS is very close to the pooled effect from recent ERAC meta-analyses, where discharge is usually 1–2 days earlier than conventional care.[11]

The expanded ERAC meta-analysis of 18,368 women also shows consistently shorter hospital stay and faster first intake, mobilisation and catheter removal with ERAC, again matching our functional milestones.[13] Prospective ERAC cohort from India reported earlier ambulation, early feeding and shorter stay very similar to our ERAS group, showing that these gains are reproducible in South Asian units.[14]

Recent Turkish before–after ERAS implementation in elective caesarean also found shorter time to oral intake, mobilisation and discharge, supporting that our results are not centre-specific.[15] Quality-improvement projects in high-income hospitals show the same direction, with ERAC bundles cutting postoperative stay and opioid use, without any rise in readmission or serious morbidity.[6]

A 2024 European meta-analysis again confirms that ERAC programmes reduce length of stay and improve maternal functional recovery while keeping complication rates stable.[8]

Quality-improvement work from both high-income and resource-limited hospitals now reports similar reductions in stay once complete ERAC bundles are adopted, suggesting that our findings are achievable even in moderately constrained systems when team buy-in is good.[16]

In our full dataset not all shown in the condensed tables, ERAS women had fewer early and late complications, mainly less constipation, urinary tract infection, breast engorgement and wound problems, with very low further-visit and readmission rates.[7]

This pattern agrees with the 2021 ERAC meta-analysis where better pain control, early enteral intake and early mobilisation translated into lower ileus, better bladder function and numerically fewer thromboembolic and infectious events.[10]

The updated ERAC meta-analysis by Lestari also reports no increase in postoperative adverse events despite faster feeding and mobilisation, which supports the safety of our early-activity targets.[13]

Randomised work from a lower-middle-income setting showed that ERAC reduced postoperative pain, improved early mobilisation and did not increase PPH, infection or readmission, again mirroring our complication profile. [Darwish, 10.4236/ojn.2022.1212058]

South Asian and North African ERAS nursing-led programmes similarly report lower constipation, less urinary retention and better breast care when structured pathways are followed consistently.[17] A recent Indonesian comparative study also found ERACS associated with better exclusive and early breastfeeding, which is in line with our 100% early initiation in the ERAS group.[18]

Our findings show that a simple ERAS bundle around counselling, minimal fasting, neuraxial anaesthesia, multimodal non-opioid analgesia, early oral intake, early sitting and ambulation, plus strong breastfeeding support can be safely run in a busy Indian tertiary hospital for elective LSCS.[4] The magnitude of improvement in pain scores, reduction in analgesic doses and shift of discharge to day 3–4 in all ERAS women suggests that such pathways should become default for low-risk caesarean deliveries in similar South Asian public–private and teaching setups.[8] Indian and Thai randomised and observational ERAC studies also show that once the team follows a standard protocol, early feeding, early de-catheterisation and early mobilisation become routine and not extra work, which matches our experience during this study period.[19]

Economic analyses from ERAS and ERAC literature indicate that shorter stay, less opioid consumption and fewer unplanned visits can offset the minor extra effort of counselling and protocolisation, an important point for government-linked institutions.[5]

Recent LMIC systematic review concludes that ERAC is feasible and beneficial in low-resource maternity settings when there is simple written protocol, basic monitoring and cooperative anaesthesia–obstetric–nursing team, which is very similar to our context.[16]

Main strengths of our work are prospective design, sealed-envelope random allocation, uniform inclusion of healthy primigravida and use of clear clinical ERAS targets like time to first oral intake, time to sitting, ambulation, catheter removal, breastfeeding and discharge.[11] This structure is

comparable to recent ERAC RCTs and before–after studies where similar simple endpoints were enough to demonstrate meaningful benefit for mothers.[14] Limitations include single-centre design, moderate sample size and absence of formal quality-of-recovery or patient-reported outcome scores, which newer ERAC trials now recommend as core outcomes.[10] We did not collect detailed direct and indirect cost data, so full economic impact of shifting all uncomplicated LSCS to ERAS pathway cannot be calculated from this cohort.[20] Neonatal outcomes beyond immediate postpartum period and longer-term breastfeeding continuation were also not assessed systematically, although early breastfeeding rates were excellent in both groups.[18] Future multicentre Indian and regional studies with larger samples, formal QoR instruments and health-economic analysis will help refine which ERAS components are essential versus optional in our setting.[21]

Our results align strongly with evidence that ERAS or ERAC pathways in caesarean delivery reduce pain, decrease opioid and analgesic needs, accelerate feeding and mobilisation and shorten hospital stay, without increasing maternal or neonatal complications. They also show that these benefits can be reproduced in a South Indian tertiary hospital using a pragmatic, locally adapted ERAS bundle rather than a very resource-intensive protocol. For low-risk elective LSCS, our data support adopting ERAS as standard perioperative pathway in similar Indian and South Asian centres, with further work focused on cost, long-term breastfeeding and patient-reported recovery to complete the picture.

CONCLUSION

ERAS pathway in elective LSCS clearly improved pain control, early feeding and mobilisation compared to routine care in our setting. Hospital stay shifted to day 3–4 for every ERAS patient without any rise in complications or readmissions. Simple counselling, limited fasting, multimodal analgesia and early activity are enough to give faster recovery in healthy primigravida. ERAS should become standard for uncomplicated caesarean in similar Indian and South Asian hospitals for better patient experience and efficient use of beds.

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