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Original Article

Obstetrics and Gynaecology Section

Evaluating ERAS Protocol Implementation for Elective Caesarean Delivery: A Pilot Study on Perioperative Outcomes

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ABSTRACT

Introduction: The global rise in Caesarean Section (CS) rates has spotlighted the need to optimise perioperative care to enhance maternal recovery and reduce postoperative complications. Traditional perioperative practices, such as prolonged fasting, delayed mobilisation, and opioid-based analgesia, often contribute to suboptimal recovery and extended hospital stays. Enhanced Recovery After Surgery (ERAS) protocols offer a structured, evidence-based alternative aimed at minimising surgical stress, reducing opioid consumption, and accelerating recovery.

Aim: To assess the effectiveness of the ERAS protocol in improving postoperative recovery outcomes in patients undergoing elective CS.

Materials and Methods: This pilot study, designed as a prospective interventional, single-blind investigation, was conducted by the Department of Obstetrics and Gynaecology at Jawaharlal Nehru Medical College (JNMC), Wardha,Maharashtra, India. from January 2022 to December 2024. A total of 208 women undergoing elective CS were randomised into two equal groups: ERAS and traditional care. The ERAS group received comprehensive preoperative education, multimodal non opioid analgesia, early oral intake, and early ambulation, while the traditional group received conventional perioperative care. Key outcomes assessed included postoperative pain scores, opioid use, incidence of ileus, and duration of hospital stay. Statistical analysis included the Chi-square test for categorical variables, with $p<0.05$ considered significant.

Results: Baseline demographic and clinical characteristics were comparable between the groups. The mean age of participants was 27.08±4.54 years. Patients managed under ERAS reported significantly lower pain scores (VAS 6/10 in 73.21%), complete avoidance of opioids (0% vs. 87.08%), and no cases of postoperative ileus. Moreover, all ERAS patients were discharged within five days, compared to 7-10 days in the traditional group ($p<0.001$ for all comparisons).

Conclusion: The implementation of ERAS protocols in elective CS significantly improves postoperative recovery by reducing pain, eliminating opioid dependency, enhancing gastrointestinal function, and shortening hospital stays. These findings support the broader adoption of ERAS as a standard of care in obstetric surgery.

Keywords: Caesarean section, Enhanced Recovery After Surgery, Hospital stay, Multimodal analgesia, Opioid free recovery

INTRODUCTION

One of the most common surgical procedures carried out globally is the CS, playing a pivotal role in reducing maternal and neonatal morbidity and mortality when medically indicated [1-3]. In India, the proportion of caesarean deliveries has increased substantially, rising from 3% in 1992-93 to 17% in 2015-16 and reaching 21.5% in 2019-21, reflecting a marked upward trend over the past decades [4]. While this increase reflects improved access to lifesaving surgical care, it also raises concerns about potential overuse, especially in low-risk pregnancies, and highlights the need for optimising postoperative recovery strategies [5-8].

The perioperative course of Caesarean delivery is often associated with significant physical and psychological stress. Postoperative pain, delayed mobilisation, gastrointestinal dysfunction, and prolonged hospitalisation remain major challenges impacting maternal well-being, satisfaction, and overall recovery [9-11]. Traditional care protocols commonly involve extended preoperative fasting, reactive opioid-based analgesia, late initiation of oral feeding, and delayed ambulation, all of which contribute to suboptimal outcomes and increased healthcare costs [12].

To address these limitations, the ERAS model has emerged as an evidence-based, multidisciplinary framework aimed at minimising the physiological stress of surgery and promoting a rapid return to baseline function [13-15]. ERAS principles incorporate structured preoperative counseling, judicious fluid management, early oral intake, multimodal analgesia with minimal reliance on opioids, and early mobilisation. Initially developed for colorectal procedures, ERAS has since been successfully adapted across multiple surgical disciplines, including obstetrics. In the context of Caesarean delivery, ERAS implementation has demonstrated meaningful improvements in maternal outcomes [16-21]. For instance, a study by Kleiman AM et al., (2020) reported that ERAS protocols in elective CS significantly reduced opioid consumption, lowered postoperative pain scores, and shortened hospital stays without increasing complication or readmission rates. These findings support ERAS as a beneficial standardised approach to improving the quality and efficiency of perioperative obstetric care [22].

The ERAS Society and the Society of Obstetric Anaesthesia and Perinatology (SOAP) have published consensus recommendations specific to Caesarean delivery, outlining best practices across the preoperative, intraoperative, and postoperative phases [23-26]. These include strategies such as carbohydrate loading, neuraxial anaesthesia with long-acting opioids, early catheter removal, and structured discharge planning. Despite the increasing adoption of ERAS in high-income settings, its application and evaluation in nations with low and moderate incomes remain limited, particularly in the obstetric domain. Furthermore, there is insufficient data on how well these protocols perform across diverse populations and healthcare infrastructures.

Given the rising Caesarean rates and the pressing need for improved perioperative care, this pilot study was conducted to evaluate the

clinical effectiveness of ERAS protocols in enhancing postoperative recovery among women undergoing elective CS. Findings from this initial study will serve as a foundation for future research with a larger sample size to further validate and expand upon these results.

MATERIALS AND METHODS

This pilot study, designed as a prospective interventional, single-blind study, was conducted by the Department of Obstetrics and Gynaecology at Jawaharlal Nehru Medical College (JNMC), Wardha, Maharashtra, India, from January 2022 to December 2024. Before enrollment, all subjects provided written informed consent, and the study was approved by the Institutional Ethics Committee {Ref No. DMIMS(DU)/IEC/2023/738, dated 21st March 2023}.

A total of 208 pregnant women scheduled for elective CS were enrolled and randomly allocated into two equal groups. Group A (n=104) received perioperative care according to the ERAS protocol, while Group B (n=104) followed the conventional perioperative care pathway. Randomisation was achieved using a computer generated random number table, ensuring unbiased allocation. Each subject was assigned a number corresponding to the group allocation sequence, which was sealed in opaque envelopes opened only after enrollment. To ensure the single-blind design, the principal investigator responsible for outcome assessment was blinded to group assignments during data collection and analysis.

As this was a pilot study, a feasible sample of 208 participants (104 per group) was enrolled. A convenience sampling technique was used to include all eligible women undergoing elective Caesarean delivery during the study period.

Inclusion and Exclusion criteria: Inclusion criteria consisted of low-risk singleton pregnancies at a gestational age of 37 weeks or more, with adequate antenatal follow-up. Exclusion criteria included high-risk pregnancies such as preeclampsia, placenta previa, and multiple gestations, as well as emergency CSs and unbooked or poorly documented cases.

Study Procedure

The ERAS protocol included structured antenatal counseling, nutritional optimisation, limited preoperative fasting (allowing clear fluids up to two hours before surgery), prophylactic antiemetics, goal-directed fluid therapy, multimodal non opioid analgesia, early removal of the urinary catheter (within 6-12 hours), initiation of oral intake within 2-4 hours postoperatively, and ambulation within six hours of surgery. In contrast, the traditional care group underwent standard institutional practice, which included prolonged fasting, opioid-based analgesia, delayed oral intake, catheter removal after 12 hours, and ambulation initiated on the first postoperative day.

Data were recorded using a predesigned structured proforma and included demographic details, surgical characteristics, and postoperative recovery parameters. The primary outcomes measured were postoperative pain, using the Visual Analog Scale (VAS) [27], postoperative opioid consumption, incidence of postoperative ileus, and duration of hospital stay. Secondary outcomes included venous thromboembolism, postpartum hemorrhage, surgical site infection, and 30-day readmission to the hospital.

STATISTICAL ANALYSIS

For the statistical analysis, International Business Machines Statistical Package for the Social Sciences (IBM SPSS) version 24.0 (Armonk, NY, USA) was utilised. Qualitative variables were presented using frequency and percentage, while quantitative variables were displayed as means with standard deviations. Group comparisons were conducted using the Chi-square test for categorical data. P-values below 0.05 were considered statistically significant.

RESULTS

The baseline demographic and clinical profiles were comparable between the ERAS (n=104) and Traditional (n=104) groups. The majority of patients were in the 21-30 years age group {ERAS: 75% (n=78); Traditional: 75.96% (n=79)}. The leading indication for CS in both groups was previous Lower Segment Caesarean Section (LSCS) {ERAS: 57.69% (n=60); Traditional: 58.65% (n=61)} [Table/Fig-1] [28].

Parameters	ERAS protocol	Traditional protocol	p-value
Age (years)			
≤20	5 (4.81%)	8 (7.69%)	0.627
21-30	78 (75%)	79 (75.96%)	
31-40	20 (19.23%)	15 (14.42%)	
>40	1 (0.96%)	2 (1.92%)	
Residence			
Urban	39 (37.5%)	43 (41.35%)	0.67
Rural	65 (62.5%)	61 (58.65%)	
Socioeconomic class [28]			
Lower	18 (17.31%)	22 (21.15%)	0.812
Lower middle	43 (41.35%)	38 (36.54%)	
Middle	40 (38.46%)	42 (40.38%)	
Upper middle	3 (2.88%)	2 (1.92%)	
Obstetric score			
Primigravida	44 (42.31%)	43 (41.35%	0.888
Multigravida	60 (57.69%)	61 (58.65%	
Gestational age			
36 weeks - 36+6 weeks	8 (7.69%)	6 (5.77%)	0.952
37 weeks - 37+6 weeks	25 (24.04%)	22 (21.15%)	
38 weeks - 38+6 weeks	32 (30.77%)	35 (33.65%)	
39 weeks - 39+6 weeks	25 (24.04%)	27 (25.96%)	
40 weeks - 40+6 weeks	14 (13.46%)	14 (13.46%)	
Indication for caesarean			
Previous LSCS	60 (57.69%)	61 (58.65%)	0.742
Breech	36 (34.62%)	32 (30.77%)	
Cephalopelvic disproportion	3 (2.88%)	6 (5.77%)	
Postdatism	5 (4.81%)	5 (4.81%)	

[Table/Fig-1]: Baseline clinical and demographic features of patients in the traditional protocol and ERAS groups having an elective Caesarean Section (CS).
Note: p-values were calculated using the Chi-square test for comparison of categorical variables between groups.

Postoperative ileus was recorded in 2.88% (n=3) of patients in the traditional group; however, it was not seen in any of the patients in the ERAS group {0% (n=0)}. As p=0.246, the difference was not statistically significant, indicating that the incidences in the two groups were similar.

The majority of patients in the ERAS group reported moderate pain levels, with 73.08% (n=76) rating their pain as 6 out of 10. In contrast, the traditional group exhibited a wider spread, with significantly more patients experiencing higher pain scores, including 37.5% (n=39) reporting an 8 out of 10. The difference in pain score distribution between the two groups was highly statistically significant (p<0.001), indicating better postoperative pain control in the ERAS group [Table/Fig-2].

Peak pain scores	ERAS protocol	Traditional protocol	p-value
4 out of 10	9 (8.65%)	0 (0%)	<0.001
5 out of 10	12 (11.54%)	0 (0%)	
6 out of 10	76 (73.08%)	37 (35.58%)	
7 out of 10	7 (6.73%)	28 (26.92%)	
8 out of 10	0 (0%)	39 (37.5%)	
Total	104 (100%)	104 (100%)	

[Table/Fig-2]: Distribution of peak postoperative pain scores in ERAS and traditional protocol groups.
Note: p-values were calculated using the Chi-square test for comparison of categorical variables between groups.

There were no postoperative opioid needs among the patients in the ERAS group {0% (n=0)}, compared to 86.54% (n=90) of patients in the traditional group (p<0.001) [Table/Fig-3].

Postoperative opioid consumption	ERAS protocol	Traditional protocol	p-value
Not required	104 (100%)	14 (13.46%)	<0.001
Required	0 (0%)	90 (86.54%)	
Total	104 (100%)	104 (100%)	

[Table/Fig-3]: Postoperative opioid consumption in ERAS and traditional protocol groups.
Note: p-values were calculated using the Chi-square test for comparison of categorical variables between groups.

All patients in the ERAS group were discharged within three to five days, with 34.62% (n=36) staying for five days and 33.65% (n=35) staying for three days. In contrast, none of the patients in the traditional group were discharged before seven days, and 31.73% (n=33) required 10 days of hospitalisation (p<0.001) [Table/Fig-4].

Length of hospital stay	ERAS protocol	Traditional protocol	p-value
3 days	35 (33.65%)	0 (0%)	<0.001
4 days	33 (31.73%)	0 (0%)	
5 days	36 (34.62%)	0 (0%)	
7 days	0 (0%)	24 (23.08%)	
8 days	0 (0%)	19 (18.27%)	
9 days	0 (0%)	28 (26.92%)	
10 days	0 (0%)	33 (31.73%)	
Total	104 (100%)	104 (100%)	

[Table/Fig-4]: Length of hospital stay in ERAS and traditional protocol groups.
Note: p-values were calculated using the Chi-square test for comparison of categorical variables between groups.

DISCUSSION

In the present study, baseline demographic and clinical characteristics were comparable between the ERAS and traditional groups, ensuring internal validity for outcome comparisons. Similar to our cohort, previous LSCS emerged as the leading indication; a tertiary hospital-based study in Eastern India (2017-2018) reported previous LSCS as the primary indication in 29.96% of Caesareans, followed by labor arrest (13.94%) and cephalopelvic disproportion (11.84%) [23].

Postoperative ileus was observed exclusively in the traditional care group (2.88%), with no cases reported in the ERAS cohort. Although the difference was not statistically significant, the absence of ileus in the ERAS group suggests a favourable impact of early oral intake and mobilisation on gastrointestinal recovery. Thiele RH et al., demonstrated that standardised ERAS pathways significantly reduced gastrointestinal complications such as ileus through early ambulation, multimodal analgesia, and early enteral nutrition [24].

Patients managed under the ERAS protocol experienced notably better pain relief, with most reporting moderate pain levels (VAS score of 6). Similar findings were described by Wilson RD et al., (2018), who observed that incorporating multimodal analgesia within the ERAS framework substantially reduced postoperative pain and enhanced maternal satisfaction [18].

The most striking difference between the groups was seen in postoperative opioid consumption. None of the patients in the ERAS group required opioid analgesics, while a substantial 86.54% of patients in the traditional group did, highlighting a significant reduction in opioid reliance under the ERAS protocol. This trend was further supported by Lester SA et al., (2020) and Langnas EM et al., (2021) [25,26].

Lester SA et al., analysed 541 caesarean deliveries and found that introducing an ERAS program reduced mean inpatient opioid use from 104.3 mg to 60.3 mg of Oral Morphine Equivalents (OME) (a 42% decrease; p<0.001). Additionally, opioid use within 24 hours post discharge dropped from 74.6% to 41.1% (also p<0.001), while average pain scores remained low (1.9 vs. 1.6) [25]. Langnas EM et al., (2021) conducted an interrupted time series on 1,473 caesarean cases and reported a decrease in discharge opioid prescriptions from 95.4% pre ERAS to 80.7% post ERAS. Moreover, there was a monthly reduction of 0.48 OME in discharge prescriptions (p<0.01) [26]. This aligns with the findings of MacGregor CA et al., who reported a drop in median postoperative opioid use from 140 mg to 0 mg Morphine Milligram Equivalents (MME) following ERAS implementation (p<0.001), along with a reduction in hospital stay from 4.02 to 2.37 days [29]. Similarly, Sutton CD and Carvalho B (2017) highlighted that the use of scheduled non opioid analgesia (acetaminophen and NSAIDs) alongside neuraxial morphine not only provides effective pain relief but also reduces opioid-related side effects, facilitates early ambulation, and improves maternal satisfaction [30]. These statistically supported outcomes are consistent with our results, reinforcing the efficacy of ERAS protocols in enhancing recovery and minimising opioid use after caesarean section.

The length of hospital stay was notably shorter in the ERAS group, with all patients discharged within five days. In contrast, none of the patients in the traditional group were discharged before seven days, and one-third required a 10-day stay. Similarly, Wrench IJ et al., (2015) reported that following ERAS implementation, 85% of caesarean patients were discharged on postoperative day one, compared to 0% pre ERAS, with no increase in readmission or complication rates [31].

Given these favourable outcomes and the growing body of literature supporting ERAS in obstetric practice, the necessity of this study was to validate the protocol's utility within the Indian healthcare system, especially in tertiary settings with diverse patient populations. The results confirm that adopting ERAS protocols for CSs can yield measurable benefits, justifying broader implementation as a standard of care.

Limitation(s)

This single-center pilot study had a limited sample size, which may restrict the generalisability of the findings. Participant blinding was not feasible, introducing potential bias. Long-term outcomes such as maternal satisfaction and neonatal health were not assessed. Additionally, biochemical and patient reported recovery markers were not included, warranting further research through larger multicentric trials.

CONCLUSION(S)

Implementation of the ERAS protocol in elective caesarean sections significantly improved key perioperative outcomes compared to traditional care. The results of this study reinforce the feasibility and clinical relevance of ERAS in a tertiary care setting and support its broader implementation in routine obstetric care.

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