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Enhanced Recovery After C-Section; Experience at KGH

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Author`s Contribution

[1,4]Substantial contributions to the conception or design of the work; or the acquisition, [3]Active participation in active methodology, [5,6]analysis, or interpretation of data for the work, [2]Drafting the work or revising it critically for important intellectual content

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ABSTRACT

Objective: To assess the effectiveness of the Enhanced Recovery After Surgery (ERAS) protocol in improving postoperative outcomes following cesarean delivery compared with conventional care.

Methodology: This prospective observational study was conducted in the Obstetrics and Gynecology Department, Kharadar General Hospital, Karachi, from April to September 2024. Ninety women aged 18–40 years with singleton pregnancies undergoing elective cesarean section were enrolled and divided into ERAS (n = 45) and control (n = 45) groups. Both underwent the same surgical technique. The ERAS protocol included goal-directed IV fluids, early oral intake, mobilization within 8 hours, early catheter removal, dressing change at 24 hours, multimodal analgesia, and a short course of IV antibiotics. The control group received standard care with fixed-rate IV fluids, delayed oral intake and mobilization, late catheter removal, dressing change on day 3, and prolonged IV therapy. Data were analyzed using SPSS 26.

Results: The ERAS group showed significantly shorter IV fluid duration (10.18 ± 1.64 h vs. 24.00 ± 0.00 h), earlier oral intake (5.22 ± 1.61 h vs. 11.87 ± 1.62 h), and mobilization (7.64 ± 1.50 h vs. 35.47 ± 10.22 h) (all p = 0.001). Catheter removal, dressing change, and IV antibiotic duration were also earlier (p = 0.001). Pain scores at 24 h were lower (3.40 ± 1.18 vs. 5.91 ± 1.52), and hospital stay was reduced (1.73 ± 0.62 days vs. 5.02 ± 0.87 days) in the ERAS group.

Conclusion: Implementation of ERAS after cesarean delivery significantly enhanced recovery, reduced postoperative discomfort, and shortened hospitalization, supporting its integration into routine obstetric surgical practice.

Keywords: Cesarean section, ERAS, postoperative recovery, early mobilization, maternal outcomes

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Introduction

Caesarean section is among the most frequently performed surgical procedures, and clinicians are confronted with the dual challenge of managing both fetal and maternal risks of morbidity and mortality following the delivery.[1] It is estimated that by the year 2030, approximately 28.5% of births globally will occur through surgical delivery, with regional variations from as low as 7.1% in sub-Saharan Africa to as high as 63.4% in Eastern Asia.[2,3] In many countries today, surgical birth rates have surpassed 40%. In contrast to vaginal birth, it is often associated with extended hospitalization, reduced maternal satisfaction, and slower physical and functional recovery. Notably, the typical patient is a young, otherwise healthy woman who would ideally benefit from a quicker return to baseline in order to care for her newborn effectively.[4]

A key factor contributing to this increase is the adoption of the Enhanced RecoveryAfter Cesarean (ERAC) model, which offers improved recovery times and multiple advantages over traditional management methods.[2.5] ERAC has shown significant benefits and is increasingly viewed as the future standard for cesarean delivery worldwide, its implementation requires ongoing

evaluation. The essential component of the ERAS protocol is effective pain management, which is achieved through strategies such as preoperative patient education, multimodal analgesia, and the early initiation of oral medications.[6] However, this evaluation should cover various critical aspects, such as anesthetic techniques, pain management strategies, wound healing processes, and the pace of functional recovery. The assessment of anesthesia in cesarean delivery should emphasize the patient's response, effectiveness of intraoperative and postoperative pain control, and any adverse effects or complications. It is also important to document the type of anesthesia used and monitor for related issues during or after surgery.[2,7] Postoperative wound healing and infection prevention are equally critical aspects of recovery that must be thoroughly evaluated. Moreover, assessing functional recovery such as the patient's ability to ambulate, resume oral intake, and perform routine daily activities is essential in determining the overall success of enhanced recovery protocols.[2,8]

With the steadily rising global rates of cesarean deliveries, the integration of Enhanced Recovery After Surgery (ERAS) protocols presents a valuable opportunity to enhance maternal comfort in the postoperative period, improve clinical outcomes, and support the timely return of normal physiological function. Although the application of ERAS in cesarean sections is still evolving, the ERAS Society has recently introduced comprehensive, evidence-based guidelines covering preoperative, intraoperative, and postoperative care for both scheduled and unscheduled cesarean deliveries.[4,9,10] However, to contribute further to the existing body of knowledge and share insights from our clinical experience, this study has been conducted to evaluate the effectiveness of the ERAS protocol in cesarean sections at a tertiary care hospital

Methodology

This prospective observational study was conducted at gynae and OBS department of Kharadar General Hospital (KGH) Karachi. Study was done during a period of six months from April 2024 to Sept 2024. All the women aged 18 years to 40 years old presented with singleton pregnancy and selected for elective cesarean section with ASA (American Society of Anesthesiologists) physical status I or II were included. All the patients who underwent emergency cesarean section, patients with twin pregnancies, known medical comorbidities like uncontrolled diabetes, hypertension disorders, renal impairment and chronic liver disease or the patients developed intraoperative complications including intraoperative massive hemorrhage and those who were nor agreeing to participate in the study were excluded.

The surgical method was the same in both ERAS and non-ERAS arms. Intravenous fluids were administered using a goal-directed approach at 1 mL/kg/hour, aiming for a target urine output. Intravenous fluids were discontinued either once the patient tolerated oral intake or after 12 hours postoperatively, whichever occurred earlier. Pain management followed a multimodal regimen, including intravenous Paracetamol and diclofenac for the first 24 hours, followed by oral analgesics as needed. Injection tramadol hydrochloride 100 mg was administered as a rescue analgesic when required. Antimicrobial prophylaxis included intravenous ceftriaxone 1 g twice daily for 24 hours, followed by oral Cefixime 200 mg twice daily for five days, along with intravenous metronidazole 500 mg three times daily for 24 hours. Early oral intake was initiated with sips of water few hours of shifting from the operating room, and regular feeding was started within 8 hours postoperatively. Early mobilization was promoted in phases: within 8 hours postoperatively, patients were encouraged to sit at the edge of the bed or move to a chair, and ambulate as tolerated. From 8–24 hours, walking at least 1–2 times per day was advised, increasing to 3–4 times per day after 24 hours. Urinary catheters were removed between 8–12 hours postpartum to facilitate early mobility and reduce infection risk. Dressing changes were performed at 24 hours post-surgery.

All the patients of the standard care group received postoperative management according to routine hospital practices. Intravenous hydration was maintained at a rate of 100 mL per hour, typically for 24 hours, until the patient was able to tolerate oral intake. Ambulation was guided by the comfort level of the patient and clinical judgment of the attending physician. Urinary catheters were withdrawn between 24 to 48 hours following the procedure. Wound dressings were generally replaced on the third postoperative day. Injectable antibiotics and pain relief medications were administered for the initial 48 hours, followed by a five-day course of oral antimicrobial therapy. Data regarding maternal recovery parameters, complications, hospital stay and postoperative outcomes were recorded and analyzed using SPSS version 26.

Results

The mean age of participants in the ERAS group was 25.3 years with a standard deviation of 4.88, while the control group had a higher average age of 29.7 years and a standard deviation of 5.87. In terms of booking status, women in the ERAS group were booked (84.4%) compared to the control group (53.3%), (p-0.001). Out of all, 68.9% were booked and 31.1% were un-booked. Regarding the number of previous cesarean sections, 66.7% of women in the ERAS group had no prior cesarean compared to 33.3% in the control group, p-0.015. Additionally, 22.2% in the ERAS group and 37.8% in the control group had one previous cesarean, while fewer women had two or more previous cesareans in both groups. 46.7% of women in the ERAS group were primiparous compared to 24.4% in the control group as shown in Table 1.

TableI: Demographic variables of the patients information (n=90).

Variables		Study groups Control	ERAS	Total	p-value
Booking status	Booked	24	38	62	0.001
		53.3%	84.4%	68.9%	
	Un-booked	21	7	28	
		46.7%	15.6%	31.1%	
Number of Previous CS	No	15	30	45	0.015
		33.3%	66.7%	50.0%	
	1	17	10	27	
		37.8%	22.2%	30.0%	
	2	11	4	15	
		24.4%	8.9%	16.7%	
	3	2	1	3	
		4.4%	2.2%	3.3%	
Parity of women	Primiparous	11	21	32	0.059
		24.4%	46.7%	35.6%	
	Parity 1-3	33	22	55	
		73.3%	48.9%	61.1%	
	4-5	1	2	3	
		2.2%	4.4%	3.3%	

There was mean intravenous fluid rate was lower in the ERAS group (20.67 ± 4.11 mL/hr) compared to the control group (28.80 ± 8.25 mL/hr), and the duration of IV fluid administration was also considerably shorter in the ERAS group (10.18 ± 1.64 hours) versus 24 hours in the control group (p = 0.001). Oral intake was initiated much earlier in the ERAS group (5.22 ± 1.61 hours) than in the control group (11.87 ± 1.62 hours), and patients in the ERAS arm were mobilized earlier (7.64 ± 1.50 hours) compared to those in the control group (35.47 ± 10.22 hours), (p-0.001**)**. Mean duration of catheter removal was also significantly lower in the ERAS group and dressing changes were done earlier (p -0.001). The duration of IV antibiotic therapy was shorter in the ERAS group (25.07 ± 3.45 hours) than in the control group (46.67 ± 3.81 hours). Additionally both groups received five days of oral antibiotics; the IV analgesia duration was notably less in the ERAS group. Furthermore the pain scores at 24 hours postoperatively and lengths of hospital stay were significantly lower in the ERAS group compared to the control group (p - 0.00**1**), indicating an enhanced and earlier recovery, as shown in Table II.

Table II: Clinical outcomes comparison among ERAS and conventional care after c section. (n=90)

Variables	Groups	N	Mean	Std. D	p-value
IV Fluids Rate (mL/hr)	ERAS	45	20.67	4.107	0.001
	Control	45	28.80	8.251	
IV Fluids Duration (hours)	ERAS	45	10.18	1.642	0.001
	Control	45	24.00	.000	
Oral Intake Initiation (hours)	ERAS	45	5.22	1.608	0.001
	Control	45	11.87	1.618	
Mobility Initiation (hours)	ERAS	45	7.64	1.495	0.001
	Control	45	35.47	10.219	
Catheter Removal Time (hours)	ERAS	45	10.18	1.642	0.001
	Control	45	36.27	10.389	
Dressing Change (Post-op Day)	ERAS	45	24.53	2.501	0.001
	Control	45	52.53	13.365	
IV Antibiotic Duration (hours)	ERAS	45	25.07	3.454	0.001
	Control	45	46.67	3.814	
Oral Antibiotic Duration (days)	ERAS	45	5.00	.000[a]	0.001
	Control	45	5.00	.000[a]	
IV Analgesia Duration (hours)	ERAS	45	25.07	4.298	0.001
	Control	45	46.93	8.018	
Pain Score at 24h (0-10)	ERAS	45	3.40	1.176	0.001
	Control	45	5.91	1.520	
Hospital Stay (days)	ERAS	45	1.73	.618	0.001
	Control	45	5.02	.866	

Discussion

Cesarean section is a surgery of choice in majority of patients, but carries significant challenges for feto-maternal health, requiring specialized post-operative care.[11] ERAS, in this context, not only decreases intra-operative stress response but also diminishes likelihood of complications, reduces duration of hospital-stay, and helps quick recovery following surgery.[12] This study assessed the effectiveness of the ERAS protocol in enhancing postoperative recovery after cesarean delivery versus conventional care. The mean age of participants in the ERAS group was 25.3 years with a standard deviation of 4.88, while the control group had a higher average age of 29.7 years and a standard deviation of 5.87. Compared to our study cohort, in the study of Aliem et al[13] mean age of study group participants was 28.24 years and in the control group mean age was 27.12 years. Additionally in this study, majority of women 68.9% were booked and

31.1% were un-booked. Booked women were more common in the ERAS group (84.4%) compared to the control group (53.3%), with a statistically significant difference in booking status between both groups (p-0.001). Regarding the number of previous cesarean sections, 66.7% of women in the ERAS group had no prior cesarean compared to 33.3% in the control group. The difference of previous cesarean sections was statistically significant between the study and control groups (p-0.015). Moreover, 22.2% in the ERAS group and 37.8% in the control group had one previous cesarean, while fewer women had two or more previous cesareans in both groups. 46.7% of women in the ERAS group were primiparous compared to 24.4% in the control group. In line with these findings, in the study of Wang et al[14] majority of patients had no previous experience of cesarean section (69.26%). Consistently, in the study by Niyigena et al[15] the majority of patients had no history of previous cesarean section (70.34%), while only 29.66% had a prior cesarean history. In contrast to our findings, they reported a higher proportion of multiparous women in both the study group (90%) and the control group (52%), whereas primiparous women constituted only 10% and 48% of the respective groups. These contradictory findings may be attributed to differences in sample size and patient selection criteria for ERAS implementation between the studies.

In present study, mean intravenous fluid rate was lower in the ERAS group (20.67 ± 4.11 mL/hr) compared to the control group (28.80 ± 8.25 mL/hr), and the duration of IV fluid administration was also considerably shorter in the ERAS group 10.18±1.64 hours versus 24 hours in the control group p- 0.001. Additionally, both groups received five days of oral antibiotics. The duration of IV antibiotic therapy was shorter in the ERAS group 25.07±3.45 hours than in the control group 46.67±3.81 hours. The IV analgesia duration was notably less in the ERAS group. Oral intake was initiated much earlier in the ERAS group 5.22±1.61 hours than in the control group 11.87±1.62 hours. Consistent findings were documented in the study of Gupta et al[16] where in ERAS group, phenylephrine requirement (70±26 g vs.112.5±29.4 g) and analgesic need within 24 hours (114.3±36 g vs.152.6±51 g) were significantly lower than in Controls (adjusted $p < 0.01$). Correspondingly, in the study of Hedderson et al[17] the time to oral intake was reduced by 11.1 hr in the post-ERAS compared to pre-ERAS, suggesting decreased IV dependency. Moreover, mean opioid exposure decreased by nearly 50% (pre-ERAS=10.7 to post-ERAS=5.4 equivalents) and multimodal analgesia increased from 9.7 percent to 88.8 percent.

In this study, patients in the ERAS arm were mobilized earlier (7.64 ± 1.50 hours) compared to those in the control group (35.47 ± 10.22 hours), (p-0.001). Mean duration of catheter removal was also significantly lower in the ERAS group and dressing changes were done earlier (p-0.001). Furthermore the pain scores at 24 hours postoperatively and lengths of hospital stay were significantly lower in the ERAS group compared to the control group (p - 0.001), indicating an enhanced and earlier recovery. Corresponding to these findings in the study of Gupta et al[16] length of hospital stay (2.8 ± 0.5 vs. 5.3 ± 0.6 hours), postoperatively VAS scores, ambulation time (7.7±1.8 vs 63.6±6.8), and decatheterization time (6.6±1 vs 62.7±9.7) were significantly decreased in ERAS group than in Controls ($p < 0.01$). In agreement with our findings, a meta-analysis conducted by Meng et al[18] also observed statistically significant decrease in length of hospital stay, postoperative VAS score, and opioid use in the ERAS group compared to in conventional group ($p < 0.00001$). Similarly, Kleiman et al[19] also documented significantly lower pain scores ($p<0.007$) and length of hospital stay ($p<0.001$) in ERAS group. Overall the implement of ERAS into routine obstetric surgical practice is promising due to its observed clinical and recovery benefits; however, based on limitations of this study like small sample size, lack of patient satisfaction assessment, short follow-up duration, and potential confounding variables weaken the overall strength and applicability of the findings. Consequently, these preliminary results should be interpreted with carefully and not considered conclusive evidence for widespread implementation. However further large-scale, multicenter randomized trials incorporating diverse populations, long-term outcomes, patient-reported experiences, their satisfaction level and cost-effectiveness analysis are strongly recommended to validate and improve the protocol for more extensive, evidence-based clinical implementation specifically at local level.

Conclusion

The study observed that implementing the ERAS protocol significantly improved postoperative outcomes compared to conventional care, including earlier oral intake and ambulation, reduced durations of IV fluids, catheterization, and antibiotics, better pain control, and shorter hospital stays indicating faster recovery, enhanced patient comfort, and more efficient use of hospital

resources. Based on given benefits, the integration of ERAS into routine obstetric surgical practice is recommended; however, due to limitations such as a small sample size and the absence of patient satisfaction analysis, these findings should not be considered definitive, and further multicenter studies with larger populations are needed to validate the results and optimize the protocol for broader clinical application.

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