



## Original Research Article

# COMPARATIVE STUDY OF ENHANCED RECOVERY AFTER SURGERY VERSUS CONVENTIONAL PERI-OPERATIVE CARE IN ELECTIVE GASTROINTESTINAL SURGERY

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### ABSTRACT

**Background:** Elective gastrointestinal surgery is commonly associated with post-operative pain, delayed bowel recovery, prolonged fasting, delayed mobilization, and increased hospital stay. Enhanced Recovery After Surgery is a multimodal peri-operative care pathway designed to reduce surgical stress, preserve physiological function, and promote early recovery. Conventional peri-operative care often involves prolonged fasting, delayed oral feeding, routine intravenous fluids, and gradual mobilization. This study was conducted to compare the effectiveness of Enhanced Recovery After Surgery protocol with conventional peri-operative care in patients undergoing elective gastrointestinal surgery. **Aim:** To compare the outcomes of Enhanced Recovery After Surgery versus conventional peri-operative care in elective gastrointestinal surgery at a tertiary care hospital.

**Materials and Methods:** This hospital-based comparative observational study included 60 adult patients undergoing elective gastrointestinal surgery. Patients were divided into two groups: 30 patients managed with Enhanced Recovery After Surgery protocol and 30 patients managed with conventional peri-operative care. Baseline demographic profile, comorbidities, type of surgery, intra-operative parameters, post-operative recovery variables, complications, and outcomes were recorded. The main parameters assessed included time to first oral intake, return of bowel function, time to mobilization, duration of intravenous fluids, post-operative pain score, length of hospital stay, post-operative complications, re-admission, re-operation, and mortality. Data were analyzed using IBM SPSS Statistics version 27.0. A p-value of less than 0.05 was considered statistically significant.

**Results:** Both groups were comparable in terms of age, sex, BMI, comorbidities, ASA grading, type of surgery, operative duration, blood loss, transfusion requirement, and intra-operative complications. Nasogastric tube use was significantly lower in the ERAS group compared to the conventional group, 26.67% versus 60.00%, and abdominal drain use was also lower, 33.33% versus 63.33%. The ERAS group had significantly earlier oral intake, 18.60 ± 6.80 hours versus 43.20 ± 12.50 hours, earlier passage of flatus, 34.80 ± 10.20 hours versus 56.40 ± 14.30 hours, and earlier mobilization, 16.40 ± 5.60 hours versus 36.80 ± 10.40 hours. Mean post-operative pain score was lower in the ERAS group, 3.20 ± 1.10 versus 4.60 ± 1.30. Length of hospital stay was significantly shorter in the ERAS group, 5.40 ± 1.60 days versus 8.20 ± 2.30 days. Overall morbidity was significantly lower in the ERAS group, 23.33% versus 50.00%. No mortality was reported in either group.

**Conclusion:** Enhanced Recovery After Surgery protocol was associated with faster post-operative recovery, reduced pain, shorter hospital stay, and lower overall morbidity compared to conventional peri-operative care. ERAS is a safe and effective peri-operative care pathway for elective gastrointestinal surgery in tertiary care hospitals.

**Keywords:** Enhanced Recovery After Surgery; ERAS; Conventional peri-operative care; Elective gastrointestinal surgery; Post-operative recovery.

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## INTRODUCTION

Elective gastrointestinal surgery includes a wide range of procedures involving the oesophagus, stomach, small bowel, colon, rectum, liver, biliary tract, and pancreas. These operations are commonly performed for benign, inflammatory, obstructive, and malignant diseases. Although improvements in anaesthesia, operative technique, antimicrobial prophylaxis, and critical care have made gastrointestinal surgery safer, post-operative recovery may still be delayed by pain, ileus, nausea and vomiting, prolonged fasting, restricted mobility, fluid imbalance, wound complications, and hospital-acquired morbidity. Conventional peri-operative care has traditionally focused on prolonged pre-operative fasting, routine use of nasogastric tubes and drains, delayed oral feeding, liberal intravenous fluids, opioid-based analgesia, and mobilization only after clinical recovery. Many of these practices were followed for safety, but increasing evidence has shown that several of them may delay recovery when applied routinely to all patients. Enhanced Recovery After Surgery, commonly known as ERAS, is a structured, evidence-based, multidisciplinary peri-operative care pathway designed to reduce surgical stress, maintain physiological function, and support early recovery after major surgery. The concept is based on the understanding that no single intervention is sufficient to improve recovery; rather, multiple small but coordinated changes across the pre-operative, intra-operative, and post-operative periods can produce a meaningful improvement in patient outcomes. ERAS emphasizes patient education, optimization of comorbidities, avoidance of prolonged fasting, pre-operative carbohydrate loading where appropriate, rational fluid therapy, maintenance of normothermia, opioid-sparing analgesia, early removal of tubes and drains, early oral intake, and early mobilization. These principles represent a shift from routine-based care to protocol-based care focused on functional recovery.<sup>[1]</sup> In gastrointestinal surgery, ERAS has particular relevance because many post-operative problems are related to gut function, nutrition, pain control, and mobility. Prolonged fasting and delayed feeding may worsen catabolism and reduce patient strength, while excessive opioid use may aggravate ileus and nausea. Routine nasogastric decompression and abdominal drains may restrict mobility and increase discomfort when not clearly indicated. ERAS attempts to interrupt this cycle by promoting early feeding, multimodal analgesia, early ambulation, and

selective rather than routine use of tubes. Current colorectal surgery guidelines support multiple components of enhanced recovery, including pre-admission counselling, nutritional assessment, avoidance of unnecessary bowel preparation in selected cases, minimally invasive surgery where feasible, multimodal analgesia, early diet, and structured discharge planning.<sup>[2]</sup> The peri-operative period in gastrointestinal surgery requires coordination between surgeons, anaesthesiologists, nursing staff, dietitians, physiotherapists, and patients. ERAS is therefore not only a surgical protocol but also a system of care. In conventional peri-operative management, practices may vary according to individual preference and institutional routine. In contrast, ERAS provides a standardized pathway with defined targets for pre-operative preparation, intra-operative management, and post-operative recovery. Such standardization is especially important in tertiary care hospitals, where patients may undergo different types of gastrointestinal surgery and may have varying baseline risks. Standard protocols can reduce variability, improve communication among healthcare workers, and help identify deviations from expected recovery. The application of ERAS has extended beyond colorectal surgery to upper gastrointestinal, hepatobiliary, pancreatic, and other major abdominal procedures. In pancreatic surgery, updated ERAS recommendations emphasize careful patient selection, pre-operative optimization, appropriate nutritional support, goal-directed fluid therapy, pain control, early mobilization, and early enteral intake where feasible.<sup>[3]</sup> Similarly, liver surgery guidelines highlight the importance of prehabilitation in selected high-risk patients, smoking and alcohol cessation, prevention of hypothermia, balanced fluid management, and early post-operative recovery measures.<sup>[4]</sup> These developments show that ERAS principles are adaptable across gastrointestinal subspecialties, although protocol components may need modification according to the organ involved, operative complexity, and patient condition.<sup>[4]</sup> One of the major goals of ERAS is to reduce the stress response to surgery. Surgical trauma triggers endocrine, metabolic, inflammatory, and immune changes that may lead to insulin resistance, protein breakdown, fluid shifts, fatigue, and impaired healing. Conventional care may unintentionally prolong these effects through fasting, immobility, excessive intravenous fluids, and high opioid exposure. ERAS aims to preserve normal physiology as far as possible by maintaining nutrition,

encouraging movement, minimizing unnecessary tubes, and using analgesic strategies that reduce opioid requirement. In liver surgery, ERAS has also been discussed as a patient-centred pathway that may improve clinical outcomes and optimize resource utilization when compliance with protocol elements is maintained.<sup>[5]</sup> Another important aspect of ERAS is patient participation. Pre-operative counselling allows patients to understand the expected course after surgery, including when they may start oral intake, sit out of bed, walk, and prepare for discharge. This reduces anxiety and makes the patient an active participant in recovery rather than a passive recipient of care. In elective gastrointestinal surgery, where surgery is planned in advance, there is an opportunity to correct anaemia, improve nutrition, control diabetes and hypertension, encourage smoking cessation, and improve physical conditioning before admission. Patient-centred preparation is particularly useful in tertiary care hospitals where patients may present with complex disease and multiple comorbidities. Despite its advantages, ERAS implementation may face practical challenges. These include lack of awareness, resistance to changing traditional practices, limited staffing, variable patient compliance, concern regarding early feeding, and difficulty maintaining uniform protocol adherence. Some patients may not tolerate all components of ERAS because of advanced disease, poor nutritional status, intra-operative findings, or post-operative complications. Therefore, ERAS should be applied as a structured but clinically flexible pathway. Recent literature continues to emphasize that ERAS programs should be adapted to local resources while preserving core elements such as patient education, multimodal analgesia, rational fluid therapy, early feeding, and early mobilization.<sup>[6]</sup>

## MATERIALS AND METHODS

This study was designed as a hospital-based comparative observational study to evaluate the outcomes of Enhanced Recovery After Surgery (ERAS) protocol versus conventional peri-operative care among patients undergoing elective gastrointestinal surgery at a tertiary care hospital. The study included two groups of patients: those managed according to the ERAS protocol and those managed with conventional peri-operative care. The comparison was made to assess differences in post-operative recovery, complications, pain control, bowel recovery, length of hospital stay, and overall clinical outcomes. The study was conducted in the Department of General Surgery at a tertiary care hospital. Patients admitted for elective gastrointestinal surgical procedures were enrolled after fulfilling the eligibility criteria. The hospital had facilities for pre-operative assessment, anaesthesia care, operative management, post-operative monitoring, intensive care support when required, and follow-up evaluation. The study population

consisted of adult patients undergoing elective gastrointestinal surgery. A total of 60 patients were included in the study. The patients were divided into two groups, with 30 patients managed under the Enhanced Recovery After Surgery protocol and 30 patients managed with conventional peri-operative care. Both groups were comparable with respect to demographic profile, clinical diagnosis, type of surgery, and baseline health status.

### Inclusion Criteria

Patients aged 18 years and above who were admitted for elective gastrointestinal surgery and were willing to participate in the study were included. Patients who were fit for elective surgery after pre-anaesthetic evaluation and those who provided written informed consent were considered eligible. Patients undergoing elective upper gastrointestinal, small bowel, colorectal, hepatobiliary, or other abdominal gastrointestinal procedures were included according to the clinical indication.

### Exclusion Criteria

Patients undergoing emergency gastrointestinal surgery were excluded from the study. Patients with severe uncontrolled systemic illness, advanced cardiac or respiratory disease, severe renal or hepatic dysfunction, active sepsis, disseminated malignancy, pregnancy, inability to understand the study protocol, or refusal to provide consent were also excluded. Patients requiring prolonged pre-operative intensive care or those with major intra-operative complications requiring deviation from the planned peri-operative protocol were not included in the final analysis.

### Methodology

Patients in the ERAS group received peri-operative care according to the Enhanced Recovery After Surgery protocol, which included structured pre-operative counselling, reduced fasting, carbohydrate loading where appropriate, avoidance of routine bowel preparation unless indicated, multimodal analgesia, early removal of tubes and drains, early oral feeding, and early mobilization. Patients in the conventional care group received standard peri-operative care followed routinely in the hospital, including conventional fasting, routine intravenous fluids, delayed oral feeding, opioid-based analgesia when required, and mobilization according to the usual post-operative recovery pattern.

**Pre-operative Assessment:** All patients underwent detailed clinical evaluation, including history taking, physical examination, assessment of comorbidities, nutritional status, diagnosis, indication for surgery, and previous surgical history. Routine pre-operative investigations included complete blood count, renal function tests, liver function tests, serum electrolytes, blood sugar levels, coagulation profile, blood grouping, chest radiograph, electrocardiogram, and other investigations as required according to the disease condition and planned surgery. Pre-anaesthetic evaluation was performed in all patients before surgery.

**ERAS Protocol:** In the ERAS group, patients received detailed pre-operative counselling regarding the surgical procedure, expected post-operative course, pain management, early feeding, breathing exercises, and mobilization. Prolonged fasting was avoided, and clear fluids were allowed up to a few hours before surgery as per anaesthesia recommendations. Carbohydrate drinks were given pre-operatively when not contraindicated. Intra-operatively, efforts were made to maintain normothermia, avoid fluid overload, reduce surgical stress, and use minimally invasive techniques where feasible. Post-operatively, multimodal analgesia was used to reduce opioid requirement, oral fluids and diet were started early according to tolerance, urinary catheters and drains were removed as early as clinically appropriate, and patients were encouraged for early ambulation.

**Conventional Peri-operative Care:** Patients in the conventional care group were managed according to the routine peri-operative practices followed in the hospital. These patients generally underwent overnight fasting before surgery, received intravenous fluids in the peri-operative period, and oral feeding was initiated after the return of bowel sounds or passage of flatus. Analgesia was provided mainly according to conventional practice, including opioid and non-opioid analgesics as required. Mobilization, removal of urinary catheter, nasogastric tube, and drains were carried out based on the treating surgeon's clinical judgment and routine post-operative recovery.

**Operative Management:** All surgeries were performed by experienced surgical teams under appropriate anaesthesia. The type of surgical procedure, operative approach, duration of surgery, intra-operative blood loss, requirement of blood transfusion, use of drains, use of nasogastric tube, and any intra-operative complications were recorded. Standard surgical and anaesthetic principles were followed in both groups. Peri-operative antibiotic prophylaxis and venous thromboembolism prophylaxis were given according to hospital protocol and patient risk factors.

**Post-operative Management:** Post-operative monitoring included assessment of vital signs, pain score, urine output, bowel sounds, abdominal distension, nausea, vomiting, wound condition, and early complications. Patients were evaluated for tolerance to oral fluids and diet, time to first bowel sound, time to passage of flatus, time to passage of stool, requirement of analgesics, time to mobilization, removal of catheter, removal of drain, and duration of intravenous fluid therapy. Any deviation from the planned protocol was recorded along with the reason.

**Study Parameters:** The main parameters assessed in the study included age, sex, body mass index, diagnosis, comorbidities, American Society of Anesthesiologists physical status, type of gastrointestinal surgery, operative duration, intra-operative blood loss, requirement of blood

transfusion, use of nasogastric tube, use of abdominal drain, time to first oral intake, time to return of bowel function, post-operative pain score, analgesic requirement, time to first mobilization, duration of intravenous fluids, post-operative nausea and vomiting, surgical site infection, anastomotic leak, respiratory complications, urinary tract infection, re-admission, re-operation, length of hospital stay, and overall post-operative morbidity.

**Pain Assessment:** Post-operative pain was assessed using the Visual Analogue Scale. Pain scores were recorded at regular intervals in the post-operative period. The requirement of rescue analgesia and total analgesic consumption were documented in both groups. The effectiveness of multimodal analgesia in the ERAS group was compared with conventional analgesic practices in the conventional care group.

**Assessment of Bowel Recovery:** Return of bowel function was assessed by recording the time to appearance of bowel sounds, time to passage of flatus, and time to passage of stool. Tolerance to oral fluids and solid diet was also documented. Early return of gastrointestinal function was considered an important indicator of post-operative recovery.

**Assessment of Mobilization:** Mobilization was assessed by recording the time at which the patient first sat out of bed, stood with support, and walked with or without assistance. Early ambulation was encouraged in the ERAS group as part of the protocol, while in the conventional group mobilization was done according to routine clinical practice.

**Post-operative Complications:** All post-operative complications were recorded and compared between the two groups. Complications included nausea, vomiting, ileus, wound infection, abdominal collection, anastomotic leak, respiratory infection, urinary tract infection, deep vein thrombosis, need for intensive care, re-operation, and mortality. Complications were diagnosed based on clinical examination, laboratory findings, radiological investigations, and treating surgeon's assessment.

#### **Statistical Analysis**

The collected data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 27.0. Continuous variables were expressed as mean and standard deviation, while categorical variables were expressed as frequency and percentage. The independent sample t-test was used to compare normally distributed continuous variables between the two groups, while the Mann-Whitney U test was used for non-normally distributed variables. The Chi-square test or Fisher's exact test was used to compare categorical variables. A p-value of less than 0.05 was considered statistically significant.

## **RESULTS**

A total of 60 patients undergoing elective gastrointestinal surgery were included in the study. Among them, 30 patients were managed according to

the Enhanced Recovery After Surgery protocol and 30 patients were managed with conventional peri-operative care.

**Table 1: Distribution of patients according to demographic and baseline clinical profile**

The demographic and baseline clinical characteristics of patients in both groups were comparable. The mean age of patients in the ERAS group was  $45.80 \pm 12.40$  years, while it was  $47.30 \pm 13.10$  years in the conventional group. The difference in mean age was not statistically significant, with a p-value of 0.651, indicating that both groups had a similar age distribution. In the ERAS group, 18 patients were male, accounting for 60.00%, and 12 patients were female, accounting for 40.00%. In the conventional group, 17 patients were male, accounting for 56.67%, and 13 patients were female, accounting for 43.33%. The gender distribution was almost similar in both groups, and the difference was not statistically significant, with a p-value of 0.795. The mean body mass index was  $23.60 \pm 3.20$  kg/m<sup>2</sup> in the ERAS group and  $24.10 \pm 3.50$  kg/m<sup>2</sup> in the conventional group. The difference was statistically insignificant, with a p-value of 0.566. With regard to comorbidities, diabetes mellitus was present in 6 patients in the ERAS group, accounting for 20.00%, and in 7 patients in the conventional group, accounting for 23.33%. Hypertension was present in 8 patients in the ERAS group, accounting for 26.67%, and in 9 patients in the conventional group, accounting for 30.00%. The p-values for diabetes mellitus and hypertension were 0.754 and 0.774, respectively, showing no statistically significant difference between the groups. The distribution of ASA grading was also comparable. In the ERAS group, 12 patients, accounting for 40.00%, belonged to ASA grade I; 16 patients, accounting for 53.33%, belonged to ASA grade II; and 2 patients, accounting for 6.67%, belonged to ASA grade III. In the conventional group, 11 patients, accounting for 36.67%, belonged to ASA grade I; 17 patients, accounting for 56.67%, belonged to ASA grade II; and 2 patients, accounting for 6.67%, belonged to ASA grade III.

**Table 2: Distribution according to type of gastrointestinal surgery**

The distribution of different types of gastrointestinal surgeries was similar between the ERAS and conventional groups. Upper gastrointestinal surgery was performed in 6 patients in the ERAS group, accounting for 20.00%, and in 7 patients in the conventional group, accounting for 23.33%. The difference was not statistically significant, with a p-value of 0.754. Small bowel surgery was performed in 5 patients in the ERAS group, accounting for 16.67%, compared to 4 patients in the conventional group, accounting for 13.33%. The p-value was 0.718, indicating no significant difference. Colorectal surgery was the most common type of surgery in both groups. It was performed in 12 patients in the ERAS group, accounting for 40.00%, and in 11 patients in the conventional group, accounting for 36.67%. The difference was statistically insignificant, with a p-

value of 0.791. Hepatobiliary surgery was performed in 4 patients in the ERAS group, accounting for 13.33%, and in 5 patients in the conventional group, accounting for 16.67%, with a p-value of 0.718. Other gastrointestinal surgeries were performed in 3 patients in each group, accounting for 10.00% in both groups, with a p-value of 1.000.

**Table 3: Comparison of intra-operative parameters between the two groups**

The intra-operative parameters showed that both groups were comparable in terms of operative duration, blood loss, transfusion requirement, and intra-operative complications. The mean operative duration was  $132.40 \pm 35.60$  minutes in the ERAS group and  $138.70 \pm 38.20$  minutes in the conventional group. Although the mean operative duration was slightly lower in the ERAS group, the difference was not statistically significant, with a p-value of 0.511. The mean intra-operative blood loss was  $185.30 \pm 68.40$  mL in the ERAS group and  $198.60 \pm 72.10$  mL in the conventional group. This difference was also statistically insignificant, with a p-value of 0.466. Blood transfusion was required in 4 patients in the ERAS group, accounting for 13.33%, and in 5 patients in the conventional group, accounting for 16.67%. The difference was not statistically significant, with a p-value of 0.718. A significant difference was observed in the use of nasogastric tubes. Nasogastric tube use was reported in 8 patients in the ERAS group, accounting for 26.67%, compared to 18 patients in the conventional group, accounting for 60.00%. This difference was statistically significant, with a p-value of 0.009. Similarly, abdominal drains were used in 10 patients in the ERAS group, accounting for 33.33%, compared to 19 patients in the conventional group, accounting for 63.33%. The difference was statistically significant, with a p-value of 0.020. Intra-operative complications occurred in 2 patients in the ERAS group, accounting for 6.67%, and in 3 patients in the conventional group, accounting for 10.00%. The difference was not statistically significant, with a p-value of 0.640.

**Table 4: Comparison of post-operative recovery parameters between the two groups**

Post-operative recovery parameters showed a statistically significant improvement in the ERAS group compared to the conventional group. The mean time to first oral intake was  $18.60 \pm 6.80$  hours in the ERAS group, whereas it was  $43.20 \pm 12.50$  hours in the conventional group. This difference was highly statistically significant, with a p-value of less than 0.001. The mean time to first bowel sound was  $24.30 \pm 8.40$  hours in the ERAS group and  $39.70 \pm 11.60$  hours in the conventional group. The difference was statistically significant, with a p-value of less than 0.001. Similarly, the mean time to passage of flatus was  $34.80 \pm 10.20$  hours in the ERAS group compared to  $56.40 \pm 14.30$  hours in the conventional group, with a p-value of less than 0.001. The mean time to passage of stool was also shorter in the ERAS group, at  $58.20 \pm 16.40$  hours, compared to  $82.60 \pm$

20.10 hours in the conventional group, with a p-value of less than 0.001. The mean time to first mobilization was  $16.40 \pm 5.60$  hours in the ERAS group and  $36.80 \pm 10.40$  hours in the conventional group. This difference was highly significant, with a p-value of less than 0.001. The duration of intravenous fluids was significantly shorter in the ERAS group, with a mean duration of  $2.10 \pm 0.80$  days, compared to  $4.30 \pm 1.20$  days in the conventional group. The p-value was less than 0.001. The mean post-operative VAS pain score was  $3.20 \pm 1.10$  in the ERAS group and  $4.60 \pm 1.30$  in the conventional group. The difference was statistically significant, with a p-value of less than 0.001. The mean length of hospital stay was  $5.40 \pm 1.60$  days in the ERAS group compared to  $8.20 \pm 2.30$  days in the conventional group. This difference was statistically significant, with a p-value of less than 0.001.

**Table 5: Comparison of post-operative complications and outcome between the two groups**

Post-operative complications were generally lower in the ERAS group compared to the conventional group. Post-operative nausea and vomiting occurred in 5 patients in the ERAS group, accounting for 16.67%, compared to 11 patients in the conventional group, accounting for 36.67%. Although the incidence was lower in the ERAS group, the difference was not statistically significant, with a p-value of 0.080. Prolonged ileus was observed in 2 patients in the ERAS group, accounting for 6.67%, and in 7 patients in the conventional group, accounting for 23.33%. The p-value was 0.071, showing that the difference did not reach statistical significance, although there

was a clear numerical reduction in the ERAS group. Surgical site infection occurred in 3 patients in the ERAS group, accounting for 10.00%, compared to 8 patients in the conventional group, accounting for 26.67%. The p-value was 0.095, indicating no statistically significant difference, but again showing a lower trend in the ERAS group. Respiratory complications were seen in 1 patient in the ERAS group, accounting for 3.33%, and in 5 patients in the conventional group, accounting for 16.67%. The p-value was 0.085, showing that the difference was not statistically significant, although the incidence was lower among ERAS patients. Urinary tract infection occurred in 1 patient in the ERAS group, accounting for 3.33%, and in 3 patients in the conventional group, accounting for 10.00%, with a p-value of 0.301. Anastomotic leak was reported in 1 patient in the ERAS group, accounting for 3.33%, and in 2 patients in the conventional group, accounting for 6.67%. The difference was not statistically significant, with a p-value of 0.554. Re-operation was required in 1 patient in each group, accounting for 3.33% in both groups, with a p-value of 1.000. Re-admission occurred in 1 patient in the ERAS group, accounting for 3.33%, and in 2 patients in the conventional group, accounting for 6.67%, with a p-value of 0.554. Overall morbidity was significantly lower in the ERAS group. It was observed in 7 patients, accounting for 23.33%, compared to 15 patients in the conventional group, accounting for 50.00%. This difference was statistically significant, with a p-value of 0.032. No mortality was reported in either group.

**Table 1: Distribution of patients according to demographic and baseline clinical profile**

Parameter	ERAS group (n=30)	Conventional group (n=30)	p-value
Mean age, years	45.80 ± 12.40	47.30 ± 13.10	0.651
Male	18 (60.00%)	17 (56.67%)	0.795
Female	12 (40.00%)	13 (43.33%)	0.795
Mean BMI, kg/m <sup>2</sup>	23.60 ± 3.20	24.10 ± 3.50	0.566
Diabetes mellitus	6 (20.00%)	7 (23.33%)	0.754
Hypertension	8 (26.67%)	9 (30.00%)	0.774
ASA grade I	12 (40.00%)	11 (36.67%)	0.791
ASA grade II	16 (53.33%)	17 (56.67%)	0.795
ASA grade III	2 (6.67%)	2 (6.67%)	1.000

**Table 2: Distribution according to type of gastrointestinal surgery**

Type of surgery	ERAS group (n=30)	Conventional group (n=30)	p-value
Upper gastrointestinal surgery	6 (20.00%)	7 (23.33%)	0.754
Small bowel surgery	5 (16.67%)	4 (13.33%)	0.718
Colorectal surgery	12 (40.00%)	11 (36.67%)	0.791
Hepatobiliary surgery	4 (13.33%)	5 (16.67%)	0.718
Other gastrointestinal surgery	3 (10.00%)	3 (10.00%)	1.000

**Table 3: Comparison of intra-operative parameters between the two groups**

Parameter	ERAS group (n=30)	Conventional group (n=30)	p-value
Mean operative duration, minutes	132.40 ± 35.60	138.70 ± 38.20	0.511
Mean intra-operative blood loss, mL	185.30 ± 68.40	198.60 ± 72.10	0.466
Blood transfusion required	4 (13.33%)	5 (16.67%)	0.718
Nasogastric tube used	8 (26.67%)	18 (60.00%)	0.009
Abdominal drain used	10 (33.33%)	19 (63.33%)	0.020
Intra-operative complications	2 (6.67%)	3 (10.00%)	0.640

**Table 4: Comparison of post-operative recovery parameters between the two groups**

Post-operative parameter	ERAS group (n=30)	Conventional group (n=30)	p-value
Time to first oral intake, hours	18.60 ± 6.80	43.20 ± 12.50	<0.001
Time to first bowel sound, hours	24.30 ± 8.40	39.70 ± 11.60	<0.001
Time to passage of flatus, hours	34.80 ± 10.20	56.40 ± 14.30	<0.001
Time to passage of stool, hours	58.20 ± 16.40	82.60 ± 20.10	<0.001
Time to first mobilization, hours	16.40 ± 5.60	36.80 ± 10.40	<0.001
Duration of IV fluids, days	2.10 ± 0.80	4.30 ± 1.20	<0.001
Mean post-operative VAS pain score	3.20 ± 1.10	4.60 ± 1.30	<0.001
Length of hospital stay, days	5.40 ± 1.60	8.20 ± 2.30	<0.001

**Table 5: Comparison of post-operative complications and outcome between the two groups**

Complication / outcome	ERAS group (n=30)	Conventional group (n=30)	p-value
Post-operative nausea and vomiting	5 (16.67%)	11 (36.67%)	0.080
Prolonged ileus	2 (6.67%)	7 (23.33%)	0.071
Surgical site infection	3 (10.00%)	8 (26.67%)	0.095
Respiratory complication	1 (3.33%)	5 (16.67%)	0.085
Urinary tract infection	1 (3.33%)	3 (10.00%)	0.301
Anastomotic leak	1 (3.33%)	2 (6.67%)	0.554
Re-operation	1 (3.33%)	1 (3.33%)	1.000
Re-admission	1 (3.33%)	2 (6.67%)	0.554
Overall morbidity	7 (23.33%)	15 (50.00%)	0.032
Mortality	0 (0.00%)	0 (0.00%)	—

## DISCUSSION

The present study included 60 patients undergoing elective gastrointestinal surgery, with 30 patients in the ERAS group and 30 patients in the conventional care group. Baseline characteristics were comparable between both groups, as mean age was  $45.80 \pm 12.40$  years in the ERAS group and  $47.30 \pm 13.10$  years in the conventional group, with no significant difference. Sex distribution, BMI, diabetes mellitus, hypertension, and ASA grading were also statistically similar. This baseline comparability is important because the improved post-operative outcomes observed in the ERAS group are less likely to be due to demographic imbalance. Fearon et al. (2005) described ERAS as a multimodal peri-operative pathway for colonic surgery based on pre-operative counselling, reduced surgical stress, optimal analgesia, early feeding, and early mobilization, and emphasized that such protocols are most meaningful when patient groups are clinically comparable before intervention. The findings of the present study support this principle, as both groups were similar before surgery, but the ERAS group showed better recovery outcomes after surgery.<sup>[7]</sup> In the present study, the distribution of gastrointestinal procedures was also comparable between both groups. Colorectal surgery was the most common procedure, performed in 12 patients in the ERAS group and 11 patients in the conventional group, while upper gastrointestinal, small bowel, hepatobiliary, and other gastrointestinal surgeries were similarly distributed. Lassen et al. (2009) recommended ERAS-based peri-operative care mainly for colorectal surgery, but also highlighted that the principles of multimodal care can be adapted to general surgical practice when evidence-based elements are followed. In comparison, the present study included a broader elective gastrointestinal surgery population rather than only colorectal surgery, yet the maximum proportion of cases was

colorectal, allowing meaningful comparison with standard ERAS literature. The similarity in type of surgery between both groups strengthens the interpretation that differences in post-operative recovery were related to peri-operative care protocol rather than procedure distribution.<sup>[8]</sup> Intra-operative parameters such as mean operative duration, intra-operative blood loss, blood transfusion requirement, and intra-operative complications were not significantly different between the two groups in the present study. Mean operative duration was  $132.40 \pm 35.60$  minutes in the ERAS group and  $138.70 \pm 38.20$  minutes in the conventional group, while mean blood loss was  $185.30 \pm 68.40$  mL and  $198.60 \pm 72.10$  mL, respectively. Anderson et al. (2003), in a randomized trial of multimodal optimization versus standard peri-operative care in colonic resection, also reported comparable baseline and operative characteristics, but showed a marked reduction in hospital stay with optimized care, with median stay of 3 days compared with 7 days in standard care. Similarly, the present study showed that even when operative factors were similar, ERAS significantly improved post-operative recovery and reduced hospital stay from  $8.20 \pm 2.30$  days in the conventional group to  $5.40 \pm 1.60$  days in the ERAS group.<sup>[9]</sup> A significant reduction in the use of nasogastric tubes and abdominal drains was observed in the ERAS group in the present study. Nasogastric tubes were used in 8 patients in the ERAS group compared with 18 patients in the conventional group, and abdominal drains were used in 10 patients compared with 19 patients, respectively. These differences were statistically significant, with p-values of 0.009 and 0.020. Gatt et al. (2005) found that multimodal optimization in major colonic resection significantly reduced hospital stay from 7.50 days in conventional care to 5.00 days in the optimized group, and also reduced duration of intravenous infusion and improved gut recovery. The present study showed a similar direction of benefit, as reduced tube and drain use in

the ERAS group was associated with earlier oral intake, earlier bowel recovery, and shorter hospital stay.<sup>[10]</sup> The present study demonstrated significantly earlier return of gastrointestinal function in the ERAS group. Time to first oral intake was  $18.60 \pm 6.80$  hours in the ERAS group compared with  $43.20 \pm 12.50$  hours in the conventional group. Time to first bowel sound, passage of flatus, and passage of stool were also significantly shorter in the ERAS group, with p-values of less than 0.001 for all parameters. Khoo et al. (2007), in a randomized controlled trial among patients undergoing elective colorectal cancer surgery, reported that multimodal peri-operative management reduced hospital stay from 7 days in conventional care to 5 days in the optimized group. This is comparable to the present study, where faster bowel recovery and early oral feeding were associated with reduced hospital stay from 8.20 days in the conventional group to 5.40 days in the ERAS group.<sup>[11]</sup> Early mobilization was another major advantage of ERAS in the present study. Mean time to first mobilization was  $16.40 \pm 5.60$  hours in the ERAS group compared with  $36.80 \pm 10.40$  hours in the conventional group, which was statistically significant. Muller et al. (2009), in a randomized trial of fast-track versus standard care after open colonic surgery, reported that fast-track care reduced post-operative complications from 37 of 75 patients in the standard care group to 16 of 76 patients in the fast-track group and shortened median hospital stay from 9 days to 5 days. In the present study, early mobilization was also associated with reduced overall morbidity, which was 23.33% in the ERAS group compared with 50.00% in the conventional group. These findings suggest that early ambulation may contribute to faster functional recovery and reduced complication burden.<sup>[12]</sup> Pain control was significantly better in the ERAS group in the present study, with mean post-operative VAS pain score of  $3.20 \pm 1.10$  compared with  $4.60 \pm 1.30$  in the conventional group. Duration of intravenous fluids was also significantly shorter, at  $2.10 \pm 0.80$  days in the ERAS group compared with  $4.30 \pm 1.20$  days in the conventional group. Varadhan et al. (2010), in a meta-analysis of randomized controlled trials in major elective open colorectal surgery, found that ERAS reduced length of stay by a weighted mean difference of 2.55 days and reduced complications with a relative risk of 0.53, without significant increase in readmission or mortality. The present study showed a similar magnitude of benefit, with hospital stay reduced by 2.80 days and overall morbidity reduced from 50.00% to 23.33%, supporting the effectiveness and safety of ERAS in elective gastrointestinal surgery.<sup>[13]</sup> Post-operative complications were numerically lower in the ERAS group in the present study. Post-operative nausea and vomiting occurred in 16.67% of ERAS patients compared with 36.67% of conventional patients, prolonged ileus in 6.67% compared with 23.33%, surgical site infection in 10.00% compared with 26.67%, and respiratory complications in 3.33%

compared with 16.67%. Although individual complications did not reach statistical significance, overall morbidity was significantly lower in the ERAS group. Spanjersberg et al. (2011), in a Cochrane review of fast-track surgery versus conventional recovery strategies for colorectal surgery, found that fast-track care significantly reduced length of stay and overall complications, although major complications were not significantly reduced. This pattern is similar to the present study, where overall morbidity improved significantly, while individual serious outcomes such as anastomotic leak, re-operation, and re-admission were not significantly different.<sup>[14]</sup> The overall findings of the present study show that ERAS was associated with earlier oral intake, faster bowel recovery, earlier mobilization, lower pain score, shorter intravenous fluid duration, reduced use of nasogastric tubes and drains, shorter hospital stay, and lower overall morbidity. Sauro et al. (2024), in a large meta-analysis of 74 randomized clinical trials including 9076 participants across different surgical specialties, reported that ERAS reduced hospital length of stay by 1.88 days and reduced complications with a risk ratio of 0.71, while readmission and mortality were not significantly increased. In comparison, the present study showed a larger reduction in mean hospital stay of 2.80 days and no mortality in either group. These findings support the conclusion that ERAS is a safe and effective peri-operative care approach for elective gastrointestinal surgery in a tertiary care hospital setting.<sup>[15]</sup>

## CONCLUSION

The present study showed that Enhanced Recovery After Surgery protocol was safe and effective in patients undergoing elective gastrointestinal surgery. Both groups were comparable in baseline and operative characteristics, but the ERAS group had significantly earlier oral intake, faster return of bowel function, earlier mobilization, lower post-operative pain score, and shorter duration of intravenous fluids. The length of hospital stay was also significantly reduced in the ERAS group compared to conventional peri-operative care. Overall morbidity was lower among patients managed with ERAS, without any increase in re-operation, re-admission, anastomotic leak, or mortality. Thus, ERAS can be considered a beneficial peri-operative care pathway for elective gastrointestinal surgery in tertiary care hospitals.

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