SAS Journal of Surgery
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

Surgery

Enhanced Recovery after Gastric Resection for Carcinoma of the Stomach in a Tertiary Care Hospital

Dr. Shahrzaad Chowdhury[1*], Dr. Mahrukh Chowdhury[2], Prof. Dr. M Fardil Hossain Faisal[3], Dr. Most Mahfuja Parvin[4], Dr. Sadia Afrin Shanta[5]

[1]Assistant Professor, Department of Surgery, Shaheed Monsur Ali Medical College, Dhaka, Bangladesh
[2]Indoor Medical Officer, Department of Peadiatrics, Sir Salimullah Medical College & Mitford Hospital, Dhaka, Bangladesh
[3]Professor, Department of Surgery, Shaheed Monsur Ali Medical College, Dhaka, Bangladesh
[4]Assistant Professor, Department of Surgery, Shaheed Monsur Ali Medical College, Dhaka, Bangladesh
[5]Registrar, Department of Surgery, Shaheed Monsur Ali Medical College, Dhaka, Bangladesh

DOI: https://doi.org/10.36347/sasjs.2026.v12i05.013 | **Received:** 30.03.2026 | **Accepted:** 12.05.2026 | **Published:** 19.05.2026

***Corresponding author:** Dr. Shahrzaad Chowdhury
Assistant Professor, Department of Surgery, Shaheed Monsur Ali Medical College, Dhaka, Bangladesh
Email: csun.shah@gmail.com

Abstract **Original Research Article**

Background: Gastric cancer is the third leading cause of cancer mortality worldwide. Standard treatment includes gastrectomy with lymphadenectomy and chemotherapy, but carries high morbidity. Enhanced Recovery After Surgery (ERAS) improves outcomes by reducing surgical stress, complications, hospital stay, costs, and enhancing recovery and patient satisfaction. ***Objectives:*** To evaluate the safety and effectiveness of the ERAS protocol following gastric resection for carcinoma of the stomach. ***Methods:*** This prospective study was conducted in the Department of Surgery at Shaheed Suhrawardy Medical College & Hospital, Dhaka, Bangladesh, from February 2020 to July 2020. A total of 50 patients undergoing gastric resection were included and followed to assess early postoperative outcomes. Preoperative and postoperative evaluations included clinical history, physical examination, and relevant investigations. Data were recorded in structured case forms and analyzed using SPSS version 20.0. ***Results:*** The majority of patients (54%) were aged 51-60 years, with a mean age of 52.30±9.17 years; 72% were male. Hypertension (58%) was the most common comorbidity. Most patients were ASA II (64%). Laparoscopic surgery was performed in 82% of cases. The overall postoperative complication rate was 8%, including bowel obstruction (2%), anastomotic leak (2%), and wound infection (4%). The mean postoperative hospital stay was 5.37±0.63 days. ***Conclusion:*** The ERAS protocol following gastric surgery is safe and effective, resulting in faster recovery, fewer complications, and a reduced hospital stay. It is feasible and beneficial in our clinical setting.

Keywords: ERAS protocol, Gastrectomy, Gastric cancer, Hospital stay, Postoperative outcomes, Surgical stress.

INTRODUCTION

Gastric cancer remains a significant global health problem and is one of the leading causes of cancer-related mortality worldwide. Despite a gradual decline in incidence in some regions, it continues to pose a substantial burden, particularly in Asian countries. Globally, gastric cancer ranks among the top causes of cancer deaths, reflecting its aggressive nature and often late presentation [1,2]. Curative treatment primarily depends on surgical resection, typically involving gastrectomy with regional lymphadenectomy, often combined with chemotherapy. However, even with advances in surgical techniques and perioperative care, gastric cancer surgery is still associated with considerable morbidity (ranging from 9% to 29%) and a non-negligible mortality rate [3,4]. Traditional perioperative care pathways in gastric surgery have long been characterized by prolonged fasting, delayed mobilization, excessive use of drains and tubes, and delayed initiation of oral feeding. These conventional practices often contribute to increased surgical stress, delayed recovery of gastrointestinal function, and prolonged hospital stay. Furthermore, such approaches may increase the risk of postoperative complications, including infections, pulmonary issues, and anastomotic leakage, ultimately affecting patient outcomes and healthcare costs [5, 6]. In response to these limitations, the concept of Enhanced Recovery After Surgery (ERAS), also known as fast-track surgery, was introduced as a multidisciplinary and evidence-based approach to perioperative care. Initially developed in the late 1990s, ERAS has evolved significantly over the past

decade and has been widely adopted across various surgical specialties [7,8]. The fundamental principle of ERAS is to reduce the physiological stress response to surgery and maintain postoperative organ function, thereby facilitating early recovery. This is achieved through a combination of optimized preoperative, intraoperative, and postoperative strategies. Key components of ERAS protocols include comprehensive preoperative counseling, optimization of nutritional status, minimal preoperative fasting with carbohydrate loading, standardized anesthetic and analgesic techniques, avoidance of unnecessary tubes and drains, early mobilization, and early initiation of oral feeding. These interventions collectively aim to enhance recovery by maintaining physiological homeostasis and reducing the impact of surgical trauma [4,9]. Over the past decade, numerous studies and meta-analyses have evaluated the efficacy of ERAS protocols in gastric cancer surgery. Evidence suggests that ERAS significantly reduces postoperative hospital stay, accelerates the return of bowel function, and lowers healthcare costs without increasing complication rates [10,11]. A systematic review and meta-analysis demonstrated that ERAS protocols reduced the length of hospital stay and improved early postoperative recovery, while maintaining comparable safety profiles to conventional care [10]. Similarly, other studies have reported reductions in inflammatory markers and improved clinical outcomes with ERAS implementation [6,12]. In addition, the integration of ERAS protocols with minimally invasive surgical techniques, such as laparoscopic gastrectomy, has further enhanced postoperative outcomes. The combination of reduced surgical trauma and optimized perioperative care results in faster recovery, less postoperative pain, and improved patient satisfaction. Recent clinical studies have shown that ERAS implementation can reduce hospital stay by up to three days without increasing readmission rates, highlighting its clinical and economic benefits [11]. Despite these promising outcomes, the adoption of ERAS in gastric cancer surgery is still evolving, particularly in developing countries. Variations in clinical practice, resource limitations, and lack of standardized protocols remain challenges to its widespread implementation. Moreover, concerns regarding safety, especially in complex procedures like total gastrectomy, necessitate further evaluation in different clinical settings. Therefore, this study aims to assess the safety and effectiveness of ERAS protocols in patients undergoing gastric resection for carcinoma of the stomach. By evaluating early postoperative outcomes, this study seeks to contribute to the growing body of evidence supporting the role of ERAS in improving surgical care and patient recovery in gastric cancer management.

METHODOLOGY

This prospective study was designed to evaluate the safety and effectiveness of the Enhanced Recovery After Surgery (ERAS) protocol in patients undergoing gastric resection for carcinoma of the stomach. The study was conducted in the Department of Surgery at Shaheed Suhrawardy Medical College & Hospital, Dhaka, over six months from February 2020 to July 2020. Due to time limitations, a total of 50 patients were enrolled using a purposive sampling technique.

Inclusion criteria:

Patients with histologically confirmed carcinoma of the stomach who underwent elective gastric resection were included in the study.

Exclusion criteria:

Patients unwilling to provide informed consent were excluded. Additionally, patients diagnosed with gastrointestinal stromal tumors or gastric carcinoids were not included. Cases with conditions likely to impair rapid postoperative recovery—such as pregnancy, inflammatory bowel disease, chronic renal disease, uncontrolled diabetes mellitus, or severe cardiopulmonary dysfunction (ASA grades IV and V)—were also excluded. Furthermore, patients with a history of prior chemotherapy, multiple organ malignancies, or those undergoing emergency surgery were omitted from the study.

Study procedure:

Data were collected by the investigator through face-to-face interviews using a predesigned structured questionnaire after obtaining written informed consent. Information regarding demographic characteristics, clinical findings, and perioperative variables was recorded systematically. Collected data were carefully checked for completeness, coded, and organized for analysis.

Data analysis:

All data were analyzed using SPSS version 20.0. Categorical variables were presented as frequencies and percentages and analyzed using the Chi-square test. Continuous variables were expressed as mean ± standard deviation and compared using Student's t-test. A p-value of <0.05 was considered statistically significant.

RESULTS

This prospective study was conducted over six months (February–July 2020) at Shaheed Suhrawardy Medical College and Hospital, Dhaka, including 50 patients diagnosed with carcinoma of the stomach. Demographic, clinical, operative, and postoperative data were systematically collected and analyzed. The age distribution showed that the majority of patients (54%) were between 51 and 60 years, followed by 32% in the 41–50 years group. The mean age was 52.30±9.17 years. Regarding gender, 72% of patients were male, and 28% were female. Most patients (62%) were non-smokers, while 38% were former smokers; no current smokers were identified. Hypertension was the most common comorbidity (58%), followed by diabetes mellitus (16%), hypothyroidism (10%), and respiratory illness (8%).

According to the ASA grading system, 32% of patients were classified as ASA I, 64% as ASA II, and only 4% as ASA III, indicating that most patients had no or mild systemic disease. Tumor localization revealed that 70% of cases involved the distal stomach, 20% were proximal gastric cancers, and 10% were located at the cardia. In terms of surgical procedures, lower radical gastrectomy was the most commonly performed operation (70%), followed by total gastrectomy (24%) and proximal esophago-gastrectomy (6%). Most patients (88%) underwent open surgery, while only 12% had laparoscopic procedures. Operation time exceeded 3 hours in 56% of cases. Regarding tumor staging, 78% of patients were classified as TNM stage III, while 22% were stage II. Postoperative pain management required intravenous or epidural analgesia for 3–7 days in the majority of patients. Postoperative complications occurred in 30% of patients, while 70% had no complications. The most common complications were wound infection (14%) and respiratory complications (6%), followed by duodenal stump leakage (6%), postoperative ileus (2%), and anastomotic leakage (2%). Most complications were managed conservatively. Recovery parameters showed that bowel peristalsis resumed at a mean of 2.9±0.9 days, and patients started a liquid diet at 3.2±1.2 days. The mean time to first flatus was 3.1±1.1 days, and the semisolid diet was initiated at 5.8±2.1 days. The average length of postoperative hospital stay was 10.5±2.63 days. Laboratory findings demonstrated significant postoperative changes, including increased white blood cell count and neutrophil percentage, along with decreased lymphocyte count and serum albumin levels ($p<0.05$), reflecting the physiological response to surgery.

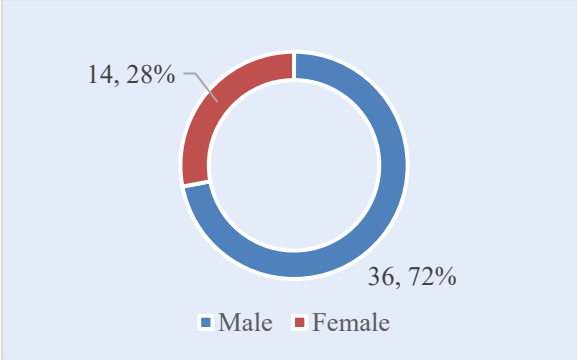

Figure 1: Gender distribution of cases (N=50)

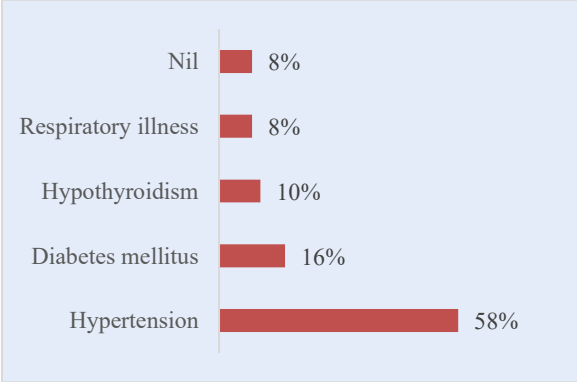

Figure 2: Co-morbidity distribution of patients

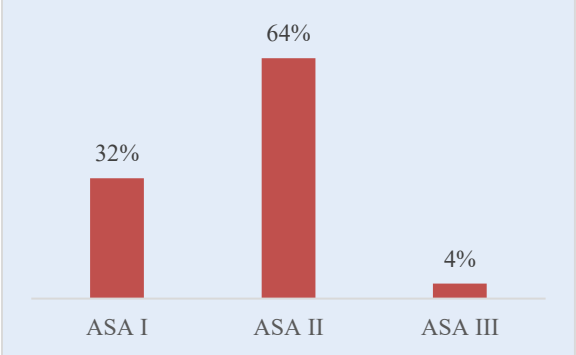

Figure 3: The ASA grade distribution of the patients

Table 1: Types of operations performed

Operations performed	n	%
Lower radical gastrectomy	35	70%
Total gastrectomy	12	24%
Proximal esophago-gastrectomy	3	6%

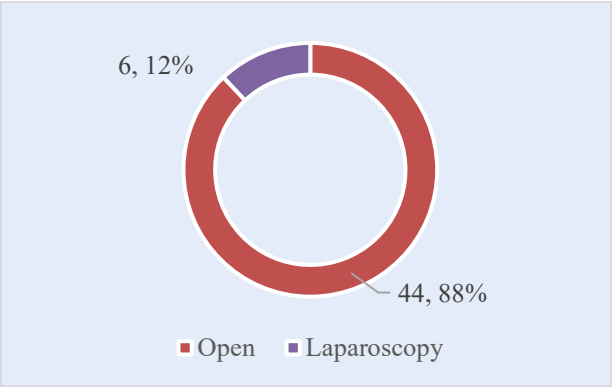

Figure 4: Type of surgical approach

Table 2: TNM stage of the patients

TNM stage	n	%
Stage I	0	0.0%
Stage II	11	22.0%
Stage III	38	78.0%

Table 3: Postoperative complications of the patients

Complications	n	%
Post-operative ileus	1	2%
Duodenal stump leakage	3	6%
Anastomotic leakage	1	2%
Wound infection	7	14%
Respiratory complication	3	6%
None	35	70%

Table 4: Post-operative recovery parameters

Post-operative recovery	Days (Mean± SD)
Peristalsis recovery	2.9 ± 0.9
Liquid diet	3.2 ± 1.2
Urinary catheter removal	2.3 ± 0.8
Passage of flatus or stool	3.1 ± 1.1
Semisolid diet	5.8 ± 2.1
Discharge from the hospital	8.4 ± 3.2

Table 5: Laboratory investigation of the patients

Investigation	Mean± SD	p-value
WBC		
Pre-operative	6.29±1.63	0.016
1st POD	11.99±1.32	
2nd POD	10.11±2.36	
Neutrophil, %		
Pre-operative	64.72±17.87	0.001
1st POD	85.92±18.23	
2nd POD	75.11±15.86	
Lymphocyte count		
Pre-operative	2.49±0.61	0.002
1st POD	1.78±0.59	
2nd POD	2.32±0.81	

Investigation	Mean± SD	p-value
Albumin		
Pre-operative	41.89±2.78	0.001
1st POD	28.32±2.69	
2nd POD	27.54±2.68	

DISCUSSION

Enhanced Recovery After Surgery (ERAS) programs consist of a series of evidence-based perioperative interventions designed to reduce surgical stress, maintain physiological function, and accelerate postoperative recovery. The fundamental concept of ERAS is to shorten the recovery period by optimizing early postoperative care, thereby reducing hospital stay without compromising patient safety [13,14]. Although ERAS has been widely established in colorectal surgery, its adoption in upper gastrointestinal procedures, particularly gastric cancer surgery, is still evolving [15]. The present prospective study was conducted to evaluate the safety and effectiveness of ERAS following gastric resection for carcinoma of the stomach. The demographic findings revealed that the majority of patients (54%) were within the 51–60 years age group, with a mean age of 52.30±9.17 years. This is consistent with previous studies, which reported peak incidence in the fifth to sixth decade of life [16]. Male predominance (72%) observed in this study also aligns with existing literature, where male-to-female ratios range from 2:1 to 2.5:1 [17]. Regarding comorbidities, hypertension was the most common (58%), followed by diabetes mellitus and hypothyroidism. Similar patterns have been reported in other studies, reflecting the typical clinical profile of gastric cancer patients [16]. Most patients were classified as ASA I and II, indicating relatively good preoperative physical status, comparable with previous findings [18]. Tumor localization in this study showed a predominance of distal gastric cancer (70%), which is in agreement with global trends, particularly in Asian populations [19]. The distribution of surgical procedures also reflected standard oncological practices, with lower radical gastrectomy being the most frequently performed operation. Comparable procedural distributions have been reported in other studies evaluating ERAS in gastric surgery [20]. Minimally invasive surgery is an important component of ERAS protocols. Although the majority of patients in this study underwent open surgery (88%), the role of laparoscopic approaches in enhancing recovery is well documented. Previous studies have demonstrated that laparoscopic gastrectomy, when combined with ERAS, results in reduced postoperative pain, faster recovery, and shorter hospital stay [21]. In terms of tumor staging, most patients (78%) were in TNM stage III, indicating late presentation, which is common in developing countries. Similar stage distributions have been reported in comparable settings [22]. Despite advanced disease stages, the postoperative complication rate in this study was relatively low (30%), with the majority of patients (70%) experiencing no complications. The most frequent complications were wound infection and respiratory issues, while serious complications such as anastomotic leakage were rare. These findings are consistent with previous studies demonstrating that ERAS does not increase complication rates and may even reduce them [23]. Postoperative pain assessment using VAS scores showed a gradual reduction over time, indicating effective pain control under ERAS protocols. Previous studies have similarly reported lower pain scores and reduced analgesic requirements with ERAS implementation [24]. A key finding of this study was the relatively short mean postoperative hospital stay (5.37±0.63 days), which is consistent with other studies reporting reduced length of stay with ERAS protocols [25]. Early recovery parameters, including return of bowel function and initiation of oral feeding, were also achieved within shorter durations, further supporting the effectiveness of ERAS. Laboratory parameters demonstrated expected postoperative inflammatory responses, with increases in WBC and neutrophil counts and decreases in lymphocyte count and serum albumin levels. These changes were statistically significant and comparable to previous findings. Studies have shown that ERAS protocols can attenuate the inflammatory response, as evidenced by lower levels of inflammatory markers such as CRP and neutrophils [26]. Overall, the findings of this study support the growing body of evidence that ERAS protocols are safe, feasible, and effective in gastric cancer surgery. They contribute to faster recovery, reduced complications, and shorter hospital stays. However, wider implementation and further large-scale studies are needed to standardize ERAS protocols in different clinical settings.

Limitation:

This study had several limitations, including a relatively small sample size and short study duration, which may affect generalizability. It was conducted in a single center, limiting external validity. Additionally, long-term follow-up was not performed, preventing assessment of survival outcomes and long-term benefits of the ERAS protocol.

CONCLUSION

Enhanced Recovery After Surgery (ERAS) following gastric resection is a safe and effective approach that significantly shortens postoperative hospital stay, reduces complications, and accelerates recovery of physical function. The findings suggest that ERAS improves overall postoperative outcomes in gastric cancer patients without compromising safety. Wider implementation of ERAS protocols in clinical practice is recommended, although further large-scale

studies are required to confirm its long-term benefits and broader applicability.

Recommendation

Future studies should involve larger sample sizes and multicenter settings across Bangladesh to enhance generalizability. Long-term follow-up is essential to evaluate survival and quality of life. Adoption of a multidisciplinary approach and standardized ERAS protocols will further improve accuracy, consistency, and overall patient outcomes in gastric cancer management.

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