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Preoperative Nutritional Optimization and Its Effect on Postoperative Outcomes in Gastrointestinal Surgery

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ABSTRACT:
Background: Malnutrition had been recognized as a significant risk factor contributing to poor postoperative outcomes in patients undergoing gastrointestinal surgery. Preoperative nutritional optimization had been considered an important strategy to improve surgical recovery and reduce complications.
Aim: The study aimed to evaluate the effect of preoperative nutritional optimization on postoperative outcomes in patients undergoing gastrointestinal surgery.
Methodology: This prospective observational study had been conducted at Pakistan Institute of Medical Sciences (PIMS), Islamabad, from June 2025 to May 2026. A total of 90 patients scheduled for elective gastrointestinal surgery had been included. Patients had undergone preoperative nutritional assessment using standard screening tools, and those identified as malnourished or at risk had received individualized nutritional optimization including high-protein diets, oral nutritional supplements, and, where required, enteral support for 10–14 days prior to surgery. Postoperative outcomes including wound infection, anastomotic leakage, length of hospital stay, and overall complication rates had been recorded and analyzed.
Results: Patients who had received preoperative nutritional optimization demonstrated significantly improved postoperative outcomes. The incidence of surgical site infections had been reduced, and rates of anastomotic leakage had been lower compared to baseline expectations. The optimized group had also shown shorter hospital stays and faster return of gastrointestinal function. Overall postoperative complication rates had been reduced in nutritionally optimized patients.
Conclusion: Preoperative nutritional optimization had significantly improved postoperative outcomes in gastrointestinal surgery patients by reducing complications and shortening hospital stay. It had been concluded that routine nutritional assessment and targeted intervention should be integrated into preoperative surgical care.
Keywords: Preoperative nutrition, gastrointestinal surgery, nutritional optimization, postoperative outcomes, surgical complications.

INTRODUCTION:

Preoperative nutritional optimization had been recognized as a critical component in the comprehensive management of patients undergoing gastrointestinal (GI) surgery. Over the past several decades, surgical outcomes had been shown to be influenced not only by surgical technique and perioperative care but also by the physiological and metabolic status of the patient prior to intervention [1]. Malnutrition had been

particularly prevalent among patients with gastrointestinal diseases due to factors such as impaired digestion, malabsorption, chronic inflammation, malignancy-related cachexia, and reduced oral intake. Consequently, optimizing nutritional status before surgery had gained increasing attention as an important strategy to improve postoperative recovery and reduce complications.

Gastrointestinal surgery had been associated with a high risk of postoperative morbidity, including wound infection, anastomotic leakage, delayed wound healing, prolonged ileus, and increased length of hospital stay [2]. It had been widely observed that patients with poor nutritional reserves had experienced significantly higher rates of these complications compared to well-nourished individuals. Serum albumin levels, body mass index (BMI), unintentional weight loss, and subjective global assessment scores had often been used as indicators of nutritional status and predictors of surgical outcomes. These parameters had been closely linked with immune competence, tissue repair capacity, and overall physiological resilience during the stress of surgery.

Preoperative nutritional optimization had included a range of interventions such as oral nutritional supplementation, immunonutrition, enteral feeding, and, in severe cases, parenteral nutrition [3]. These interventions had aimed to correct protein-energy malnutrition, replenish micronutrient deficiencies, and enhance immune function prior to surgical stress. Immunonutrition, which had included nutrients such as arginine, omega-3 fatty acids, and nucleotides, had been particularly studied for its potential to modulate inflammatory responses and improve postoperative recovery. Enhanced recovery after surgery (ERAS) protocols had also emphasized the importance of preoperative nutritional assessment and optimization as a key element in improving surgical outcomes [4].

In gastrointestinal oncology, where patients had frequently presented with advanced disease and significant weight loss, preoperative nutritional support had been especially important. It had been observed that malnourished cancer patients had poorer tolerance to surgery, higher postoperative infection rates, and reduced overall survival compared to those who had received adequate nutritional intervention before surgery [5]. Similarly, in benign conditions such as inflammatory bowel disease, intestinal obstruction, and chronic pancreatitis, nutritional optimization had played a crucial role in improving physiological readiness for surgical intervention.

Despite growing evidence supporting the benefits of preoperative nutritional optimization, its implementation in routine clinical practice had remained inconsistent across healthcare settings. Variability in nutritional screening protocols, lack of standardized guidelines, and limited awareness among healthcare providers had contributed to suboptimal utilization of nutritional interventions [6]. Moreover, the optimal duration, composition, and timing of nutritional support had remained areas of ongoing research and debate.

Given these considerations, the present study had been designed to evaluate the impact of preoperative nutritional optimization on postoperative outcomes in patients undergoing gastrointestinal surgery [7]. It had aimed to assess whether targeted nutritional interventions prior to surgery had resulted in reduced postoperative complications, shorter hospital stays, and improved overall recovery. The findings of this study had been expected to contribute to the growing body of evidence supporting routine preoperative nutritional assessment and optimization as an integral part of surgical care in gastrointestinal practice [8].

MATERIALS AND METHODS:

This study was conducted at the Department of General Surgery, Pakistan Institute of Medical Sciences (PIMS), Islamabad, over a period extending from June 2025 to May 2026. A total of 90 patients undergoing elective gastrointestinal (GI) surgeries were enrolled to evaluate the effect of preoperative nutritional optimization on postoperative outcomes. The study design was a prospective comparative cohort study.

Patients aged 18 to 70 years, of either gender, who were scheduled for elective gastrointestinal surgical procedures such as gastrectomy, colectomy, bowel resection, and hepato-biliary surgeries were included. Patients who were unwilling to participate, those undergoing emergency surgeries, patients with advanced metastatic disease, severe organ failure (cardiac, hepatic, or renal), or those already receiving long-term parenteral nutrition were excluded from the study. Written informed consent was obtained from all participants prior to enrollment.

The 90 patients were divided into two groups using a simple randomization technique. Group A consisted of 45 patients who received structured preoperative nutritional optimization, while Group B included 45

patients who received standard preoperative care without targeted nutritional intervention. Baseline demographic and clinical characteristics such as age, gender, body mass index (BMI), comorbidities, and type of planned surgery were recorded for all participants.

Preoperative nutritional status was assessed using validated screening tools, including the Subjective Global Assessment (SGA) and serum albumin levels. Patients in Group A underwent a targeted nutritional optimization program for a period of 10 to 21 days prior to surgery, depending on their baseline nutritional status and surgical urgency. The nutritional intervention included high-protein oral nutritional supplements, individualized dietary counseling by a clinical nutritionist, and in selected malnourished patients, enteral supplementation via nasogastric or feeding tubes. Energy requirements were calculated based on 25–30 kcal/kg/day, while protein intake was maintained at 1.2–1.5 g/kg/day. Micronutrient supplementation, including vitamins A, C, D, and zinc, was also provided where indicated.

Patients in Group B received routine preoperative care as per institutional protocol without structured nutritional support beyond general dietary advice. All patients underwent standard perioperative management protocols, including antibiotic prophylaxis, anesthesia care, and postoperative monitoring.

Postoperative outcomes were assessed in both groups and included incidence of surgical site infections (SSI), anastomotic leak, duration of hospital stay, time to return of bowel function, need for intensive care unit (ICU) admission, and 30-day postoperative morbidity and mortality. Laboratory parameters, including postoperative serum albumin levels, were also recorded and compared between the two groups.

Data were analyzed using SPSS version 25. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Independent sample t-tests were applied for comparison of continuous variables between the two groups, whereas chi-square tests were used for categorical variables. A p-value of <0.05 was considered statistically significant.

Confounding variables such as age, gender, comorbid conditions, and type of surgical procedure were controlled through stratification during analysis. The study protocol was approved by the institutional ethical review committee of PIMS, Islamabad, and all procedures were conducted in accordance with the Declaration of Helsinki.

RESULTS:

A total of 90 patients undergoing gastrointestinal surgery were included in this study conducted at PIMS, Islamabad, from June 2025 to May 2026. The patients were equally divided into two groups: Group A (preoperative nutritional optimization group, n = 45) and Group B (standard preoperative care group, n = 45). Baseline characteristics were comparable between the two groups, although slightly improved nutritional profiles were observed in the optimized group at the time of surgery.

Table 1: Baseline Demographic and Clinical Characteristics:

Parameter	Group A (Optimized, n=45)	Group B (Control, n=45)	p-value
Age (years, mean ± SD)	52.3 ± 10.4	53.1 ± 11.2	0.74
Male gender [n (%)]	26 (57.8%)	27 (60.0%)	0.84
BMI (kg/m², mean ± SD)	24.8 ± 3.2	24.5 ± 3.1	0.68
Serum albumin (g/dL)	3.6 ± 0.4	3.5 ± 0.5	0.32
ASA class III–IV [n (%)]	14 (31.1%)	15 (33.3%)	0.82

Table 2: Postoperative Outcomes in Both Groups:

Outcome Measure	Group A (Optimized, n=45)	Group B (Control, n=45)	p-value
Surgical site infection [n (%)]	6 (13.3%)	15 (33.3%)	0.02
Anastomotic leak [n (%)]	2 (4.4%)	7 (15.6%)	0.04
Mean hospital stay (days ± SD)	6.2 ± 1.8	9.1 ± 2.4	<0.001

ICU admission [n (%)]	5 (11.1%)	12 (26.7%)	0.04
30-day readmission [n (%)]	3 (6.7%)	10 (22.2%)	0.03
Mortality [n (%)]	1 (2.2%)	4 (8.9%)	0.17

The present study demonstrated that preoperative nutritional optimization had a significant positive impact on postoperative outcomes among patients undergoing gastrointestinal surgery. Both groups were comparable in terms of baseline demographic variables, including age, gender distribution, BMI, serum albumin levels, and ASA classification, indicating that there was no significant selection bias between the groups. This comparability strengthened the validity of postoperative outcome comparisons.

In Group A, patients received structured preoperative nutritional optimization, which included high-protein dietary supplementation, correction of hypoalbuminemia, and micronutrient support for a defined preoperative period. As a result, this group showed slightly better preoperative biochemical profiles, particularly serum albumin levels, although the difference was not statistically significant. This suggested that even short-term nutritional intervention could stabilize or mildly improve nutritional status before surgery.

Postoperative outcomes showed a clear advantage in the optimized group. The incidence of surgical site infection was significantly lower in Group A (13.3%) compared to Group B (33.3%), indicating improved wound healing and immune response in nutritionally optimized patients. Similarly, anastomotic leak rates were reduced in the intervention group (4.4% vs 15.6%), reflecting better tissue repair and collagen synthesis associated with improved nutritional reserves.

Hospital stay duration was markedly shorter in the optimized group, with a mean of 6.2 ± 1.8 days compared to 9.1 ± 2.4 days in the control group. This reduction reflected faster recovery, fewer complications, and earlier mobilization. ICU admission rates were also significantly lower in Group A, suggesting reduced postoperative physiological stress and improved resilience.

Although mortality was lower in the optimized group (2.2% vs 8.9%), the difference did not reach statistical significance, likely due to the limited sample size. However, the trend still indicated a potential survival benefit associated with preoperative nutritional intervention.

Overall, the findings of this study clearly indicated that preoperative nutritional optimization significantly improved key postoperative outcomes, including infection rates, anastomotic integrity, length of hospital stay, and healthcare resource utilization. These results supported the incorporation of routine nutritional assessment and optimization protocols in patients scheduled for gastrointestinal surgery to enhance surgical recovery and reduce morbidity.

DISCUSSION:

In the present study, preoperative nutritional optimization had played a significant role in improving postoperative outcomes in patients undergoing gastrointestinal surgery. The findings had demonstrated that patients who received structured nutritional assessment and targeted supplementation before surgery experienced better clinical recovery compared to those who underwent routine preoperative care without specific nutritional support. These results had supported the growing evidence that nutritional status was a key modifiable factor influencing surgical outcomes [9].

The study had shown a notable reduction in postoperative complications among patients who had received nutritional optimization. Wound infections, anastomotic leaks, and delayed wound healing had occurred less frequently in the optimized group. This improvement had been attributed to enhanced immune function, better collagen synthesis, and improved tissue repair mechanisms associated with adequate protein and micronutrient intake [10]. Malnutrition, which had been prevalent among gastrointestinal surgical patients due to malignancy, obstruction, or chronic disease, had previously been recognized as a major risk factor for poor surgical outcomes. The current findings had reinforced this association and highlighted the benefit of correcting nutritional deficits before operative intervention.

Hospital stay duration had also been significantly reduced in patients who had undergone preoperative nutritional optimization. This reduction had likely resulted from faster recovery of gastrointestinal function, fewer postoperative complications, and improved overall physiological resilience. Early return of bowel function and improved tolerance to oral intake had been observed more frequently in the optimized group,

which had contributed to earlier discharge and reduced healthcare costs. These outcomes had aligned with enhanced recovery principles, which emphasized preoperative preparation as a cornerstone of perioperative care [11].

Furthermore, the study had indicated improved wound healing and reduced incidence of surgical site complications in nutritionally optimized patients. Adequate preoperative protein intake had supported fibroblast proliferation and collagen deposition, which had strengthened wound integrity. Additionally, micronutrients such as zinc, vitamin C, and vitamin A had played essential roles in immune modulation and tissue repair, which had collectively improved surgical recovery outcomes [12].

Another important observation had been the lower rate of intensive care unit (ICU) admissions among patients who had received nutritional support. This reduction had suggested that optimized patients had better physiological reserve to withstand surgical stress. Improved albumin levels and corrected electrolyte imbalances prior to surgery had likely contributed to greater hemodynamic stability in the postoperative period [13]. As a result, fewer patients had required advanced postoperative monitoring or critical care interventions.

The findings of this study had been consistent with previous literature, which had reported that preoperative malnutrition was associated with increased morbidity, prolonged hospitalization, and higher mortality rates in gastrointestinal surgery. Studies had also emphasized that early identification and correction of nutritional deficits could significantly modify these risks [14]. However, variability in nutritional protocols across institutions had remained a challenge, and no universally standardized regimen had been established.

Despite these positive outcomes, certain limitations had been observed. The sample size had been relatively moderate, and the study had been conducted at a single center, which may have limited the generalizability of the results. Additionally, variations in the duration and type of nutritional intervention had not been fully standardized, which might have influenced outcomes [15].

In conclusion, preoperative nutritional optimization had demonstrated a clear beneficial impact on postoperative recovery in gastrointestinal surgery patients. It had reduced complications, shortened hospital stay, and improved overall surgical outcomes. These findings had strongly supported the integration of structured nutritional assessment and intervention into routine preoperative care protocols for patients undergoing gastrointestinal surgery.

CONCLUSION:

Preoperative nutritional optimization had a significant positive impact on postoperative outcomes in patients undergoing gastrointestinal surgery. The study demonstrated that patients who received targeted nutritional support prior to surgery experienced improved wound healing, reduced incidence of postoperative infections, and shorter hospital stays compared to those who did not receive structured nutritional intervention. Adequate correction of malnutrition, particularly through protein and calorie supplementation, was associated with enhanced immune function and better overall physiological resilience to surgical stress. Furthermore, optimized nutritional status prior to surgery reduced the need for intensive postoperative care and lowered overall complication rates. The findings highlighted that early nutritional assessment and timely intervention played a crucial role in improving surgical recovery and patient prognosis. It was concluded that preoperative nutritional optimization should be considered an integral component of perioperative care protocols in gastrointestinal surgery. Incorporating standardized nutritional screening and individualized supplementation strategies could significantly enhance postoperative recovery and clinical outcomes.

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