

Prospective Observational Study of Preoperative Nutritional Status and Its Impact on Postoperative Morbidity in General Surgical Patients

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ABSTRACT

Background: Preoperative nutritional status is an important determinant of postoperative outcomes in surgical patients. The present study was undertaken to evaluate the impact of preoperative nutritional status on postoperative morbidity among general surgical patients by assessing nutritional status before surgery, comparing postoperative outcomes between well-nourished and malnourished patients, and examining the association between nutritional parameters and specific postoperative complications.

Materials and Methods: This prospective observational cohort study was conducted in the Department of General Surgery at a tertiary care teaching hospital over a period of 12 months. A total of 200 adult patients undergoing elective and emergency general surgical procedures were enrolled. Preoperative nutritional assessment was performed using Body Mass Index (BMI), serum albumin, hemoglobin concentration, and total lymphocyte count (TLC). Patients were categorized as well-nourished or malnourished based on predefined nutritional criteria. Postoperatively, patients were followed during their hospital stay for the development of complications. Data were analyzed using the Chi-square test and independent Student's t-test, with $p < 0.05$ considered statistically significant.

Results: Of the 200 patients studied, 79 (39.5%) were malnourished and 121 (60.5%) were well-nourished. Overall postoperative morbidity was observed in 59 (29.5%) patients and was significantly higher among malnourished patients compared to well-nourished patients (48.1% vs. 17.4%; OR=4.41, $p < 0.001$). Patients who developed postoperative complications had significantly lower mean BMI, serum albumin levels, hemoglobin concentrations, and TLC than those without complications ($p < 0.001$). Malnourished patients demonstrated significantly higher rates of surgical site infection, wound dehiscence, respiratory complications, prolonged ileus, and prolonged hospital stay. Hypoalbuminemia, low BMI, anemia, and lymphocytopenia were significantly associated with specific postoperative complications.

Conclusion: Preoperative malnutrition is a significant predictor of postoperative morbidity in general surgical patients. Routine nutritional assessment and timely nutritional optimization may help reduce postoperative complications, shorten hospital stay, and improve overall surgical outcomes.

Keywords: Preoperative nutritional status. Postoperative morbidity. Malnutrition in surgical patients.

INTRODUCTION

Nutritional status plays a pivotal role in determining surgical outcomes, particularly in patients undergoing general surgical procedures. Malnutrition, which includes both undernutrition and overnutrition, has been widely recognized as a significant modifiable risk factor influencing postoperative morbidity and mortality. In the perioperative setting, inadequate nutritional reserves impair wound healing, compromise immune function, and increase susceptibility to infections, thereby prolonging hospital stay and increasing healthcare costs. Conversely, obesity is also associated with adverse outcomes such as delayed wound healing, surgical site infections, and cardiopulmonary complications.[1]

Preoperative nutritional assessment has gained increasing importance as a part of routine surgical evaluation. Various tools such as Body Mass Index (BMI), serum albumin levels, Nutritional Risk Index (NRI), and Subjective Global Assessment (SGA) are commonly used to evaluate nutritional status. Among these, serum albumin is considered a reliable biochemical marker of nutritional status and has been strongly associated with postoperative complications. Studies have demonstrated that hypoalbuminemia is an independent predictor of increased postoperative morbidity and mortality.[2]

In general, surgical patients, especially those undergoing elective procedures, preoperative identification of nutritional deficiencies allows for timely intervention, including nutritional supplementation and optimization strategies. Early identification and correction of malnutrition can significantly reduce postoperative complications such as surgical site infections, anastomotic leaks, prolonged ileus, and delayed recovery. Despite advances in surgical techniques and perioperative care, postoperative

complications remain a major concern, particularly in nutritionally compromised individuals.[3]

The burden of malnutrition is particularly high in developing countries, including India, where a significant proportion of patients present late with chronic illnesses, contributing to poor nutritional reserves. Additionally, socioeconomic factors, dietary habits, and comorbid conditions further influence the nutritional status of patients presenting for surgery. The burden of malnutrition remains substantial in developing countries, including India, where nutritional deficiencies continue to affect various population groups. Socioeconomic disparities, inadequate dietary diversity, and poor access to nutritious food contribute significantly to undernutrition and poor nutritional reserves. [4] Some study reported that inadequate dietary diversity and lower socioeconomic status were significantly associated with undernutrition among children in Uttar Pradesh, highlighting the persistent burden of malnutrition in India.[5] Such factors may also contribute to compromised nutritional status among adults presenting for surgical interventions, thereby influencing postoperative outcomes. Therefore, assessing the impact of preoperative nutritional status on postoperative outcomes in such settings becomes crucial for improving patient care and surgical outcomes. This study was done to evaluate the impact of preoperative nutritional status on postoperative morbidity in general surgical patients

MATERIALS & METHODS

Study Setting and Source of Data

This prospective observational cohort study was conducted in the Department of General Surgery at a tertiary care teaching hospital. The study population comprised adult patients admitted for elective and emergency general surgical procedures during the study period. Consecutive

eligible patients meeting the inclusion criteria were enrolled after obtaining written informed consent.

Study Design

The study was designed as a prospective observational cohort study. Patients were assessed preoperatively for their nutritional status and subsequently followed throughout their postoperative hospital stay to evaluate the occurrence of postoperative complications and other clinical outcomes.

Study Duration

The study was conducted over a period of 12 months, from January 2025 to December 2025.

Sample Size

A total of 200 patients undergoing general surgical procedures were included in the study using complete enumeration approach, hence no predetermination of sample size was done.

Inclusion Criteria

Patients fulfilling the following criteria were included:

- Age ≥ 18 years.
- Patients undergoing elective or emergency general surgical procedures.
- Patients willing to participate and providing written informed consent.

Exclusion Criteria

Patients meeting any of the following criteria were excluded:

- Terminally ill patients or those receiving palliative care for advanced malignancy.
- Patients with severe hepatic failure or renal failure.
- Patients receiving preoperative nutritional supplementation or nutritional rehabilitation.
- Patients unwilling to participate in the study.

Nutritional Assessment and Study Procedure

All enrolled patients underwent a detailed preoperative evaluation. Demographic information, clinical history, comorbid conditions, and operative details were recorded using a structured data collection proforma.

Nutritional status was assessed preoperatively using anthropometric, hematological, and biochemical parameters, including Body Mass Index (BMI), serum albumin concentration, hemoglobin level, and total lymphocyte count (TLC).

Patients were categorized into two groups based on their nutritional status:

Malnourished: Patients fulfilling any one of the following criteria:

- BMI < 18.5 kg/m²
- Serum albumin < 3.5 g/dL
- Hemoglobin < 10 g/dL
- Total lymphocyte count < 1500 cells/mm³

Well-nourished: Patients not meeting any of the above criteria.

Baseline investigations included complete blood count, serum albumin estimation, and other routine preoperative laboratory investigations as indicated. Following surgery, patients were prospectively monitored throughout their hospital stay for the development of postoperative complications, including surgical site infection, wound dehiscence, respiratory complications, sepsis, prolonged ileus, and prolonged hospital stay.

The incidence of postoperative morbidity was recorded and compared between the well-nourished and malnourished groups.

Sample Processing

Venous blood samples were collected under aseptic conditions and analyzed in the central hospital laboratory using standard laboratory protocols. Serum albumin levels were measured using validated biochemical methods. Anthropometric measurements, including height and weight, were obtained using calibrated instruments, and BMI was

calculated as weight in kilograms divided by the square of height in meters (kg/m²).

Data Collection

Data were collected prospectively using a predesigned and pretested case record form. Information regarding demographic characteristics, nutritional parameters, comorbidities, surgical details, and postoperative outcomes was systematically documented. All patients were followed until discharge from the hospital to ensure complete recording of postoperative complications.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 28. Continuous variables were expressed as mean \pm standard deviation (SD), whereas categorical variables were presented as frequencies and percentages.

Comparisons between groups were performed using: Independent Student's t-test for continuous variables. Chi-square test for categorical variables. Odds ratios (ORs) were calculated to estimate the strength of associations between nutritional status and postoperative complications. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

The study was approved by the Institutional Ethics Committee of Dr. Vithalrao Vikhe Patil Foundations Medical College and Hospital, Ahmednagar, Maharashtra, India (Approval No. VIMS/IEC/C/2025/120). Written informed consent was obtained from all participants before enrollment.

RESULT

Table 1 depicts among the 200 patients included in the study, 121 (60.5%) were classified as well-nourished and 79 (39.5%) as malnourished. Overall, postoperative morbidity occurred in 59 (29.5%) patients. The incidence of postoperative complications was significantly higher among malnourished patients (48.1%) compared to well-nourished patients (17.4%). Conversely, the majority of well-nourished patients (82.6%) remained free of postoperative complications, whereas only 51.9% of malnourished patients had an uncomplicated postoperative course. The association between preoperative nutritional status and postoperative morbidity was highly significant ($\chi^2 = 21.72$, $p < 0.001$). Malnourished patients had a 4.41-fold higher risk of developing postoperative morbidity compared with well-nourished patients (OR = 4.41; 95% CI: 2.32–8.41).

Table 1. Impact of Preoperative Nutritional Status on Overall Postoperative Morbidity (N = 200)

Preoperative Nutritional Status	Postoperative Morbidity Present n (%)	Postoperative Morbidity Absent n (%)	Total n (%)	Odds Ratio (malnourished vs well-nourished):	P value
Well-nourished	21 (17.4)	100 (82.6)	121 (60.5)	4.41	<0.001
Malnourished	38 (48.1)	41 (51.9)	79 (39.5)		
Total	59 (29.5)	141 (70.5)	200 (100)		

Note: Chi square test.

Table 2 compares patients who developed postoperative morbidity had significantly poorer nutritional profiles than those without complications. The mean BMI was significantly lower among patients with morbidity (19.7 ± 2.6 kg/m²) compared with those without morbidity (23.4 ± 3.1 kg/m²; $p < 0.001$). Similarly, serum albumin levels were markedly reduced in the morbidity

group (3.12 ± 0.44 g/dL vs. 3.86 ± 0.51 g/dL; $p < 0.001$). Hemoglobin concentration and total lymphocyte count were also significantly lower among patients who experienced postoperative complications (10.3 ± 1.4 g/dL and 1542 ± 418 /mm³, respectively) than among those with an uncomplicated postoperative course (11.8 ± 1.5 g/dL and 1916 ± 472 /mm³, respectively;

p < 0.001 for both). These findings indicate that poor preoperative nutritional status is strongly associated with an increased risk of postoperative morbidity.

Table 2. Assessment of Preoperative Nutritional Status in General Surgical Patients According to Postoperative Morbidity (N = 200)

Nutritional Parameter	Morbidity Present (n = 59) Mean ± SD	Morbidity Absent (n = 141) Mean ± SD	p value
Body Mass Index (kg/m ²)	19.7 ± 2.6	23.4 ± 3.1	<0.001
Serum Albumin (g/dL)	3.12 ± 0.44	3.86 ± 0.51	<0.001
Hemoglobin (g/dL)	10.3 ± 1.4	11.8 ± 1.5	<0.001
Total Lymphocyte Count (/mm ³)	1542 ± 418	1916 ± 472	<0.001

Note: Independent t test.

Table 3 shows that postoperative complications were significantly more common among malnourished patients than well-nourished patients. Malnourished patients had higher rates of surgical site infection (21.5% vs. 7.4%), wound dehiscence (11.4% vs. 3.3%), respiratory complications (15.2% vs. 5.0%), prolonged ileus (13.9% vs. 5.8%), and prolonged

hospital stay >7 days (39.2% vs. 15.7%). Overall postoperative morbidity was significantly higher in malnourished patients (48.1%) compared to well-nourished patients (17.4%) (OR = 4.41, p < 0.001), indicating that poor preoperative nutritional status is strongly associated with adverse postoperative outcomes.

Table 3. Comparison of Postoperative Morbidity Between Well-Nourished and Malnourished Patients (N = 200)

Postoperative Complication	Well-nourished (n = 121)	Malnourished (n = 79)	Odds Ratio	p value
Surgical site infection	9 (7.4)	17 (21.5)	3.41	0.004
Wound dehiscence	4 (3.3)	9 (11.4)	3.76	0.023
Respiratory complications	6 (5.0)	12 (15.2)	3.43	0.013
Prolonged ileus	7 (5.8)	11 (13.9)	2.63	0.049
Hospital stay >7 days	19 (15.7)	31 (39.2)	3.47	<0.001
Any postoperative morbidity	21 (17.4)	38 (48.1)	4.41	<0.001

Note: Chi square test.

Table 4 demonstrates a significant association between abnormal preoperative nutritional parameters and specific postoperative complications. Patients with serum albumin levels <3.5 g/dL had a significantly higher incidence of surgical site infection compared to those with normal albumin levels (25.0% vs. 6.8%; OR = 4.56, p < 0.001). Similarly, patients with BMI <18.5 kg/m² were nearly seven times more likely to develop wound dehiscence than patients with normal BMI (18.6% vs. 3.2%; OR = 6.95, p < 0.001). Respiratory complications were significantly more

frequent among patients with hemoglobin <10 g/dL compared to those with higher hemoglobin levels (17.5% vs. 5.6%; OR = 3.59, p = 0.008). Furthermore, patients with a total lymphocyte count <1500/mm³ had a significantly higher rate of prolonged hospital stay exceeding seven days than those with normal lymphocyte counts (42.9% vs. 19.2%; OR = 3.16, p < 0.001). These findings indicate that hypoalbuminemia, low BMI, anemia, and lymphocytopenia are important predictors of adverse postoperative outcomes in general surgical patients.

Table 4. Association Between Nutritional Parameters and Specific Postoperative Complications (N = 200)

Nutritional Parameter	Postoperative Complication	Abnormal Group n/N (%)	Normal Group n/N (%)	Odds Ratio (OR)	p-value
Serum albumin <3.5 g/dL vs ≥3.5 g/dL	Surgical site infection	17/68 (25.0)	9/132 (6.8)	4.56	<0.001
BMI <18.5 kg/m ² vs ≥18.5 kg/m ²	Wound dehiscence	8/43 (18.6)	5/157 (3.2)	6.95	<0.001
Hemoglobin <10 g/dL vs ≥10 g/dL	Respiratory complications	10/57 (17.5)	8/143 (5.6)	3.59	0.008
Total lymphocyte count <1500/mm ³ vs ≥1500/mm ³	Hospital stay >7 days	21/49 (42.9)	29/151 (19.2)	3.16	<0.001

Note: Chi square test.

DISCUSSION

In the present study, postoperative morbidity was observed in 48.1% of malnourished patients compared with 17.4% of well-nourished patients. Malnourished patients had more than four times higher odds of developing postoperative complications (OR = 4.41, $p < 0.001$). These findings are consistent with those reported by Keerio et al. [1], who observed significantly higher postoperative complication rates and longer hospital stays among nutritionally compromised surgical patients. Similarly, Zhang et al. [2] demonstrated that poor preoperative nutritional status was independently associated with an increased risk of postoperative infections and adverse surgical outcomes. The observed relationship may be explained by impaired immune function, reduced protein reserves, delayed collagen synthesis, and compromised wound healing in malnourished individuals, all of which predispose patients to postoperative complications.

The present study also found that patients who developed postoperative morbidity had significantly lower BMI, serum albumin levels, hemoglobin concentrations, and total lymphocyte counts compared with patients without complications. Among these parameters, serum albumin emerged as one of the strongest indicators of adverse postoperative outcomes. Hypoalbuminemia reflects both inadequate nutritional reserves and systemic inflammatory burden and has been widely recognized as a predictor of poor surgical outcomes. Ornaighi et al. [6]

similarly reported that low preoperative serum albumin levels were associated with increased postoperative morbidity and mortality across various surgical specialties. Reduced hemoglobin levels may impair tissue oxygen delivery and wound healing, while low lymphocyte counts indicate compromised immune competence, thereby increasing susceptibility to infections and delayed recovery. Similar observations were reported by Elsamadicy et al. [4] and Kinugasa et al. [7], who identified poor nutritional indices as important determinants of postoperative recovery and complications.

Analysis of specific postoperative complications revealed significantly higher rates of surgical site infection, wound dehiscence, respiratory complications, prolonged ileus, and prolonged hospital stay among malnourished patients. Surgical site infection occurred nearly three times more frequently in malnourished patients, while wound dehiscence and respiratory complications were also significantly increased. These findings are in agreement with those of Fiorindi et al. [8], who reported that inadequate nutritional status adversely affects tissue repair mechanisms and increases postoperative infectious complications. Poor nutritional status may impair fibroblast proliferation, collagen deposition, and immune response, thereby delay wound healing and increase the likelihood of wound-related complications.

A notable finding of the present study was the significantly higher incidence of prolonged hospitalization among malnourished patients. Similar observations

have been reported by Venianaki et al. [9], who demonstrated that malnutrition contributes to delayed recovery, increased postoperative complications, and greater healthcare utilization. Prolonged hospital stay not only increases healthcare costs but also exposes patients to additional hospital-acquired complications, underscoring the clinical importance of early nutritional optimization.

Further analysis of individual nutritional parameters demonstrated that hypoalbuminemia, low BMI, anemia, and lymphocytopenia were significantly associated with specific postoperative complications. Patients with serum albumin levels below 3.5 g/dL had a markedly increased risk of surgical site infection, while patients with BMI below 18.5 kg/m² were more likely to develop wound dehiscence. Similarly, anemia was associated with respiratory complications, and low total lymphocyte count was associated with prolonged hospital stay. These findings support previous reports by Gn et al. [10] and Lidoriki et al. [11], suggesting that objective nutritional markers can serve as useful predictors of postoperative outcomes and may aid in identifying high-risk surgical patients who could benefit from targeted nutritional interventions. The findings of the present study have important clinical implications. Routine preoperative nutritional screening using simple, readily available parameters such as BMI, serum albumin, hemoglobin, and lymphocyte count may help identify patients at increased risk of postoperative morbidity. Early nutritional intervention, including dietary counselling, oral nutritional supplementation, and perioperative nutritional support, may improve nutritional status and potentially reduce postoperative complications, shorten hospital stay, and enhance recovery.

CONCLUSION

The present study demonstrates that preoperative nutritional status is a significant determinant of postoperative

outcomes in general surgical patients. Malnourished patients experienced substantially higher rates of postoperative morbidity compared with well-nourished patients, underscoring the adverse impact of poor nutritional status on surgical recovery. Among the nutritional parameters evaluated, low BMI, hypoalbuminemia, anemia, and reduced total lymphocyte count were significantly associated with an increased risk of postoperative complications. Malnutrition was associated with higher incidences of surgical site infection, wound dehiscence, respiratory complications, prolonged ileus, and prolonged hospital stay, indicating its broad influence on postoperative recovery and healthcare utilization. These findings highlight the need for routine preoperative nutritional screening and risk stratification in patients undergoing general surgical procedures. Early identification and optimization of nutritional deficiencies through appropriate nutritional interventions may reduce postoperative complications, shorten hospital stay, improve recovery, and ultimately enhance overall surgical outcomes. Incorporating nutritional assessment into standard preoperative evaluation protocols may therefore represent an effective and cost-efficient strategy for improving patient care.

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