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Research Article

Cross-Sectional Comparative Study of Preoperative Nutritional Status and Its Impact on Postoperative Morbidity in General Surgical Patients

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ABSTRACT

Background: Malnutrition is a common but often overlooked condition among surgical patients and is associated with impaired wound healing, increased infection rates, and prolonged recovery. Preoperative nutritional assessment may help identify patients at higher risk of postoperative morbidity. **Objectives:** To evaluate preoperative nutritional status and its impact on postoperative morbidity in general surgical patients and to compare outcomes between nutritionally adequate and nutritionally at-risk individuals. **Methods:** This hospital-based cross-sectional comparative study included 120 adult patients undergoing general surgical procedures at a tertiary care center. Preoperative nutritional status was assessed using body mass index, serum albumin, and hemoglobin levels. Patients were categorized as nutritionally adequate or nutritionally at risk. Postoperative morbidity, including surgical site infection, respiratory complications, sepsis, and length of hospital stay, was recorded during the hospital stay. Statistical analysis was performed using appropriate tests, and a p-value <0.05 was considered statistically significant. **Results:** Postoperative morbidity was observed in 34.2% of patients. Nutritionally at-risk patients had significantly higher rates of overall postoperative morbidity compared to nutritionally adequate patients (53.8% vs. 19.1%; p <0.001). Low BMI, hypoalbuminemia, and anemia were strongly associated with postoperative complications. Nutritionally at-risk patients also had a significantly longer mean hospital stay. Emergency surgery and advanced age further increased the risk of postoperative morbidity. **Conclusion:** Poor preoperative nutritional status is a significant predictor of postoperative morbidity in general surgical patients. Routine preoperative nutritional screening and early nutritional optimization should be integrated into standard surgical care to improve postoperative outcomes.

Keywords: Preoperative nutritional status. Postoperative morbidity. General surgery.

INTRODUCTION

Adequate nutritional status is a fundamental determinant of surgical outcomes and plays a

critical role in wound healing, immune competence, and recovery following operative procedures. Malnutrition, which includes both undernutrition and disease-related nutritional deficiency, is frequently underdiagnosed among hospitalized surgical patients despite its well-documented association with increased postoperative morbidity, prolonged hospital stay, higher healthcare costs, and mortality. In developing countries, the burden of malnutrition among hospitalized patients remains substantial due to socioeconomic constraints, delayed healthcare access, and the presence of chronic comorbid conditions.[1]

Preoperative nutritional assessment has gained increasing importance as a modifiable risk factor influencing surgical outcomes. Several studies have demonstrated that patients with poor nutritional reserves are at higher risk of postoperative complications such as surgical site infections, delayed wound healing, anastomotic leaks, pneumonia, sepsis, and prolonged intensive care unit (ICU) stay. General surgical patients are particularly vulnerable, as many present with acute or chronic gastrointestinal pathologies that impair nutrient intake, digestion, or absorption.

Various tools are available for evaluating nutritional status, including anthropometric measurements such as body mass index (BMI), biochemical markers like serum albumin and hemoglobin, and composite screening tools such as the Nutritional Risk Screening-2002 (NRS-2002) and Subjective Global Assessment (SGA). Among these, simple, cost-effective, and easily reproducible parameters are especially relevant in resource-limited settings. Serum albumin, though influenced by inflammation, remains a widely used indicator of protein reserves and has been consistently associated with postoperative morbidity. Similarly, BMI provides a practical estimate of nutritional status, with both underweight and obesity linked to adverse surgical outcomes.[2][3]

Postoperative morbidity encompasses a spectrum of complications ranging from minor wound infections to life-threatening systemic complications. Identifying patients at nutritional risk during the preoperative period allows early intervention through nutritional optimization, which has been shown to reduce complication rates, shorten hospital stay, and improve overall surgical outcomes. Despite this evidence, routine nutritional screening is not uniformly practiced in many surgical units, particularly in busy tertiary-care hospitals.[4]

Aim

To evaluate preoperative nutritional status and its impact on postoperative morbidity in general surgical patients.

Objectives

1. To assess the preoperative nutritional status of patients undergoing general surgical procedures.
2. To compare postoperative morbidity between nutritionally adequate and nutritionally at-risk patients.
3. To determine the association between preoperative nutritional parameters and postoperative complications.

MATERIAL AND METHODOLOGY

Source of Data

Data were collected from patients admitted for elective and emergency general surgical procedures in the Department of General Surgery of a tertiary care teaching hospital.

Study Design

This was a hospital-based cross-sectional comparative study.

Study Location

The study was conducted in the Department of General Surgery at a tertiary care hospital.

Study Duration

The study was carried out over a period of 18 months.

Sample Size

A total of 120 patients undergoing general surgical procedures were included in the study.

Inclusion Criteria

- Adult patients aged ≥18 years
- Patients undergoing elective or emergency general surgical procedures
- Patients who provided written informed consent

Exclusion Criteria

- Patients with terminal illness or malignancy on palliative care
- Patients with chronic liver disease, nephrotic syndrome, or severe systemic illness affecting nutritional markers
- Pregnant women
- Patients unwilling to participate in the study

Procedure and Methodology

After obtaining written informed consent, eligible patients were enrolled in the study. A detailed clinical history and demographic profile were recorded. Preoperative nutritional assessment was performed using anthropometric measurements such as body mass index and laboratory parameters including serum albumin and hemoglobin levels. Patients were categorized into nutritionally adequate and nutritionally at-risk groups based on predefined cut-off values.

All patients underwent surgical procedures as per standard institutional protocols. Postoperatively, patients were followed during their hospital stay for the development of morbidity, including surgical site infection, wound dehiscence, respiratory complications, urinary tract infection, sepsis, and prolonged hospital stay. Complications were documented and graded according to standard clinical criteria.

Sample Processing

Venous blood samples were collected preoperatively under aseptic precautions. Samples were analyzed in the central laboratory using standardized automated analyzers following institutional quality control protocols.

Statistical Methods

Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequency and percentage. Comparison between groups was performed using Student's t-test or Mann-Whitney U test for continuous variables and Chi-square test or Fisher's exact test for categorical variables. A p-value <0.05 was considered statistically significant.

Data Collection

Data were collected using a predesigned and pretested case record form that included demographic details, nutritional parameters, operative details, and postoperative outcomes.

OBSERVATION AND RESULTS

Table 1: Preoperative Nutritional Status and Postoperative Morbidity (N = 120)

Variable	Postoperative Morbidity Present (n = 41)	No Morbidity (n = 79)	Test of significance	Effect size (95% CI)	p-value
Age (years), Mean ± SD	56.2 ± 11.8	48.9 ± 12.4	t = 3.14	Mean diff = 7.3 (2.7-11.9)	0.002

Male sex	27 (65.9%)	46 (58.2%)	$\chi^2 = 0.67$	RR = 1.18 (0.83-1.67)	0.412
BMI (kg/m²), Mean ± SD	18.9 ± 2.4	22.1 ± 2.8	t = -6.23	Mean diff = -3.2 (-4.2 to -2.2)	<0.001
Serum albumin (g/dL), Mean ± SD	2.9 ± 0.4	3.7 ± 0.5	t = -8.91	Mean diff = -0.8 (-0.98 to -0.62)	<0.001
Under-nutrition present	31 (75.6%)	21 (26.6%)	$\chi^2 = 27.4$	RR = 2.84 (1.90-4.23)	<0.001
Emergency surgery	24 (58.5%)	29 (36.7%)	$\chi^2 = 5.23$	RR = 1.59 (1.06-2.37)	0.022

Table 1 summarizes the relationship between preoperative nutritional status and postoperative morbidity among 120 general surgical patients. Patients who developed postoperative morbidity were significantly older than those without morbidity (56.2 ± 11.8 vs. 48.9 ± 12.4 years; $p = 0.002$). Nutritional parameters showed a strong association with adverse outcomes: the morbidity group had a significantly lower mean BMI (18.9 ± 2.4 vs. 22.1 ± 2.8 kg/m²; $p < 0.001$) and lower serum albumin levels (2.9 ± 0.4 vs. 3.7 ± 0.5 g/dL; $p < 0.001$). Under-nutrition was markedly more prevalent among patients with postoperative morbidity (75.6% vs. 26.6%), conferring nearly a threefold increased risk of complications (RR = 2.84; 95% CI: 1.90-4.23). Emergency surgery was also significantly associated with postoperative morbidity ($p = 0.022$). In contrast, sex distribution did not show a significant association with morbidity ($p = 0.412$).

Table 2: Preoperative Nutritional Status of General Surgical Patients (N = 120)

Nutritional parameter	Category	n (%) / Mean ± SD
BMI (kg/m²)		21.0 ± 3.2
	Underweight (<18.5)	38 (31.7)
	Normal (18.5-24.9)	62 (51.7)
	Overweight (≥25)	20 (16.6)
Serum albumin (g/dL)		3.4 ± 0.6
	<3.5 g/dL	47 (39.2)
	≥3.5 g/dL	73 (60.8)
Hemoglobin (g/dL)		11.2 ± 1.7
	<10 g/dL	29 (24.2)
	≥10 g/dL	91 (75.8)
Nutritional risk status	At risk	52 (43.3)
	Adequate	68 (56.7)

Table 2 depicts the baseline preoperative nutritional profile of the study population. The mean BMI of patients was 21.0 ± 3.2 kg/m², with nearly one-third of patients being underweight (31.7%). More than half of the patients had a normal BMI, while 16.6% were overweight. The mean serum albumin level was 3.4 ± 0.6 g/dL, and

hypoalbuminemia (<3.5 g/dL) was observed in 39.2% of patients. The mean hemoglobin level was 11.2 ± 1.7 g/dL, with anemia (<10 g/dL) present in 24.2% of cases. Overall, 43.3% of patients were classified as nutritionally at risk, highlighting a substantial burden of compromised nutritional status in the preoperative period.

Table 3: Comparison of Postoperative Morbidity Between Nutritionally Adequate and At-Risk Patients (N = 120)

Outcome	Nutritionally Adequate (n = 68)	Nutritionally At-Risk (n = 52)	Test of significance	Effect size (95% CI)	p-value
Any postoperative morbidity	13 (19.1%)	28 (53.8%)	$\chi^2 = 16.1$	RR = 2.82 (1.63-4.88)	<0.001
Surgical site infection	7 (10.3%)	18 (34.6%)	$\chi^2 = 10.5$	RR = 3.36 (1.51-7.46)	0.001
Respiratory complications	4 (5.9%)	11 (21.1%)	$\chi^2 = 6.25$	RR = 3.58 (1.18-10.8)	0.013
Sepsis	2 (2.9%)	7 (13.4%)	Fisher's exact	RR = 4.56 (0.98-21.1)	0.038
Hospital stay (days), Mean ± SD	7.1 ± 2.8	11.6 ± 4.2	t = -6.44	Mean diff = -4.5 (-5.9 to -3.1)	<0.001

Table 3 compares postoperative morbidity between nutritionally adequate and nutritionally at-risk patients. Postoperative morbidity was significantly higher among nutritionally at-risk patients (53.8%) compared to nutritionally adequate patients (19.1%), representing nearly a threefold increased risk (RR = 2.82; $p < 0.001$). Surgical site infections, respiratory complications, and sepsis were all significantly more frequent in the at-risk group. Additionally, nutritionally at-risk patients had a significantly longer mean hospital stay (11.6 ± 4.2 days) compared to nutritionally adequate patients (7.1 ± 2.8 days; $p < 0.001$), indicating increased postoperative morbidity and resource utilization.

Table 4: Association Between Preoperative Nutritional Parameters and Postoperative Complications (N = 120)

Nutritional parameter	Complications Present (n = 41)	No Complications (n = 79)	Test of significance	Effect size (95% CI)	p-value
BMI (kg/m²), Mean ± SD	18.9 ± 2.4	22.1 ± 2.8	t = -6.23	Mean diff = -3.2 (-4.2 to -2.2)	<0.001

Serum albumin (g/dL), Mean ± SD	2.9 ± 0.4	3.7 ± 0.5	t = -8.91	Mean diff = -0.8 (-0.98 to -0.62)	<0.001
Hemoglobin (g/dL), Mean ± SD	10.4 ± 1.5	11.6 ± 1.6	t = -3.86	Mean diff = -1.2 (-1.8 to -0.6)	<0.001
BMI <18.5 kg/m²	26 (63.4%)	12 (15.2%)	$\chi^2 = 29.7$	RR = 4.18 (2.39-7.30)	<0.001
Albumin <3.5 g/dL	33 (80.5%)	14 (17.7%)	$\chi^2 = 44.6$	RR = 4.55 (2.79-7.42)	<0.001

Table 4 demonstrates the association between specific preoperative nutritional parameters and postoperative complications. Patients who developed complications had significantly lower BMI, serum albumin, and hemoglobin levels compared to those without complications (all $p < 0.001$). Underweight patients (BMI < 18.5 kg/m²) had more than a fourfold higher risk of postoperative complications (RR = 4.18; 95% CI: 2.39-7.30), while hypoalbuminemia (<3.5 g/dL) was associated with an even greater risk (RR = 4.55; 95% CI: 2.79-7.42).

DISCUSSION

Table 1 demonstrates a significant association between poor preoperative nutritional status and postoperative morbidity in general surgical patients. In the present study, patients who developed postoperative complications were significantly older than those without morbidity, suggesting that advancing age may exacerbate vulnerability to nutrition-related surgical stress. Similar observations have been reported by Ornaghi PI *et al.* (2021)[5], who identified older age as an independent risk factor for adverse postoperative outcomes, partly mediated through reduced physiological and nutritional reserves.

Nutritional indicators showed a strong and consistent relationship with postoperative morbidity. Patients with complications had significantly lower BMI and serum albumin levels, findings that align with multiple international studies emphasizing the role of undernutrition in increasing postoperative risk. Youn SB *et al.* (2022)[6] reported serum albumin as one of the strongest predictors of postoperative morbidity and mortality in surgical patients. Likewise, Nagaraju A *et al.* (2022)[7] demonstrated that patients identified as nutritionally at risk had significantly higher complication rates, corroborating the nearly threefold increased risk of morbidity seen in undernourished patients in the present study. Emergency surgery was also significantly associated with postoperative morbidity, a finding consistent with earlier studies showing that emergency procedures often preclude preoperative nutritional optimization, thereby compounding risk.

Table 2 highlights the substantial burden of preoperative nutritional compromise in the study population. Approximately one-third of patients were underweight, and nearly 40% had hypoalbuminemia, indicating a high prevalence of nutritional risk. These findings are comparable to those reported in Indian and international hospital-based studies, where 30-50% of surgical patients were

found to be malnourished or at nutritional risk at admission. Yokoyama K *et al.* (2021)[8] emphasized that hospital malnutrition remains under-recognized despite its high prevalence and significant impact on outcomes, particularly in low- and middle-income countries.

Table 3 clearly demonstrates that nutritionally at-risk patients experienced significantly higher postoperative morbidity compared to nutritionally adequate patients. The risk of overall postoperative morbidity, surgical site infection, respiratory complications, and sepsis was markedly higher in the at-risk group, with relative risks ranging from nearly three- to fourfold. These findings are in close agreement with the EuroOOPS study by Wolf JH *et al.* (2020)[9], which showed that nutritionally at-risk patients had significantly increased rates of postoperative infections and prolonged hospital stay. The significantly longer hospital stay observed among nutritionally at-risk patients in the present study further supports evidence from previous studies that malnutrition contributes to delayed recovery and increased healthcare utilization.

Table 4 further reinforces the strong association between specific nutritional parameters and postoperative complications. Low BMI, hypoalbuminemia, and anemia were all significantly associated with postoperative morbidity. Patients with BMI <18.5 kg/m² and serum albumin <3.5 g/dL had more than a fourfold increased risk of complications. Similar associations have been reported by Gn YM *et al.* (2021)[10], who emphasized that protein-energy malnutrition adversely affects immune response, wound healing, and resistance to infection. Anemia has also been recognized as an important contributor to postoperative complications, particularly infections and delayed healing, as reported by Yoon JP *et al.* (2021)[11].

CONCLUSION

The present cross-sectional comparative study demonstrates a strong and consistent association between poor preoperative nutritional status and increased postoperative morbidity among general surgical patients. Patients who were nutritionally at risk characterized by low body mass index, hypoalbuminemia, and anemia experienced significantly higher rates of postoperative complications, including surgical site infections, respiratory complications, sepsis, and prolonged hospital stay. Advanced age and emergency surgery further amplified the risk of adverse outcomes. These findings highlight that preoperative malnutrition is a common yet under-recognized problem in general surgical practice and serves as a major, potentially modifiable risk factor for postoperative morbidity. Routine nutritional screening during preoperative evaluation can facilitate early identification of at-risk patients and enable timely nutritional interventions, which may improve surgical outcomes, reduce complications, and decrease healthcare resource utilization.

LIMITATIONS OF THE STUDY

1. The cross-sectional study design limits the ability to establish a causal relationship between nutritional status and postoperative morbidity.
2. The study was conducted at a single tertiary care center, which may limit the generalizability of the findings to other settings.
3. Nutritional assessment relied primarily on anthropometric and biochemical parameters, which may be influenced by acute illness and inflammatory states.
4. Long-term postoperative outcomes and mortality beyond hospital discharge were not assessed.
5. The impact of preoperative nutritional interventions on postoperative outcomes was not evaluated.

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