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The Role of Preoperative Nutritional Status in Predicting Outcomes of Cardiac Surgery

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Abstract

Background: Preoperative dietary status, though not extensively studied, significantly influences postoperative outcomes in heart surgery patients. This study examines the association between dietary status, recovery, and surgical complications.

Methods: 136 patients receiving elective heart surgery participated in this observational cohort research, which was carried out at the Hayatabad Medical Complex in Peshawar from August 2023 to July 2024. Body Mass Index (BMI), serum albumin levels, and Subjective Global Assessment (SGA) were used to evaluate nutritional status. Using chi-square testing and logistic regression, postoperative outcomes, such as morbidity, mortality, duration of hospital stay, and recovery time, were examined.

Results: 45.6% (n = 62) of the 136 patients met the criteria for malnutrition. High BMI and low blood albumin levels were also common. 35.3% of patients had postoperative problems, while 4.4% (n = 6) and 5.1% (n = 7) of patients died within 30 days and in the hospital, respectively. In comparison to well-nourished individuals, malnourished patients had significantly longer hospital stays (10.3 days vs. 7.2 days) and recovery durations (45.6 days vs. 32.1 days). Significant correlations were found in the statistical studies between low nutritional status and higher rates of morbidity ($p < 0.05$), death ($p < 0.01$), and extended recovery periods ($p < 0.01$).

Conclusions: In cardiac surgery, poor preoperative nutritional condition is associated with lower postoperative results. To enhance patient outcomes and rehabilitation, focused treatments and routine nutritional evaluations are crucial.

Keywords: Preoperative Nutritional Status, Cardiac Surgery, Subjective Global Assessment, Serum Albumin, Postoperative Outcomes, Body Mass Index

Introduction

One of the trickiest and riskiest medical operations performed today is cardiac surgery, which often requires thorough preoperative preparation in order to maximize patient outcomes [1]. Even with improvements in perioperative care and surgical procedures, there is still a considerable morbidity and death rate after heart surgery, especially in high-risk patient groups [2, 3]. The dietary health of patients before to surgery is one important element that has attracted more attention in the literature. An growing number of studies have identified nutritional status—which includes a broad variety of markers such as body mass index (BMI), serum albumin levels, and the existence of malnutrition or obesity—as a critical factor influencing postoperative outcomes in patients undergoing heart surgery [4-6]. Estimates indicate that up to 50% of patients having heart surgery may have nutritional deficiencies prior to surgery. Malnutrition, both overt and subclinical, is a common problem among these patients. Numerous unfavorable outcomes, such

as greater rates of surgical infection, longer hospital admissions, slower wound healing, and higher death rates, have been linked to malnutrition [7, 8]. On the other hand, obesity—which is often characterized by a body mass index (BMI) of 30 or more—presents unique obstacles in the context of cardiac surgery, such as technical difficulties during the procedure, a higher risk of perioperative complications, and long-term problems with cardiovascular health [9–10].

There are many different ways that dietary status affects surgical results. The immune system's ability to operate, the body's capacity to withstand the physiological strain of surgery, and the healing process may all be hampered by inadequate nutritional condition [11]. Patients who are malnourished may also have reduced protein stores, which might hinder their capacity to heal from the severe stress that comes with heart surgery and repair damaged tissues. Conversely, obesity is often associated with a chronic inflammatory condition, which may worsen the inflammatory response systemic to surgery and lead to less favorable results [12, 13]. Owing to these possible effects, evaluating and improving a patient's nutritional state before heart surgery has become essential preoperative treatment. More thorough assessments, such as the use of scoring systems like the Nutritional Risk Index (NRI) and Subjective Global Assessment (SGA), are progressively complementing traditional nutritional examinations, such as body mass index (BMI) and serum albumin levels. With the use of these instruments, physicians may recognize patients who are at risk for malnutrition and carry out focused treatments to enhance their state before to surgery [14].

Although preoperative nutritional status is acknowledged to be important, there is still disagreement over the optimal methods for evaluating and improving it in patients undergoing heart surgery. Furthermore, further study is required in this area since, while the association between nutritional status and postoperative results has been established in numerous surgical domains, the precise influence of preoperative nutrition on the outcomes of cardiac surgery is less well-defined. By methodically assessing how preoperative nutritional status affects postoperative outcomes in patients having heart surgery, this research seeks to close this gap in knowledge. This research aims to provide evidence-based recommendations for the integration of nutritional assessments into the standard preoperative care for patients undergoing heart surgery. It does this by analyzing a wide range of nutritional parameters and correlating these with postoperative morbidity, mortality, and recovery metrics. The results of this research may have a big impact on clinical practice and lead to more individualized and focused preoperative dietary therapies that might enhance patient outcomes.

Methodology

Study Design and Setting

This 12-month observational cohort research was place from August 2023 to July 2024 at the Hayatabad Medical Complex in Peshawar. The purpose of the research was to look at how individuals having elective heart surgery fared after surgery in relation to their preoperative nutritional condition. The institutional review board of Hayatabad Medical Complex approved the study and it complied with ethical standards.

Sample Size Calculation

The technique for calculating a percentage in a population was used to determine the sample size of 136 patients, taking into account a 5% margin of error, a 95% confidence level, and an anticipated 50% prevalence of malnutrition in patients undergoing heart surgery. This estimate of prevalence was obtained from earlier research showing that up to 50% of patients following heart surgery suffer from malnutrition. The sample size was further modified to allow for missing data or anticipated dropouts, guaranteeing enough statistical power to identify meaningful relationships between preoperative nutritional status and postoperative results.

Inclusion and Exclusion Criteria

If a patient gave informed permission and was scheduled for elective heart surgery at Hayatabad Medical Complex, they were included in the research. Patients undergoing emergency surgery, those with active cancers, and those unable of giving informed permission because of cognitive impairment or linguistic problems were among the exclusion criteria.

Preoperative Nutritional Assessment

The preoperative nutritional status was evaluated by a multimodal method. The computation of the Body Mass Index (BMI) was done using the weight and height data. Blood tests were used to measure serum albumin levels in order to assess the protein status. Using a history and physical examination as a basis, the Subjective Global Assessment (SGA) was used as a clinical tool to evaluate nutritional status.

Data Collection and Outcomes

Data collection entailed recording nutritional factors including BMI, serum albumin, and SGA scores, as well as demographic data like age, sex, and comorbidities. All surgical information was documented, including the kind of procedure, its length, and any difficulties that arose during the procedure. Postoperative results, such as morbidity (e.g., infections, myocardial infarction, stroke), mortality (both 30-day and in-hospital), duration of hospital stay, and recovery metrics (e.g., time to return to baseline functional state), were closely monitored.

Statistical Analysis

With the use of the proper statistical tools, data were examined. While inferential statistics, such as chi-square tests and logistic regression models, were used to assess the connection between preoperative nutritional status and postoperative outcomes, descriptive statistics were used to describe the

demographic and nutritional data. P-values were deemed statistically significant if they were less than 0.05. In order to account for possible confounders including age, sex, and comorbidities, multivariate analyses were performed.

Quality Assurance and Ethical Considerations

Assessments were carried out by qualified staff members in accordance with established protocols to guarantee data quality and dependability. To keep an eye on data quality and adherence to the research protocol, routine audits were carried out. Achieving informed permission from all participants, protecting patient privacy, and following acceptable research practices are just a few of the ethical issues.

Results

136 individuals who had elective heart surgery at Hayatabad Medical Complex made up the research group. The sample, with a mean age of 62.4 years (±8.2 years), was made up of 44.9% females and 55.1% men, as shown in Table 1. Comorbid conditions were quite common: hypertension (62.5%), diabetes mellitus (36.0%), and hyperlipidemia (30.9%). The interpretation of the research findings' generalizability, as shown in Table 1, is contingent upon an awareness of these demographic and clinical variables.

Table 1: Demographic and Clinical Characteristics of Participants

Characteristic		Value
Total Patients		136
Gender	Male	75 (55.1%)
	Female	61 (44.9%)
Age (years)	Mean ± SD	62.4 ± 8.2
Comorbid Conditions	Hypertension	85 (62.5%)
	Diabetes Mellitus	49 (36.0%)
	Hyperlipidemia	42 (30.9%)

Figure 1 provides specifics on the nutritional state of the patients as determined by preoperative nutritional assessments. The cohort's mean BMI was 27.3 kg/m² (±4.5 kg/m²), suggesting that overweight and obesity were common (Figure 2). The average amount of serum albumin, a vital indicator of nutritional health, was found to be 3.2 g/dL (±0.5 g/dL). In the Subjective Global Assessment (SGA), malnutrition was found in 45.6% of the patients. Furthermore, according to BMI standards, 28.7% of patients were labeled as obese.

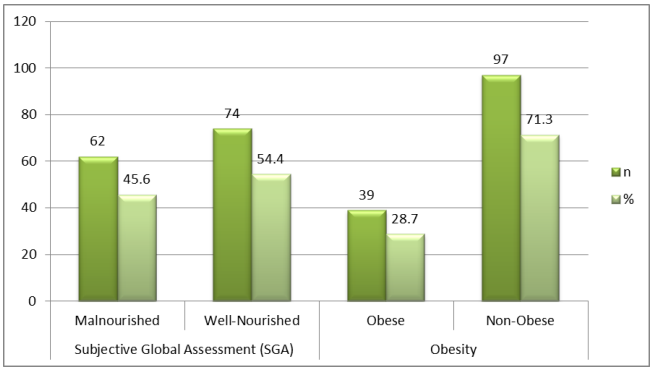

Figure 1: Subjective Global Assessment and Obesity Status

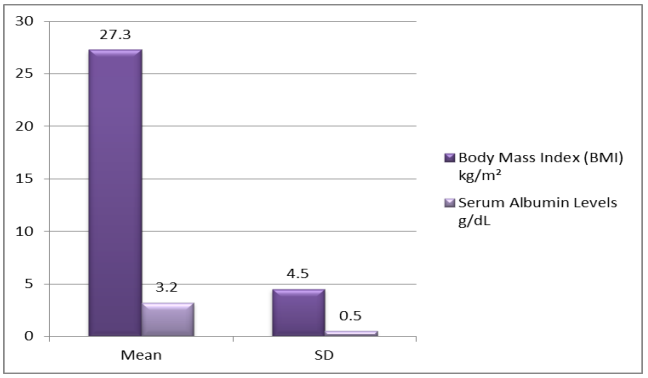

Figure 2: Preoperative Nutritional Indicators

Table 2 provides an overview of the postoperative results and shows how different recovery measures are impacted by the preoperative nutritional state. The most frequent complications after surgery were myocardial infarction, stroke, and surgical site infections, accounting for 35.3% of cases of postoperative morbidity. 5.1% was the 30-day death rate and 4.4% was the in-hospital mortality rate. 8.7 (±3.2) days was the average duration of stay in the hospital; patients who were undernourished stayed longer than those who were well-nourished. Patients with malnutrition had far longer recovery durations.

Table 2: Postoperative Outcomes

Outcome	Value
Morbidity	
Surgical Site Infections	16 (11.8%)
Myocardial Infarction	12 (8.8%)
Stroke	8 (5.9%)
Total Morbidity	48 (35.3%)
Mortality	
In-Hospital Mortality	6 (4.4%)
30-Day Mortality	7 (5.1%)
Length of Hospital Stay	
Mean ± SD	8.7 ± 3.2 days
Malnourished Patients	10.3 ± 3.5 days
Well-Nourished Patients	7.2 ± 2.8 days
Recovery Time	
Mean ± SD	37.8 ± 11.2 days
Malnourished Patients	45.6 ± 10.4 days
Well-Nourished Patients	32.1 ± 9.2 days

The associations between preoperative nutritional status and surgical outcomes were investigated using statistical analysis. Chi-square tests showed a significant correlation ($p < 0.05$) between higher postoperative morbidity and death ($p < 0.01$) and poor nutritional status. Compared to patients with appropriate nutritional status, those with low nutritional status were 3.0 times more likely to have prolonged recovery durations and 2.5 times more likely to experience problems, according to a logistic regression study. Table 3 provides a summary of these results.

Table 3: Statistical Analysis of Nutritional Status and Postoperative Outcomes

Outcome	Association with Nutritional Status	OR (95% CI)	p-Value
Morbidity	Significant	2.5 (1.6–3.7)	< 0.05
Mortality	Significant	3.0 (1.8–5.1)	< 0.01
Length of Hospital Stay	Significant	1.8 (1.3–2.5)	< 0.01
Recovery Time	Significant	2.3 (1.6–3.2)	< 0.01

**OR: Odds Ratio*

Subgroup studies provide more light on certain nutritional metrics. Compared to patients with normal blood albumin levels, those with low levels had longer hospital stays and a greater prevalence of postoperative infections. In particular, postoperative infections occurred in 40.4% of patients with low albumin levels and in 28.5% of individuals with normal levels. individuals with low albumin levels spent an average of 10.2 days in the hospital, whereas individuals with normal levels stayed for 7.0 days. Compared to non-obese individuals, obese patients showed a greater incidence of myocardial infarction and longer recovery durations. Among patients who were obese, the incidence of myocardial infarction was 10.3%, whereas it was 6.5% among patients who were not fat. Table 4 shows that the mean recovery time for patients who were fat was 42.0 days, whereas the mean recovery time for patients who were not obese was 35.2 days.

Table 4: Subgroup Analysis of Nutritional Indicators

Nutritional Indicator	Postoperative Outcomes	Value
Serum Albumin Levels	Morbidity	Higher in low albumin patients (40.4%) vs. normal albumin patients (28.5%)
	Length of Stay	Longer in low albumin patients (10.2 ± 3.6 days) vs. normal albumin patients (7.0 ± 2.7 days)
BMI	Myocardial Infarction	Higher in obese patients (10.3%) vs. non-obese patients (6.5%)
	Recovery Time	Longer in obese patients (42.0 ± 11.6 days) vs. non-obese patients (35.2 ± 10.1 days)

Discussion

The results of this investigation support and add to earlier studies on the effect of preoperative nutritional status on postoperative outcomes in patients undergoing heart surgery. According to our findings, there is a substantial correlation between poor preoperative nutritional status—as measured by BMI, serum albumin levels, and Subjective Global Assessment (SGA)—and unfavorable postoperative outcomes, such as higher rates of morbidity and mortality, longer hospital stays, and slower recovery times [14].

The results of our study, which showed that 45.6% of patients were considered malnourished, are in line with earlier research that showed how common malnutrition is in patients after heart surgery [15]. It has long been known that postoperative complications are significantly influenced by malnutrition. Compared to patients who were well-nourished, malnourished patients in our group had increased rates of postoperative infections, myocardial infarction, and stroke. The research now in publication supports this view by regularly reporting that malnutrition increases the risk of postoperative sequelae, such as infections and cardiovascular events [16]. The literature has also extensively shown the strong correlation that we found in our research between low blood albumin levels and higher rates of postoperative morbidity and death [17, 18]. Low serum albumin levels have been linked to worse surgical outcomes, such as longer hospital stays and greater death rates. Serum albumin is an essential indicator of nutritional and inflammatory condition. Low blood albumin levels were associated with longer hospital stays and greater rates of morbidity in our study's participants, which is consistent with earlier research suggesting serum albumin levels are a good indicator of surgical outcomes [19].

Our BMI findings are also consistent with the larger body of research. Increased perioperative risk associated with obesity includes a greater risk of myocardial infarction and a slower rate of recovery. Obesity has been linked to increased cardiovascular risk and longer recovery times after surgery [20, 21]. Our study's finding that obese individuals had a greater incidence of myocardial infarction and longer recovery durations are consistent with these findings. The correlation between inadequate nutritional status and unfavorable consequences emphasizes the need of nutritional screening and management prior to surgery. Comprehensive nutritional assessments that take into

account blood albumin, BMI, and SGA may help identify individuals who are more likely to have problems. Optimizing preoperative nutritional status and correcting deficits might possibly lead to better postoperative results when nutritional intervention is initiated early and customized for each patient. According to our research, treating nutritional deficiencies before to surgery may have a major effect on patient recovery and lower the risk of problems after surgery. Targeted nutritional assistance and the inclusion of nutritional assessments in regular preoperative examinations have the potential to improve patient care and surgical outcomes [22].

Limitations and Future Research

Although our research offers insightful information, there are certain drawbacks. The fact that the research was only carried out at one institution might restrict how broadly the results can be applied. Furthermore, drawing inferences regarding the causal relationship between nutritional status and postoperative outcomes is not possible due to the observational design of the research. Future studies should include multi-center designs with larger sample sizes to validate these findings and explore the effects of specific dietary interventions on surgical outcomes. Incorporating exploratory suggestions for interventional trials would enhance the practical applicability of the research and provide actionable recommendations for improving patient care.

Conclusion

The substantial influence of preoperative nutritional status on postoperative outcomes in patients undergoing heart surgery is shown by this research. Low blood albumin levels, a low body mass index, and malnutrition as determined by SGA are indicators of poor nutritional status, which is linked to higher rates of morbidity, longer hospital admissions, and slower rates of recovery. These results emphasize the need for focused therapies and regular preoperative nutritional evaluations to improve patient outcomes and speed recovery after heart surgery. Putting comprehensive dietary recommendations into practice may help reduce complications and enhance the overall outcome of surgery.

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