INSIGHTS-JOURNAL OF
HEALTH AND REHABILITATION

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

IMPACT OF PREOPERATIVE NUTRITIONAL STATUS ON WOUND HEALING OUTCOMES FOLLOWING ELECTIVE ABDOMINAL SURGERY

Original Research

Javeriya Afzal[1], Farah Naeem Malik[2], Fateen Khan[3], Rohit Kumar[4], Muhammad Umar Arshad[5], Niamat Ullah[6]*, Ghulam Farooq Kalwar[7]
[1]Senior Clinical Dietitian, Shalamar Hospital, Lahore, Pakistan.
[2]DHQ Attock / Health Services Academy, Islamabad, Pakistan.
[3]Dietitian, University of Lahore, Lahore, Pakistan.
[4]Bilawal Medical College for Boys, Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro, Pakistan.
[5]Shaikh Zayed Hospital, Lahore, Pakistan.
[6]Associate Professor, Department of Surgery, MTI Lady Reading Hospital, Peshawar, Pakistan.
[7]MBBS Student, Sulleman Roshan Medical College, Tando Adam, Pakistan.
Corresponding Author: Niamat Ullah, Associate Professor, Department of Surgery, MTI Lady Reading Hospital, Peshawar, Pakistan, niamatsurgeon@yahoomail.com
Acknowledgement: The authors acknowledge the support of surgical units at Lahore hospitals for data collection.

Conflict of Interest: None

Grant Support & Financial Support: None

ABSTRACT

Background: Wound healing complications remain a common challenge following elective abdominal surgeries, particularly in patients with compromised nutritional status. Malnutrition impairs immune function and tissue regeneration, thereby elevating the risk of postoperative morbidity. Despite this known risk, preoperative nutritional evaluation is not routinely emphasized in clinical practice.

Objective: To assess the impact of preoperative nutritional deficiencies on wound healing complications in patients undergoing elective abdominal surgery.

Methods: A cross-sectional study was conducted over eight months in three tertiary care hospitals in Lahore, Pakistan. A total of 246 adult patients scheduled for elective abdominal surgery were evaluated. Preoperative nutritional status was assessed using the Subjective Global Assessment (SGA), serum albumin levels, and anthropometric indices. Wound healing outcomes were monitored postoperatively using the Southampton Wound Assessment Scale (SWAS). Statistical analysis was performed using SPSS v26, with chi-square and logistic regression applied to determine associations and predictors.

Results: Of the participants, 37.4% were well-nourished, 42.3% moderately malnourished, and 20.3% severely malnourished. Wound complications occurred in 63.6% of moderately and 64% of severely malnourished patients, compared to only 8.7% in well-nourished patients. Hypoalbuminemia (<3.5 g/dL) was significantly associated with higher wound scores (mean SWAS 2.7) and a complication rate of 64.8%. Multivariate analysis confirmed moderate to severe malnutrition and low albumin as independent predictors of wound healing complications ($p < 0.01$).

Conclusion: Preoperative malnutrition and hypoalbuminemia significantly increase the risk of wound complications after elective abdominal surgery. Routine nutritional screening and timely intervention are essential to optimize surgical outcomes and reduce postoperative morbidity.

Keywords: Abdominal Surgery, Hypoalbuminemia, Malnutrition, Nutritional Assessment, Postoperative Complications, Preoperative Care, Wound Healing.

INTRODUCTION

Wound healing following surgery is a complex physiological process influenced by a myriad of factors, with nutritional status emerging as one of the most critical yet often underappreciated determinants. In the context of elective abdominal surgery, where optimal tissue repair is crucial to recovery and the prevention of complications, preoperative nutrition assumes an even greater importance (1,2). Despite advancements in surgical techniques and perioperative care, wound healing complications remain a prevalent issue, leading to prolonged hospital stays, increased healthcare costs, and compromised patient outcomes (3). As such, identifying modifiable risk factors—such as nutritional deficiencies—offers a meaningful opportunity to improve surgical prognosis and reduce postoperative morbidity. Similar perioperative strategies, such as inspiratory muscle training in post-surgical scoliosis patients, have already been shown to enhance recovery and functional outcomes, reinforcing the potential value of preoperative interventions in surgical care (4) Nutritional status prior to surgery is intricately linked to the body's capacity to heal. Proteins, vitamins, and trace elements play indispensable roles in the wound healing cascade, impacting cellular proliferation, collagen synthesis, immune response, and angiogenesis (5). Deficiencies in these nutrients can impede the inflammatory and proliferative phases of wound healing, leading to delayed closure, dehiscence, and susceptibility to infection. Malnutrition, though frequently associated with chronic illness or aging, is not always overt, and subclinical deficiencies may go unnoticed in routine preoperative assessments. Consequently, many patients arrive in the operating room ill-prepared at a cellular level for the rigors of surgical recovery (6).

Multiple studies have demonstrated a correlation between poor nutritional status and impaired wound healing. For instance, serum albumin, a surrogate marker for nutritional adequacy, has been consistently linked with surgical outcomes, where hypoalbuminemia is predictive of increased wound-related complications. Similarly, low preoperative levels of vitamins A, C, and zinc have been shown to impair collagen synthesis and epithelialization—two critical steps in tissue repair (7). While these associations are well-documented in general surgical literature, there remains a paucity of focused, population-specific studies addressing this relationship in patients undergoing elective abdominal procedures (8). This gap in research is particularly significant given that abdominal surgeries often involve extensive tissue handling, increased exposure to infection, and the use of foreign materials such as sutures and meshes, all of which elevate the demand for robust wound healing capacity. The current healthcare climate increasingly prioritizes personalized medicine and risk stratification. Within this framework, a preoperative nutritional evaluation could serve as a cost-effective and non-invasive tool to identify patients at risk of postoperative wound complications (9,10). However, without a clear understanding of the extent to which nutritional deficits contribute to these complications in specific surgical contexts, it remains challenging to develop standardized preoperative protocols. Most existing data either stems from heterogeneous surgical populations or lacks the methodological specificity to draw firm conclusions applicable to elective abdominal surgery patients (11,12). A cross-sectional analysis focused solely on this subgroup offers the potential to generate targeted insights and inform preemptive nutritional interventions (13).

Moreover, elective surgeries present a unique opportunity for intervention. Unlike emergency procedures, they allow a window of time during which nutritional deficiencies can be identified and potentially corrected. This proactive approach has the dual benefit of optimizing the patient's biological readiness for surgery and enhancing postoperative outcomes, thereby contributing to the broader goals of value-based care and patient-centered medicine. Yet, the adoption of such strategies requires empirical evidence that directly ties preoperative nutrition to surgical success, especially in relation to wound healing. The present study aims to fill this evidentiary gap by examining the impact of preoperative nutritional status on wound healing outcomes in patients undergoing elective abdominal surgery. By utilizing a cross-sectional study design, it seeks to assess the prevalence of nutritional deficiencies and their association with postoperative wound complications. The objective is to provide data that can guide clinicians in preoperative risk assessment and nutritional optimization strategies, ultimately improving patient outcomes and surgical efficacy.

METHODS

This cross-sectional study was conducted over a duration of eight months in three tertiary care hospitals across the Lahore region of Pakistan. These institutions were selected based on their high volume of elective abdominal surgeries and the presence of well-established surgical and nutritional assessment departments. The primary aim was to evaluate the influence of preoperative nutritional

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

deficiencies on postoperative wound healing outcomes in patients undergoing elective abdominal surgery. Participants were recruited through consecutive non-probability sampling from the general surgery departments of the respective hospitals. A sample size of 246 patients was calculated using the OpenEpi sample size calculator, assuming a 95% confidence interval, 5% margin of error, and an estimated prevalence of wound healing complications in malnourished surgical patients at 30%, as indicated by previous regional studies (14). Adult patients aged 18 to 70 years scheduled for elective abdominal surgeries were eligible for inclusion. Elective procedures included cholecystectomy, hernia repairs, colorectal resections, and gastrointestinal anastomoses. Exclusion criteria included patients undergoing emergency abdominal surgeries, those with known immunodeficiency disorders, chronic corticosteroid use, active infections, malignancy under treatment, or refusal to provide informed consent (15). Preoperative nutritional status was assessed within one week prior to surgery using a combination of anthropometric, biochemical, and clinical markers. The Subjective Global Assessment (SGA) tool was employed for overall nutritional classification into well-nourished, moderately malnourished, and severely malnourished groups. Anthropometric data included body mass index (BMI), mid-upper arm circumference (MUAC), and triceps skinfold thickness. Biochemical parameters included serum albumin, total lymphocyte count, hemoglobin levels, and serum prealbumin. Serum albumin <3.5 g/dL, total lymphocyte count <1500 cells/mm³, and hemoglobin <10 g/dL were considered indicators of nutritional deficiency.

Surgical details such as type of procedure, duration, blood loss, and use of prophylactic antibiotics were recorded intraoperatively. Postoperative wound healing was monitored for up to 30 days post-surgery using a standardized wound assessment checklist based on the Southampton Wound Assessment Scale (SWAS). Complications were categorized as mild (erythema, minor discharge), moderate (seroma, wound dehiscence without infection), or severe (infected wound dehiscence, abscess formation requiring intervention) (16,17). Follow-up evaluations were conducted by trained surgical residents blinded to the nutritional assessment data to minimize observer bias. All data were entered and managed using SPSS version 26.0. Descriptive statistics were used to summarize demographic, surgical, and nutritional variables. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages. Normality of data distribution was assessed using the Kolmogorov-Smirnov test. For bivariate analysis, the chi-square test was applied to examine associations between nutritional status categories and the presence or severity of wound healing complications. Independent samples t-tests and ANOVA were employed for comparing continuous variables across nutritional status groups. Logistic regression analysis was used to identify independent predictors of wound complications, adjusting for potential confounders such as age, comorbidities, smoking status, and duration of surgery. A p-value of less than 0.05 was considered statistically significant. The study protocol was reviewed and approved by the Ethical Review Board of the relevant institute. All participants provided written informed consent after receiving a detailed explanation of the study's purpose, procedures, and potential risks. Confidentiality was maintained throughout the research process by assigning unique identification codes to all participants and ensuring that all electronic data were password protected. By adhering to rigorous methodological standards and utilizing validated assessment tools, the study was designed to yield reliable insights into the relationship between preoperative nutritional deficiencies and wound healing outcomes. The structured approach ensures reproducibility, enhances clinical relevance, and provides a robust foundation for potential interventional strategies aimed at reducing surgical complications through nutritional optimization.

RESULTS

A total of 246 patients were enrolled in the study, with a mean age of 45.3 years. Among them, 132 (53.7%) were male and 114 (46.3%) female. Based on BMI classification, 58 (23.6%) patients were underweight (BMI < 18.5), 114 (46.3%) had normal BMI, and 74 (30.1%) were overweight or obese. Comorbidities such as diabetes and hypertension were observed in 72 (29.3%) and 86 (35%) patients respectively, while 68 (27.6%) reported active smoking. Preoperative nutritional status was evaluated using the Subjective Global Assessment. Among the participants, 92 (37.4%) were well-nourished, 104 (42.3%) moderately malnourished, and 50 (20.3%) severely malnourished. The distribution of nutritional status is depicted in Chart 1. Wound healing complications were observed in varying frequencies across the nutritional categories. Among well-nourished patients, 84 (91.3%) had no complications, with only minor issues reported in a few cases: 6 (6.5%) had mild complications, 2 (2.2%) had moderate, and none developed severe complications. In contrast, among the moderately malnourished, 69 (66.3%) experienced no complications, 24 (23.1%) developed mild, 9 (8.7%) moderate, and 2 (1.9%) severe complications. Among the severely malnourished, only 18 (36%) had no complications, while 14 (28%) had mild, 10 (20%) moderate, and 8 (16%) severe wound complications. The relationship between nutritional status and wound severity is further visualized in Chart 2. When analyzed by serum albumin levels, patients with albumin ≥3.5 g/dL (n=131) had a mean SWAS score of 1.2 and a complication rate of 18.3%. Conversely, those with albumin <3.5 g/dL (n=115) exhibited a significantly higher mean SWAS score of 2.7 and a complication rate of 64.8%. This trend demonstrated a strong association between hypoalbuminemia and increased wound

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

complications. Statistical analysis using chi-square testing revealed a significant association between nutritional status and the incidence of wound complications ($p < 0.001$). Logistic regression indicated that both moderate and severe malnutrition independently predicted the likelihood of postoperative wound complications after adjusting for age, BMI, diabetes, and smoking status ($p < 0.01$). These findings underscore a clear correlation between preoperative nutritional deficiencies and adverse wound healing outcomes following elective abdominal surgery.

Table 1: Demographic Characteristics

Variable	Value
Total Participants	246
Mean Age (years)	45.3
Gender	
Male	132
Female	114
BMI	
BMI < 18.5 (Underweight)	58
BMI 18.5–24.9 (Normal)	114
BMI ≥ 25 (Overweight/Obese)	74
Smokers	68
Diabetics	72
Hypertensive	86

Table 2: Nutritional Status Distribution

Nutritional Status	Number of Patients	Percentage (%)
Well-nourished	92	37.4%
Moderately malnourished	104	42.3%
Severely malnourished	50	20.3%

Table 3: Wound Healing Complications by Nutritional Status

Nutritional Status	No Complication	Mild Complication	Moderate Complication	Severe Complication
Well-nourished	84	6	2	0
Moderately malnourished	69	24	9	2
Severely malnourished	18	14	10	8

Table 4: Serum Albumin and Wound Complications

Serum Albumin Level	Mean SWAS Score	Complication Rate (%)
≥3.5 g/dL	1.2	18.3%
<3.5 g/dL	2.7	64.8%

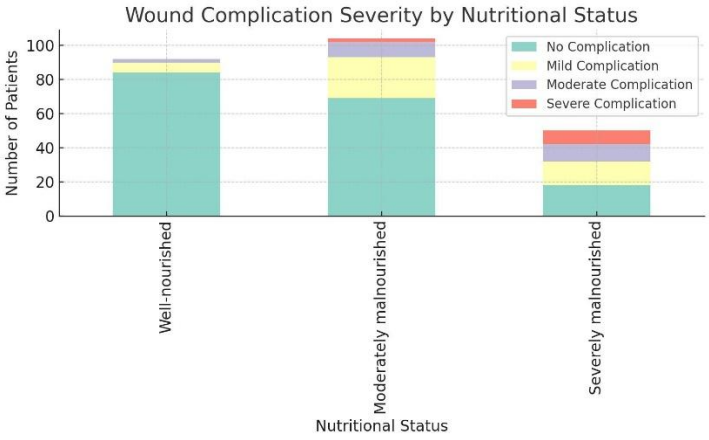

Figure 1 Wound Complication Severity by Nutritional Status

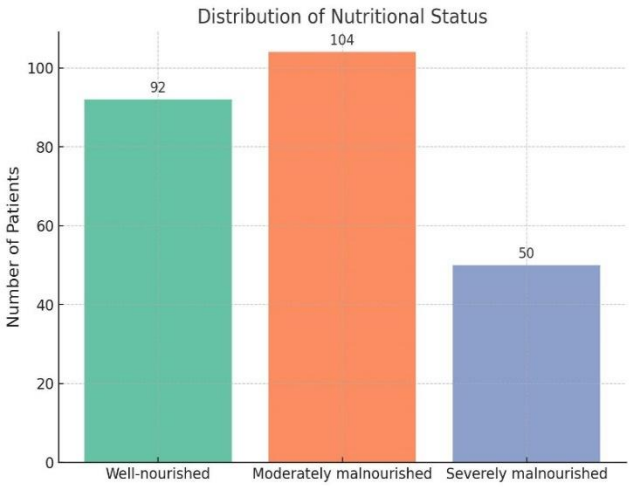

Figure 2 Distribution of Nutritional Status

DISCUSSION

The results of this study reinforce the critical role of preoperative nutritional status in determining postoperative wound healing outcomes in patients undergoing elective abdominal surgery. Nutritional deficiencies, particularly those reflected by low serum albumin levels, were found to be significantly associated with delayed wound healing and increased complication rates. These findings align with the growing body of literature emphasizing nutrition as a modifiable risk factor in surgical care. Multiple recent studies have highlighted the relationship between poor nutritional status and adverse postoperative outcomes. For instance, a study conducted a large prospective cohort study involving 360 patients and demonstrated that malnutrition assessed by tools such as the Subjective Global Assessment (SGA) and Nutritional Risk Screening (NRS-2002) correlated strongly with higher postoperative complication rates, including wound infections (17). Similarly, another study found that perioperative nutritional supplementation in malnourished lumbar spine surgery patients significantly reduced wound complications and hospital readmissions (18). In this study, hypoalbuminemia (<3.5 g/dL) was a prominent predictor of complications, consistent with findings from a study, which observed increased wound dehiscence and surgical site infections in patients with low albumin undergoing midline abdominal surgery (19). This biochemical marker remains a reliable, accessible tool for preoperative risk stratification, especially in resource-limited settings.

Interestingly, patients categorized as moderately to severely malnourished had significantly higher rates of wound complications compared to their well-nourished counterparts. This trend resonates with findings from a study where patients identified as at-risk or malnourished using the Mini Nutritional Assessment Short-Form had notably poorer outcomes and longer hospital stays following elective abdominal procedures (20). Moreover, another study corroborated these results in a study involving laparotomy patients, concluding that poor preoperative nutrition significantly predisposed patients to wound gaping and anastomotic leaks (21). An additional dimension explored in this study was the link between serum albumin and SWAS scores. Patients with normal albumin levels experienced lower SWAS scores and fewer complications, consistent with findings from a study which showed that both moderate and severe hypoalbuminemia were significant predictors of postoperative complications in pediatric abdominal surgery (22). One notable strength of this study lies in its focused and well-defined patient cohort. Unlike many multicentric trials with heterogenous surgical populations, this study exclusively examined elective abdominal surgery patients, thereby reducing variability due to surgical type. Moreover, a comprehensive assessment using both clinical and biochemical indicators of nutrition enhance the reliability of the findings. The prospective nature of data collection and use of standardized assessment tools like SWAS further strengthen the study's validity.

However, certain limitations must be acknowledged. The cross-sectional design precludes causal inference. Although the associations observed are statistically significant, longitudinal data would provide more definitive evidence of causality. The study was also limited to public tertiary hospitals in Lahore, which may affect the generalizability of findings to private or rural healthcare settings. Additionally, the influence of micronutrient deficiencies, which were not routinely assessed, remains an area for further exploration.

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

Future research should aim to evaluate the effectiveness of preoperative nutritional interventions through randomized controlled trials, particularly in under-resourced settings where malnutrition is more prevalent (23). Studies focusing on micronutrient supplementation, timing of nutritional optimization, and cost-effectiveness analyses would be valuable in shaping clinical guidelines. It is also essential to standardize nutritional screening protocols and integrate them into routine surgical workups to ensure early identification and intervention. In summary, this study affirms that preoperative nutritional deficiencies, especially hypoalbuminemia and clinically detectable malnutrition, significantly elevate the risk of postoperative wound complications in elective abdominal surgery. These findings support existing evidence advocating for routine nutritional screening and optimization in surgical candidates to improve outcomes and reduce healthcare burden.

CONCLUSION

This study concludes that preoperative nutritional deficiencies, particularly hypoalbuminemia and clinical malnutrition, are significantly associated with increased wound healing complications in elective abdominal surgery. These findings highlight the practical importance of routine nutritional screening and early intervention as integral components of preoperative care to improve surgical outcomes and reduce postoperative morbidity.

AUTHOR CONTRIBUTION

Author	Contribution
Javeriya Afzal	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Farah Naeem Malik	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Fateen Khan	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Rohit Kumar	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Muhammad Umar Arshad	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Niamat Ullah*	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Ghulam Farooq Kalwar	Contributed to study concept and Data collection Has given Final Approval of the version to be published

REFERENCES

1. Sadakane-Sakuramoto A, Hasegawa Y, Sugahara K, Horii N, Saito S, Nakao Y, et al. Change in Nutritional Status and Dysphagia after Resection of Head and Neck Cancer. Nutrients. 2021;13(7).
2. Uchibori A, Okada S, Shimomura M, Furuya T, Nakazono C, Nishimura T, et al. Clinical impact of preoperative sarcopenia and immunonutritional impairment on postoperative outcomes in non-small cell lung cancer surgery. Lung Cancer. 2024;198:108004.
3. Donahue BS. Commentary: Preoperative nutritional status and mortality from cardiac surgery: Do we have your attention yet? J Thorac Cardiovasc Surg. 2022;164(4):1150-1.
4. Shabbir, Hamza & Shafi, Muhammad & Mushtaq, Muhammad. (2025). Effects of Inspiratory Muscle Training on Respiratory Strength and Functional Capacity in Post-operative Patients with Scoliosis during Maximum Protection Phase. The Healer Journal of Physiotherapy and Rehabilitation Sciences. 5. 72-80. 10.55735/hjprs.v5i2.366.

5. Kinugasa Y, Ida M, Nakatani S, Uyama K, Kawaguchi M. Effects of preoperative nutritional status on postoperative quality of recovery: a prospective observational study. Br J Nutr. 2023;130(11):1898-903.
6. Liu X, Li M, Zhao Y, Jiao X, Yu Y, Li R, et al. The impact of preoperative immunonutritional status on postoperative complications in ovarian cancer. J Ovarian Res. 2025;18(1):88.
7. Ornaghi PI, Afferi L, Antonelli A, Cerruto MA, Odorizzi K, Gozzo A, et al. The impact of preoperative nutritional status on post-surgical complication and mortality rates in patients undergoing radical cystectomy for bladder cancer: a systematic review of the literature. World J Urol. 2021;39(4):1045-81.
8. Fiorindi C, Giudici F, Testa GD, Foti L, Romanazzo S, Tognozzi C, et al. Multimodal Prehabilitation for Patients with Crohn's Disease Scheduled for Major Surgery: A Narrative Review. Nutrients. 2024;16(11).
9. Wall J, Paul M, Phillips BE. Nutritional interventions in prehabilitation for cancer surgery. Curr Opin Clin Nutr Metab Care. 2023;26(6):497-507.
10. Parrott JM, Craggs-Dino L, Faria SL, O'Kane M. The Optimal Nutritional Programme for Bariatric and Metabolic Surgery. Curr Obes Rep. 2020;9(3):326-38.
11. Gillis C, Ljungqvist O, Carli F. Prehabilitation, enhanced recovery after surgery, or both? A narrative review. Br J Anaesth. 2022;128(3):434-48.
12. Kamocki Z, Matowicka-Karna J, Jurczuk A, Milewska A, Niewinski A, Zareba K, et al. Preoperative Glutamine Supplementation in Gastric Cancer-Thrombocyte Phagocytic Activity and Early Postoperative Outcomes. Nutrients. 2023;15(13).
13. Sowerbutts AM, Burden S, Sremanakova J, French C, Knight SR, Harrison EM. Preoperative nutrition therapy in people undergoing gastrointestinal surgery. Cochrane Database Syst Rev. 2024;4(4):Cd008879.
14. Shu W, Tao W, Chunyan H, Jie F, Yuan L, Yan X, et al. Preoperative nutritional evaluation of prostate cancer patients undergoing laparoscopic radical prostatectomy. PLoS One. 2022;17(2):e0262630.
15. Yıldız Kopuz TN, Yildiz HF, Er S, Fisunoglu M. Preoperative nutritional factors as predictors of postoperative early outcomes in colorectal cancer - A prospective cohort study. Nutr Hosp. 2024;41(5):1032-43.
16. Slováček R, Adamová Z. Preoperative nutritional management - compliance with current guidelines. Rozhl Chir. 2023;102(7):298-303.
17. Hill A, Arora RC, Engelman DT, Stoppe C. Preoperative Treatment of Malnutrition and Sarcopenia in Cardiac Surgery: New Frontiers. Crit Care Clin. 2020;36(4):593-616.
18. Raval P, Coolican M. Preoperative, intraoperative, and postoperative concepts to prevent infection for unicompartmental knee arthroplasty. J isakos. 2024;9(6):100345.
19. Bao P, Qiu P, Li T, Lv X, Wu J, Wu S, et al. Prognostic value of preoperative nutritional status for postoperative moderate to severe acute kidney injury among older patients undergoing coronary artery bypass graft surgery: a retrospective study based on the MIMIC-IV database. Ren Fail. 2024;46(2):2429683.
20. Li S, Zhang H, He J, Li S. Relationship Between Preoperative Nutritional Indicators and Postoperative Complications in Patients with Oesophageal Cancer: A Meta-Analysis. Nutr Cancer. 2024;76(7):563-72.
21. Saxena R, Agrawal T, Saxen R, Pathak M, Nayak S, Jadhav AS, et al. Relationship between preoperative nutritional status assessed using anthropometric measures and postoperative complications in pediatric surgical patients. Pediatr Surg Int. 2024;40(1):156.
22. Liu Z, Qiu T, Pei L, Zhang Y, Xu L, Cui Y, et al. Two-Week Multimodal Prehabilitation Program Improves Perioperative Functional Capability in Patients Undergoing Thoracoscopic Lobectomy for Lung Cancer: A Randomized Controlled Trial. Anesth Analg. 2020;131(3):840-9.
23. Fusaro M, Cosmai L, Evenepoel P, Nickolas TL, Cheung AM, Aghi A, et al. Vitamin K and Kidney Transplantation. Nutrients. 2020;12(9).

