

# IMPACT OF NUTRITIONAL STATUS ON POSTOPERATIVE OUTCOMES IN PEDIATRIC SURGICAL PATIENTS

Muhammad Jehangir Khan<sup>1\*</sup>

<sup>1</sup>Assistant Professor, Department of Paediatric Surgery, Khalifa Gulnawaz Teaching Hospital, Bannu Medical College, Bannu, Pakistan

## \*Corresponding Author:

**Dr. Muhammad Jehangir Khan**, Assistant Professor, Department of Paediatric Surgery, Khalifa Gulnawaz Teaching Hospital, Bannu Medical College, Bannu, Pakistan. Email: [drjehangir313@yahoo.com](mailto:drjehangir313@yahoo.com). Cell: +923339110651.

---

## ABSTRACT

### Background

Nutrition has a significant function in the prognosis of children who have surgeries. Malnourished children are at a higher risk of developing complications during the postoperative period, especially based on factors such as compromised wound healing rate and capacity or the immune system, and the rate of recovery from the physiological stress of surgery.

### Objective

This study was aimed to determine the effect of nutritional status on post operative factor of children undergoing surgery.

### Methods

This prospective observational study was conducted over 6 months from Aug, 2009 to Jan, 2010 in the Department of Paediatric Surgery, Khalifa Gulnawaz Teaching Hospital, Bannu Medical College, Bannu, Pakistan. A total of 130 pediatric patients, aged 1–14 years, were enrolled and divided into two groups based on nutritional status: The participants were divided into the malnourished group (n = 65) and the well-nourished group (n = 65). Information was obtained on anthropometric measurements, demographic characteristics, operative procedures, and findings, and the post-operative variables, including morbidity and mortality, length of hospital stay and recovery period. Data was analyzed using statistical packages SPSS version 26.0;  $p < 0.05$  was used as cut off point for significant differences.

### Results

Overall, the children with poor nutritional status produced significantly worse postoperative outcomes, for instance, having a higher risk of infection at the site of surgery (27.7% compared to 7.7%,  $p = 0.002$ ), delay wound healing (15.4% compared to 4.6%,  $p = 0.03$ ), and developing sepsis (7.7% of the children in the poor nutrition group. They also experienced longer hospital stays ( $7.4 \pm 2.1$  days vs.  $5.2 \pm 1.6$  days,  $p < 0.001$ ) and delayed time to resume oral intake ( $2.5 \pm 0.6$  days vs.  $1.8 \pm 0.4$  days,  $p < 0.001$ ). Specifically, intraoperative difficulties, including increased blood loss and longer operative time, were found more often in malnourished children.

### Conclusion

This study revealed that nutritional status affects postoperative morbidity in pediatric surgical patients. 'It has been observed that poor nutrition is a risk factor for development of complications and longer time to recovery that need for regular nutritional screen and preoperative optimization'. Perioperative nutritional interventions can be effective in enhancing the outcome of surgical operations and decreasing health costs.

**Keywords:** Nutritional status, postoperative outcomes, pediatric surgery, malnutrition, surgical complications, hospital stay, recovery time.

## INTRODUCTION

Nutrition has a significant function in the prognosis of children who have surgeries. Malnourished children are at a higher risk of developing complications during the postoperative period, especially based on factors such as compromised wound healing rate and capacity or the immune system, and the rate of recovery from the physiological stress of surgery (1). Under nutrition remains a major challenge especially in the developing world affecting many children and is a common problem within the health facilities of Peshawar.

Simply on the basis of the systemic stress caused by surgery and need for tissue repair, adequate nutrient stores are critical for immune function and healing (2-4). Undernourished children generally have lower protein and energy reserves, and decreased amounts of essential vitamins and minerals, the consequences of which are infections, slow rates of wound healing and other associated problems. Although the impact of malnutrition on surgical outcomes has been investigated in numerous studies, few have considered children and even fewer have addressed context-specific issues (5, 6).

The objective of this research was to analyse the role of malnutrition in determining postoperative outcomes in children with surgical admissions. This study was aimed at establishing empirical proof to support the impact of preoperative nutritional optimization focusing on factors like surgical complications, the duration of hospital admission, and recovery percentages. The implications of the findings are expected to assist clinicians in identifying priorities for those patients in terms of timely nutrition assessments and interventions in paediatric patients undergoing surgical procedures and therefore enhancing their clinical results and reducing overall costs of health care.

## METHODOLOGY

This prospective observational study was conducted over 6 months from Aug, 2009 to Jan, 2010 in the Department of Paediatric Surgery, Khalifa Gulnawaz Teaching Hospital, Bannu Medical College, Bannu, Pakista, a tertiary care hospital serving pediatric surgical patients. The study focused on children aged 1 year to 14 years who received elective or emergency surgeries over this period. A total of 130 patients were enrolled, divided into two groups based on their

nutritional status: The first group involves 65 undernourished children and the second group involves 65 well-nourished children.

Informed consent was taken from before data collection. There was strict adherence to ethical aspects of studying from the perspective of confidentiality during the entire study.

The inclusion criteria for patients comprised children who had undergone preoperative nutritional evaluations and those for whom the caregiver agreed to participate in the study; the exclusion criteria included patients who had incomplete records, illness, or those who had undergone surgeries in other departments of the hospital.

Data collection included the completion of a structured proforma that was completed for each participant. Data was obtained from trained researchers through preoperative interviews and or during the patient hospitalization period. Information on the age of the child, their gender and socioeconomic status was obtained from the hospitals and from the caregivers. Weight and height, BMI percentiles, weight-for-height and height-for-age z-score and mid-upper arm circumference were also measured and documented according the standard protocols. From laboratory reports the biochemical parameters, serum albumin and haemoglobin levels and indicate of micronutrients deficiencies were recorded.

Surgical details, including the type of surgery (elective or emergency), duration, and intraoperative blood loss, were extracted from operative notes and anaesthetic records. Postoperative outcomes were monitored daily by the research team until discharge, capturing data on complications such as surgical site infections, wound healing delays, sepsis, mortality, time to resume oral intake, and total hospital stay.

All collected data were cross-checked for accuracy and completeness before being entered into a secure database. Data processing and statistical analysis were performed using SPSS, with

continuous variables analyzed using independent t-tests and categorical variables compared using chi-square tests. A p-value of <0.05 was considered statistically significant.

## Result

The demographic and preoperative characteristics reveal key differences between the malnourished

## Impact Of Nutritional Status On Postoperative Outcomes In Pediatric Surgical Patients

and well-nourished groups. While the mean age and gender distribution was comparable ( $p > 0.05$ ), a significant disparity was observed in socioeconomic status. The majority of malnourished children belonged to low-income families (61.5%), 'compared to only 23.1% in the well-nourished group ( $p < 0.001$ )'. 'This suggests that economic constraints may contribute to poor nutritional status'. Additionally, malnourished children had a longer preoperative hospital stay (mean: 3.4 days vs. 2.8 days;  $p = 0.03$ ), possibly indicating a higher prevalence of preoperative complications or delayed optimization for surgery.

**Table 1. Demographic and Preoperative Characteristics of Study Participants**

Variable	'Malnourished (n = 65)'	'Well-nourished (n = 65)'	Total (n = 130)	p-value
Age (mean $\pm$ SD, years)	5.2 $\pm$ 1.4	5.6 $\pm$ 1.6	5.4 $\pm$ 1.5	0.18
Gender (Male, %)	36 (55.4%)	38 (58.5%)	74 (56.9%)	0.72
Socioeconomic Status				
- Low (%)	40 (61.5%)	15 (23.1%)	55 (42.3%)	<0.001
- Middle (%)	20 (30.8%)	40 (61.5%)	60 (46.2%)	
- High (%)	5 (7.7%)	10 (15.4%)	15 (11.5%)	
Preoperative Hospital Stay (days, mean $\pm$ SD)	3.4 $\pm$ 1.0	2.8 $\pm$ 1.1	3.1 $\pm$ 1.1	0.03

The preoperative nutritional assessment highlighted stark differences between the two groups. Malnourished children had significantly lower BMI percentiles (mean: 12.3 vs. 16.1;  $p < 0.001$ ) and more severe deviations in weight-for-height and height-for-age Z-scores ( $p < 0.001$  for both). Malnourished children also exhibited biochemical evidence of poor nutrition, with significantly lower serum albumin (2.9 g/dL vs. 3.8 g/dL;  $p < 0.001$ ) and haemoglobin levels (9.2 g/dL vs. 12.5 g/dL;  $p < 0.001$ ). These findings confirm the multidimensional impact of

malnutrition, affecting both anthropometric and biochemical markers.

**Table 2. Comparison of Preoperative Nutritional Indicators by Nutritional Status**

Variable	'Malnourished (n = 65)'	'Well-nourished (n = 65)'	p-value
BMI (mean $\pm$ SD, percentile)	12.3 $\pm$ 2.5	16.1 $\pm$ 3.0	<0.001
Weight-for-Height Z-score	-2.1 $\pm$ 0.8	-0.5 $\pm$ 0.6	<0.001
Height-for-Age Z-score	-1.8 $\pm$ 0.9	-0.2 $\pm$ 0.5	<0.001
Serum Albumin (g/dL)	2.9 $\pm$ 0.5	3.8 $\pm$ 0.4	<0.001
Hemoglobin (g/dL)	9.2 $\pm$ 1.1	12.5 $\pm$ 1.2	<0.001

The surgical characteristics reveal some notable trends. Although the type of surgery (elective vs. emergency) did not differ significantly between the groups ( $p = 0.07$ ), malnourished children experienced longer surgeries (mean duration: 2.7 hours vs. 2.3 hours;  $p = 0.02$ ) and greater intraoperative blood loss (180 mL vs. 140 mL;  $p < 0.001$ ). These findings suggest that malnutrition may increase the complexity of surgical procedures, potentially due to compromised tissue integrity or delayed wound healing.

**Table 3. Surgical Details and Intraoperative Characteristics**

Variable	Malnourished (n = 65)	Well-nourished (n = 65)	p-value
Type of Surgery (%)			
- Elective	35 (53.8%)	45 (69.2%)	0.07
- Emergency	30 (46.2%)	20 (30.8%)	
Duration of Surgery (hours)	2.7 $\pm$ 0.8	2.3 $\pm$ 0.7	0.02
Intraoperative Blood Loss (mL)	180 $\pm$ 50	140 $\pm$ 40	<0.001

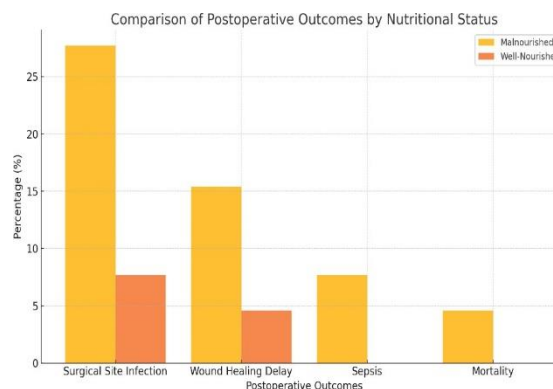
Postoperative outcomes were significantly worse in the malnourished group. Malnourished children had longer hospital stays (mean: 7.4 days vs. 5.2 days;  $p < 0.001$ ) and a higher prevalence of complications. Surgical site infections were observed in 27.7% of malnourished children compared to 7.7% in the well-nourished group ( $p = 0.002$ ). Similarly, wound healing delays (15.4%

## Impact Of Nutritional Status On Postoperative Outcomes In Pediatric Surgical Patients

vs. 4.6%;  $p = 0.03$ ) and sepsis (7.7% vs. 0%;  $p = 0.02$ ) were more common in the malnourished group'. Although mortality was slightly higher among malnourished children (4.6% vs. 0%), this difference was not statistically significant ( $p = 0.08$ ). The time to resume oral intake was also significantly delayed in malnourished children (2.5 days vs. 1.8 days;  $p < 0.001$ ), indicating slower recovery.

**Table 4. Postoperative Outcomes by Nutritional Status**

Variable	'Malnourished (n = 65)'	'Well-nourished (n = 65)'	p-value
Length of Hospital Stay (days)	$7.4 \pm 2.1$	$5.2 \pm 1.6$	$<0.001$
Postoperative Complications (%)			
- Surgical Site Infection	18 (27.7%)	5 (7.7%)	0.002
- Wound Healing Delay	10 (15.4%)	3 (4.6%)	0.03
- Sepsis	5 (7.7%)	0 (0%)	0.02
Mortality (%)	3 (4.6%)	0 (0%)	0.08
Time to Resume Oral Intake (days)	$2.5 \pm 0.6$	$1.8 \pm 0.4$	$<0.001$



**Figure 1:** The graph illustrates higher postoperative complication rates among malnourished pediatric patients compared to well-nourished ones. Surgical site infections were more common in malnourished children (27.7% vs. 7.7%), along with wound healing delays (15.4% vs. 4.6%) and sepsis (7.7% vs. 0%). Mortality, although minimal, occurred only in the malnourished group (4.6%). These trends highlight the significant impact of malnutrition on recovery, emphasizing the need for preoperative nutritional optimization to reduce complications and improve outcomes.

### DISCUSSION

Based on the results of the current study, nutritional status affects postoperative results within patients who had surgical operations in children. The rate of complications among children was higher, as well as the hospital stay and recovery time among malnourished children compared to their well-nourished peers. These results are in concordance with research evidence on the preoperative nutritional evaluation's importance in surgical outcomes and healing processes (7-9).

Research has established that when patients are malnourished, their wound healing, immune functionality and tissue regeneration is compromised hence the higher incidences of surgical site infection and slower wound healing among the malnourished group, 27.7% and 7.7% respectively for surgical site infections and 15.4 and 4.6 for delayed wound healing respectively. Several works described low preoperative albumin levels as a predictor of wound infections and impaired healing in children (10, 11). Also, the finding of sepsis in this study was found only in malnourished children, and other studies have shown that malnourished children are prone to systemic infection due to immune dysfunction (12-14).

## Impact Of Nutritional Status On Postoperative Outcomes In Pediatric Surgical Patients

The longer hospital stays and delayed time to resume oral intake observed in malnourished children in this study are also supported by previous research. Studies noted that malnourished pediatric patients had extended recovery periods due to slower metabolic adaptation and higher rates of complications (6, 15). Similarly, our finding of prolonged hospital stays (7.4 days vs. 5.2 days) was in line with reports studies found that nutritional deficits significantly contribute to increased healthcare utilization and costs (1, 16, 17).

The observed differences in intraoperative characteristics, such as increased blood loss and longer surgery duration in malnourished patients, may reflect the challenges faced by surgeons in managing compromised tissues. Studies have similarly linked poor nutritional status with greater intraoperative difficulties, further underscoring the need for careful preoperative assessment and planning (18).

Although this study did not find a statistically significant difference in mortality between the two groups, the trend toward higher mortality in malnourished children is noteworthy and consistent with previous findings reported increased perioperative mortality in children with severe nutritional deficiencies (19).

These findings emphasize the need for targeted nutritional interventions, including early screening and correction of deficiencies, in pediatric surgical patients. Nutritional supplementation and optimization before surgery have been shown to reduce complications and improve outcomes in studies (20). Integrating such interventions into routine preoperative care, particularly in resource- limited settings like Bannu, could significantly improve recovery trajectories and reduce healthcare burdens.

### CONCLUSION

Therefore, this study elicits a significant influence of nutritional status on postoperative outcomes in a paediatric population. Malnutrition lead to increased risks of surgical complications such as infections, poor wound healing and sepsis, longer length of hospital stay and delayed recovery than well nourished children. These observations support the importance of nutritional screening and nutrition therapy in the preoperative and postoperative periods. Preoperative nutritional intervention can change surgical risks and benefit, recovery duration, and surgical results. Since

malnutrition is common in resource limited settings, there is need to incorporate routine nutritional assessment and appropriate interventions in the perioperative planning. This implies that nutrition is not only important in being able to obtain better clinical results but simply to decrease the costs of health care to families and increase the quality of life for children with chronic conditions.

### REFERENCES

1. Braga M, Gianotti L, Nespoli L, Radaelli G, Di Carlo V. Nutritional approach in malnourished surgical patients: a prospective randomized study. *Archives of surgery*. 2002;137(2):174-80.
2. Bozzetti F, Braga M, Gianotti L, Gavazzi C, Mariani L. Postoperative enteral versus parenteral nutrition in malnourished patients with gastrointestinal cancer: a randomised multicentre trial. *The Lancet*. 2001;358(9292):1487-92.
3. Colecraft EK, Marquis GS, Bartolucci AA, Pulley L, Owusu WB, Maetz HM. A longitudinal assessment of the diet and growth of malnourished children participating in nutrition rehabilitation centres in Accra, Ghana. *Public health nutrition*. 2004;7(4):487-94.
4. Shetty P. Malnutrition and undernutrition. *Medicine*. 2003;31(4):18-22.
5. Stein K, Vasquez-Garibay E, Kratzsch J, Romero-Velarde E, Jahreis G. Influence of nutritional recovery on the leptin axis in severely malnourished children. *The Journal of Clinical Endocrinology & Metabolism*. 2006;91(3):1021-6.
6. Falcão MC, Tannuri U. Nutrition for the pediatric surgical patient: approach in the peri- operative period. *Revista do Hospital das Clínicas*. 2002;57:299-308.
7. Leite HP, Fisberg M, de Carvalho WB, de Camargo Carvalho AC. Serum albumin and clinical outcome in pediatric cardiac surgery. *Nutrition*. 2005;21(5):553-8.

## Impact Of Nutritional Status On Postoperative Outcomes In Pediatric Surgical Patients

8. Beattie A, Prach A, Baxter J, Pennington C. A randomised controlled trial evaluating the use of enteral nutritional supplements postoperatively in malnourished surgical patients. *Gut*. 2000;46(6):813-8.
9. Jagoe RT, Goodship TH, Gibson GJ. The influence of nutritional status on complications after operations for lung cancer. *The Annals of thoracic surgery*. 2001;71(3):936-43.
10. Felblinger DM. Malnutrition, infection, and sepsis in acute and chronic illness. *Critical Care Nursing Clinics*. 2003;15(1):71-8.
11. Huckleberry Y. Nutritional support and the surgical patient. *American journal of health-system pharmacy*. 2004;61(7):671-82.
12. Duran B. The effects of long-term total parenteral nutrition on gut mucosal immunity in children with short bowel syndrome: a systematic review. *BMC nursing*. 2005;4:1-22.
13. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. *Clinical nutrition*. 2008;27(1):5-15.
14. Secker DJ, Jeejeebhoy KN. Subjective global nutritional assessment for children. *The American journal of clinical nutrition*. 2007;85(4):1083-9.
15. Carney DE, Meguid MM. Current concepts in nutritional assessment. *Archives of surgery*. 2002;137(1):42-5.
16. Samson-Fang L, Fung E, Stallings VA, Conaway M, Worley G, Rosenbaum P, et al. Relationship of nutritional status to health and societal participation in children with cerebral palsy. *The Journal of pediatrics*. 2002;141(5):637-43.
17. Marchand V, Motil KJ. Nutrition support for neurologically impaired children: a clinical report of the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition. *Journal of pediatric gastroenterology and nutrition*. 2006;43(1):123-35.
18. Geldner G, Christ M, Wulf H. Preoperative assessment. *The Lancet*. 2004;363(9406):400-1.
19. Halaszynski TM, Juda R, Silverman DG. Optimizing postoperative outcomes with efficient preoperative assessment and management. *Critical care medicine*. 2004;32(4):S76-S86.
20. Ringwald-Smith K, Cartwright C, Mosby T, Molseed L, McCallum P. Medical nutrition therapy in pediatric oncology. *The clinical guide to oncology nutrition*. 2006;2:114-6.