Global Journal of Medical Science ISSN (Online): 2709-8699 ISSN (Print): 2789-6951

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Original Article

Impact of Preoperative Malnutrition on Postoperative Recovery among Children Undergoing Abdominal Surgery

Eva N T[1], Lablu M A S[2], Akter S[3]

[1]Medical Officer, Shin-Shin Japan Hospital, Uttara, Dhaka, Bangladesh

[2]FCPS Part -2 Trainee, Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh

[3]Resident (Phase A) Pediatric Surgery, Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh

DOI:https://doi.org/10.61561/ssbgjms.v7i03.161

Article Information

Received Date: Jul 8, 2026

Revised Date: Jul 25, 2026

Accepted Date: Sep 13, 2026

Published Date: Sep 27, 2026

Corresponding author

Dr. Nishat Tasnim Eva,

Medical Officer, Shin-Shin Japan Hospital,

Dhaka, Bangladesh

Email: tasnimeva678@gmail.com

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Abstract

Background: *Preoperative malnutrition is an important concern among children undergoing abdominal surgery, as it may impair wound healing, increase postoperative complications, delay recovery, and prolong hospital stay. This study aimed to assess the impact of preoperative malnutrition on postoperative recovery among children undergoing abdominal surgery.*

Methods: *This prospective observational cohort study was conducted among pediatric patients undergoing surgery in the Department of Pediatric Surgery at Sir Salimullah Medical College Mitford Hospital, Shin-Shin Japan Hospital, Department of General Surgery at Shaheed Suhrawardy Medical College and Hospital, Bangladesh, from January 2025 to December 2025. The study population comprised 104 children aged 0–12 years undergoing emergency or elective surgical procedures. Data were analyzed using Statistical Package for the Social Sciences (SPSS), version 26.*

Results: *Among 104 pediatric surgical patients, 45.2% had preoperative malnutrition, including 26.9% with moderate and 18.3% with severe malnutrition. Malnutrition was significantly associated with longer operative duration ($p = 0.010$). Compared with children with normal nutritional status, malnourished children had significantly higher rates of postoperative complications (38.3% vs. 19.3%), delayed feeding (51.1% vs. 22.8%), delayed wound healing (25.5% vs. 10.5%), and hospital stay exceeding seven days (53.2% vs. 28.1%). Their mean hospital stay was also significantly longer (7.2 ± 3.1 vs. 5.8 ± 2.6 days; $p = 0.016$), whereas the difference in surgical-site infection was not statistically significant.*

Conclusion: *Preoperative malnutrition was prevalent among children undergoing surgery and was significantly associated with increased postoperative complications, delayed initiation of feeding, impaired wound healing, and prolonged hospitalization. Children with malnutrition also experienced a longer average hospital stay than those with normal nutritional status. However, the difference in surgical-site infection rates between the two groups was not statistically significant.*

Keywords: *Malnutrition, Abdominal Surgery, Postoperative Recovery*

Introduction

Malnutrition is an important and potentially modifiable risk factor that may adversely influence postoperative recovery in children undergoing abdominal surgery. Adequate nutrition is essential for normal growth, immune competence, maintenance of muscle mass, wound healing, and restoration of physiological function after surgical stress. The magnitude of childhood malnutrition makes this issue particularly relevant in developing countries. The 2025

UNICEF–WHO–World Bank joint estimates reported that, in 2024, approximately 150.2 million children under five years were stunted and 42.8 million experienced wasting worldwide[1]. In Bangladesh, the Bangladesh Demographic and Health Survey 2022 reported that 24% of children under five were stunted, 11% were wasted, and 22% were underweight[2]. An analysis using Bangladesh's Multiple Indicator Cluster Survey (MICS) 2019 similarly reported prevalences of 28% for stunting, 9.8% for wasting, and 22.6% for underweight[3]. The adverse effects of malnutrition on surgical recovery are biologically plausible. Protein-energy deficiency may impair collagen synthesis, tissue regeneration, and immune responses, thereby increasing the risk of wound infection, wound dehiscence, and delayed healing. Reduced physiological reserves may also limit a child's capacity to tolerate surgical stress and recover from infection. Nutritional assessment should therefore incorporate age-appropriate anthropometric indicators, including weight-for-age, height-for-age, weight-for-height or length, body mass index (BMI)-for-age z-scores, and mid-upper arm circumference (MUAC), where appropriate[4]. Nevertheless, Wessner and Burjonrappa's review of 35 publications, of which only six met the inclusion criteria, identified insufficient high-quality evidence linking preoperative nutritional assessment with pediatric surgical outcomes[5]. Clinical studies have subsequently provided quantitative evidence of the potential relationship between nutritional status and postoperative outcomes. Alshehri and colleagues analyzed 23,714 children undergoing abdominal or thoracic surgery using the Pediatric National Surgical Quality Improvement Program database. They identified stunting in 11.1% and wasting in 3.8% of the cohort; stunting was associated with increased odds of any 30-day postoperative complication (adjusted odds ratio [OR] 1.16, 95% confidence interval [CI] 1.0–1.3; p=0.036)[6]. Roberson and colleagues subsequently analyzed 282,056 pediatric surgical patients and found that 19% met at least one of four definitions of malnutrition. The need for preoperative nutritional support was associated with increased odds of postoperative infection (OR 1.47, 95% CI 1.36–1.60), as were stunting (OR 1.17, 95% CI 1.10–1.25) and preoperative hypoalbuminemia (OR 1.17, 95% CI 1.04–1.32). Wasting alone was not independently associated with infection, demonstrating that the identified risk varies according to the nutritional indicator used[7]. Evidence from resource-constrained settings is also informative. In a prospective Ethiopian study involving 109 children undergoing elective general surgery, Wondemagegnehu and colleagues found preoperative malnutrition in 49 children (45%). Postoperative infection occurred in 27.1% of malnourished children compared with 20.0% of well-nourished children, while mean postoperative hospital stay was 6.89 versus 5.69 days, respectively; neither difference was statistically significant[8]. In another prospective observational study, Saxena and colleagues included 627 pediatric surgical patients and documented wasting in 47.71% of children aged six months to five years and stunting in 40% of this younger group. Despite the high prevalence of nutritional abnormalities, anthropometric indicators did not demonstrate a significant association with postoperative complications in that cohort[9]. These contrasting findings underline the need for further research using clearly defined nutritional indicators and clinically relevant recovery outcomes. Despite growing recognition of perioperative nutrition, evidence specifically addressing the impact of preoperative malnutrition on recovery after pediatric abdominal surgery remains insufficient, particularly in Bangladesh. The European Society for Clinical Nutrition and Metabolism emphasizes early recognition of nutritional risk, avoidance of unnecessarily prolonged fasting, and re-establishment of oral or enteral feeding as early as clinically appropriate[10]. Therefore, this study aims to assess the impact of preoperative malnutrition on postoperative recovery among children undergoing abdominal surgery.

Methods

This prospective observational cohort study was conducted among pediatric patients undergoing surgery in the Department of Pediatric Surgery at Sir Salimullah Medical College Mitford Hospital and Shin-Shin Japan Hospital, Department of General Surgery at Shaheed Suhurawardy Medical College and Hospital, Bangladesh, from January 2025 to December 2025. The study population comprised children aged 0–12 years undergoing emergency or elective surgical procedures. A non-probability consecutive sampling technique was used. Children aged 0–12 years undergoing surgery and whose guardians provided informed consent were included. Patients with incomplete preoperative nutritional assessments or insufficient postoperative outcome data were excluded. Before surgery, sociodemographic information, including age, sex, and residence, was recorded using a structured data collection form. Preoperative nutritional status was assessed using age-appropriate anthropometric measurements interpreted according to the relevant World Health Organization (WHO) growth standards. Participants were categorized as having normal nutritional status, moderate malnutrition, or severe malnutrition using predefined anthropometric criteria. Underweight, wasting, and stunting were also recorded separately; these anthropometric abnormalities could overlap. Operative characteristics, including surgical urgency and duration of surgery, were documented from clinical records. Postoperative outcomes included any postoperative complication, surgical-site infection, delayed initiation of oral or enteral feeding beyond 48 hours, delayed wound healing, hospital stay exceeding seven days, unplanned reoperation, and in-hospital mortality. Total hospital stay was recorded in days. Data were checked for completeness, coded, and analyzed using Statistical Package for the Social Sciences (SPSS), version 26. Categorical variables were expressed as frequencies and percentages, while continuous variables were summarized as means and standard deviations. Associations between preoperative nutritional status and operative or postoperative categorical outcomes were assessed using Pearson's chi-square test or Fisher's exact test, as appropriate. Mean hospital stay between the malnourished and normally nourished groups was compared using Welch's independent-samples t-test. A p-value of less than 0.05 was considered statistically significant. Ethical approval was obtained from the respective institutional ethical review committee, and written informed consent was obtained from the parents or legal guardians of the participating children

Results

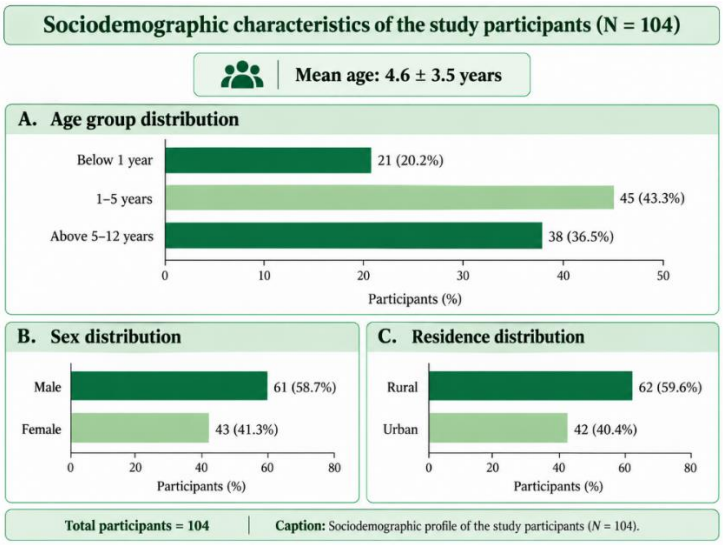


Figure 1. Sociodemographic characteristics of the study participants (N = 104)

Figure 1 presents The mean age of the participants was 4.6 ± 3.5 years. Children aged 1–5 years constituted the largest age group (43.3%), followed by those above 5 years (36.5%). Males accounted for 58.7% of participants, and 59.6% came from rural areas.

Table 1. Preoperative nutritional status of the study participants (N = 104)

Nutritional characteristics	Frequency (n)	Percentage (%)
Overall nutritional status		
Normal nutritional status	57	54.8
Moderate malnutrition	28	26.9
Severe malnutrition	19	18.3
Any preoperative malnutrition	47	45.2
Anthropometric abnormalities[1]		
Underweight	39	37.5
Wasting	31	29.8
Stunting	34	32.7
Total participants	104	100.0

[1]Anthropometric abnormalities may overlap

Table 1 shows that preoperative malnutrition was present in 47 (45.2%) children, while 57 (54.8%) had normal nutritional status. Moderate and severe malnutrition affected 26.9% and 18.3% of participants, respectively. Underweight was the most frequent anthropometric abnormality (37.5%), followed by stunting (32.7%) and wasting (29.8%).

Table 2. Association between preoperative nutritional status and operative characteristics (N = 104)

Operative characteristics	Malnourished (n = 47), n (%)	Normal nutrition (n = 57), n (%)	χ^2 (df)	p-value*
Surgical urgency			3.61 (1)	0.057
Emergency surgery	31 (66.0)	27 (47.4)	-	-
Elective surgery	16 (34.0)	30 (52.6)	-	-
Duration of surgery			9.23 (2)	0.010
Less than 1 hour	10 (21.3)	26 (45.6)	-	-
1–2 hours	22 (46.8)	24 (42.1)	-	-
More than 2 hours	15 (31.9)	7 (12.3)	-	-

*Statistical analysis: Pearson's chi-square test was used for associations between nutritional status and surgical urgency and duration. Statistical significance was set at $p < 0.05$.

Table 2 shows Emergency surgery was more frequent among malnourished children than among those with normal nutritional status (66.0% versus 47.4%), although the difference was not statistically significant ($p = 0.057$). Surgery lasting more than 2 hours was significantly more frequent in the malnourished group (31.9% versus 12.3%; $p = 0.010$), indicating a significant association between nutritional status and operative duration in this illustrative dataset.

*Outcomes overlapped

Any postoperative complication was recorded in 29 (27.9%) children. Surgical-site infection occurred in 23.1%, while delayed wound healing was observed in 17.3%. Feeding initiation beyond 48 hours occurred in 35.6% of participants, and 39.4% remained hospitalized for more than 7 days. The mean hospital stay was 6.4 ± 2.9 days. Unplanned reoperation and in-hospital mortality occurred in 4.8% and 1.9% of children, respectively

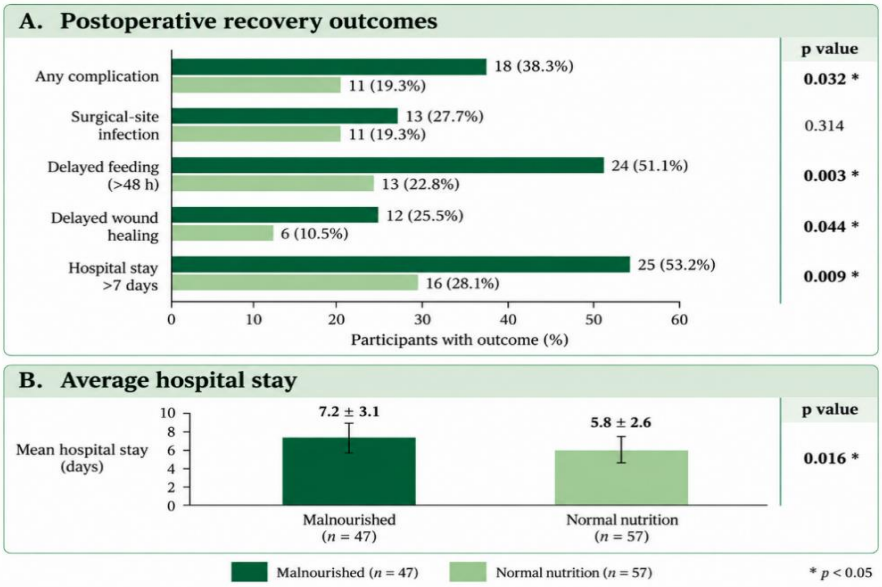


Figure 2. Postoperative recovery outcomes by nutritional status (N = 104). *p < 0.05 indicates significance

Table 4. Comparison of postoperative recovery outcomes according to preoperative nutritional status (N = 104)

Postoperative outcomes	Malnourished (n = 47), n (%)	Normal nutrition (n = 57), n (%)	χ^2	p-value*
Any postoperative complication	18 (38.3)	11 (19.3)	4.62	0.032
Surgical-site infection	13 (27.7)	11 (19.3)	1.02	0.314
Delayed feeding (>48 hours)	24 (51.1)	13 (22.8)	8.97	0.003
Delayed wound healing	12 (25.5)	6 (10.5)	4.05	0.044
Hospital stay >7 days	25 (53.2)	16 (28.1)	6.81	0.009
Mean hospital stay (days)	7.2 ± 3.1	5.8 ± 2.6	t = 2.46	0.016

*Statistical analysis: Pearson's chi-square test was used for categorical outcomes, and Welch's independent-samples t-test was used to compare mean hospital stay. Statistical significance was defined as $p < 0.05$.

Table 4 shows Postoperative complications were significantly more frequent among malnourished children than among those with normal nutritional status (38.3% versus 19.3%; $p = 0.032$). Delayed feeding occurred in 51.1% of malnourished children compared with 22.8% of well-nourished children ($p = 0.003$). Delayed wound healing was also more frequent among malnourished participants (25.5% versus 10.5%; $p = 0.044$). A hospital stays exceeding 7 days occurred in 53.2% of the malnourished group compared with 28.1% of the normal-nutrition group ($p = 0.009$). Mean hospital stay was likewise longer among malnourished children (7.2 ± 3.1 versus 5.8 ± 2.6 days; $p = 0.016$). Although surgical-site infection was numerically more frequent among malnourished participants, the difference was not statistically significant ($p = 0.314$)

Discussion

The mean age of the 104 children was 4.6 ± 3.5 years, with 63.5% aged below five years; males constituted 58.7%, and 59.6% were rural residents. Saxena et al. studied 627 pediatric surgical patients, including 350 (55.8%) aged 6 months–5 years[9]. The predominance of younger children in both cohorts highlights the importance of nutritional assessment in early childhood, although differences in age distribution, referral patterns, and healthcare settings may explain

the observed variation. Preoperative malnutrition affected 45.2% of participants, including 26.9% with moderate and 18.3% with severe malnutrition. Wondemagegnehu et al. similarly identified malnutrition in 49 of 109 children (45%) undergoing elective surgery in Ethiopia[8]. In the present study, underweight, stunting, and wasting affected 37.5%, 32.7%, and 29.8%, respectively. Saxena et al. reported underweight in 57.14%, stunting in 40.0%, and wasting in 47.71% of children aged 6 months–5 years[9]. These higher proportions may reflect differences in age composition and patient characteristics. El Koofy et al., studying 75 pediatric gastrointestinal surgical patients, found wasting in 67% of upper gastrointestinal patients versus 39.1% of lower gastrointestinal patients, while underweight affected nearly 50% of upper gastrointestinal and hepatobiliary patients[11]. Emergency surgery occurred in 66.0% of malnourished children compared with 47.4% of normally nourished children, but the difference was not statistically significant ($p = 0.057$). Conversely, operations lasting more than two hours were significantly more frequent among malnourished children (31.9% versus 12.3%; $p = 0.010$). Saxena et al. found that complications occurred in 67.2% of younger and 82.6% of older children undergoing operations exceeding two hours ($p < 0.0001$)[9]. Although their study examined complications rather than the relationship between malnutrition and operative duration, both findings emphasize the clinical importance of prolonged surgery. Overall, postoperative complications occurred in 27.9% of participants, while surgical-site infection (SSI) affected 23.1%, delayed wound healing 17.3%, and hospital stay beyond seven days 39.4%. Mean hospital stay was 6.4 ± 2.9 days, with reoperation in 4.8% and mortality in 1.9%. Bergkvist et al. reported adverse postoperative outcomes in 20% of 136 children, SSI in 17%, reoperation in 3.5%, and mortality in 6%[12]. The present cohort had higher SSI and reoperation rates but lower mortality. Wondemagegnehu et al. reported mean hospital stays of 6.89 days among malnourished children and 5.69 days among well-nourished children, although the difference was not statistically significant[8]. Stratification by nutritional status revealed significantly more postoperative complications among malnourished children (38.3% versus 19.3%; $p = 0.032$), delayed feeding (51.1% versus 22.8%; $p = 0.003$), delayed wound healing (25.5% versus 10.5%; $p = 0.044$), and prolonged hospitalization (53.2% versus 28.1%; $p = 0.009$). Mean hospital stay was also longer (7.2 ± 3.1 versus 5.8 ± 2.6 days; $p = 0.016$). Alshehri et al. analyzed 23,714 children and found that stunting increased the adjusted odds of postoperative complications by 16% (OR 1.16)[6]. Roberson et al., examining 282,056 pediatric surgical patients, found increased odds of postoperative infection with stunting (OR 1.17, 95% CI 1.10–1.25) and preoperative hypoalbuminemia (OR 1.17, 95% CI 1.04–1.32)[7]. Díaz-Amaya et al. reported increased complication risk among malnourished children aged 12 years or younger (OR 3.86, 95% CI 1.61–9.27)[13]. Nevertheless, Hill et al.'s systematic review highlighted inconsistent evidence linking undernutrition with postoperative infections[14]. The nonsignificant SSI difference in the present study (27.7% versus 19.3%; $p = 0.314$) reinforces this uncertainty.

Limitations of the study

The relatively small sample size of 104 children may limit the generalizability of the findings to other pediatric surgical populations. Variations in age, underlying surgical conditions, severity of malnutrition, and type and duration of surgery may have influenced postoperative outcomes. Furthermore, potential confounding factors may not have been fully addressed, and the duration of follow-up may have been insufficient to assess long-term nutritional recovery and postoperative complications.

Conclusion

Preoperative malnutrition was common among pediatric surgical patients and was associated with significantly higher postoperative complications, delayed feeding, delayed wound healing,

and prolonged hospital stay. Malnourished children also had a longer mean hospital stay than children with normal nutritional status, although the difference in surgical-site infection was not statistically significant.

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To cite: Eva N T, Lablu M A S, & Akter S. (2026). Impact of Preoperative Malnutrition on Postoperative Recovery among Children Undergoing Abdominal Surgery. SSB Global Journal of Medical Science, 7(03), 22=25. https://doi.org/10.61561/ssbgjms.v7i03.161

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