RESEARCH REPORTS

Risk of Malnutrition and its Relationship with Surgical Complications in Patients Undergoing Surgery under The Department of Surgery of Indira Gandhi Memorial Hospital

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ABSTRACT *Nutritional status of the patient is a key factor in determining the surgical outcomes of the patients. The objectives of this study was to to identify the relationship between risk of malnutrition and surgical outcomes. Malnutrition Universal Screening Tool (MUST) can be used to identify risk of malnutrition. The Clavien-dindo (CD) classification was used to report surgical complications. The study also aimed to identify the relationship between factors such as age, sex and comorbidities with MUST, as well as the relationship between CD grade and site, indication, type and method of surgery. Methods: A cross-sectional prospective study over three months, between 16th February to 16th May of 2024 was conducted. The study participants were 161 patients admitted for surgery under the department of Surgery in Indira Gandhi Memorial Hospital (IGMH) using consecutive sampling and collected data for MUST and CD grading in two phases. Results: The study reported that the majority of the participants who had the risk to be malnourished were in the low category(75.2%), followed by high (13%) and medium (11.8%) No significant correlation was found between MUST category and age ($p = 0.729$), sex ($p= 0.628$) and comorbidities ($p = 0.964$). 55.3% participants had CD grade 1 and 36.6% had CD grade 2. Only 8% had more than CD grade 3. Significant correlation was found between CD grade and indication ($p = <0.001$), CD grade and type ($p = <0.001$) and CD grade and method of surgery ($p < 0.01$) but not between site and CD grade ($p = 0.091$). A significant relationship was found between MUST category and CD grade. ($p = 0.035$). Conclusion: The study was consistent with numerous studies that record malnutrition to be an important factor in post-operative recovery, highlighting the importance of nutritional screening and optimization of nutritional status.*

Keywords: Malnutrition, Surgical Complications, MUST, Perioperative Nutrition, ERAS

Introduction

Malnutrition refers to a state of deficiencies, excess, or imbalance in a person's intake of nutrients and energy. (WHO, 2024) This covers two broad groups of overnutrition and undernutrition, with the latter affecting 390 million adults worldwide. (WHO, 2024)

As surgery is a significant stressor that causes the activation of several inflammatory and catabolic pathways, nutritional status greatly affects bacterial clearance, wound healing and overall physical recovery (Mignini et al., 2018). Therefore, malnutrition

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can affect the healing process of patients due to immunosuppression, increased susceptibility to infections and increased drug tolerance. Therefore, treating and preventing malnutrition can possibly improve the surgical outcome of numerous patients (Vera et al., 2011). Malnutrition is linked to a less successful recovery from surgery, and a higher incidence of postoperative complications and mortality. While it is a treatable and preventable cause of morbidity, it is often underreported in hospital settings (Hirsch, 2019).

Several validated nutritional risk assessment tools are available for evaluation of nutritional status (Noorian., 2023). These include Malnutrition Screening Tool (MST), Nutritional Risk Screening 2002 (NRS-2002), Mini Nutritional Assessment Form (MNA), and Malnutrition Universal Screening Tool (MUST) (Ingvild., 2022). To assess risk of malnutrition, it was decided to adapt MUST in this study, for its validity, reliability, and simplicity. It is less time-consuming, does not require further training, and does not involve any laboratory investigations (Todorovic, 2011). Despite the widespread implementation of the Malnutrition Universal Screening Tool (MUST) in hospitals for assessing patients' nutritional risk, research indicates that only about half of those identified at risk are subsequently referred to a dietitian. According to (Reddy & Chaithanya, 2019), this gap underscores a critical shortfall in the management of nutritional care, suggesting that the identification of nutritional risk does not consistently translate into appropriate interventions.

To assess surgical complications, the Clavien Dindo classification was used which is a standardized grading system for reporting surgical complications based on the therapy required to correct it. It is a widely used tool for its reliability, acceptability, and validity (Golger, 2023).

This research aimed to identify the number of patients in Indira Gandhi Memorial Hospital (IGMH) who were at high risk of malnutrition and how it affected surgical complications. The research also studied other factors that could have influenced malnutrition risk or surgical complications.

Review of Literature

The nutritional status of the patient is an independent factor (Alvarez-Lobos et al., 2005), a crucial modifiable risk factor (Wijnhoven et al., 2012) that determines the outcomes of surgical operations (Ford et al., 2022). According to (Prado et al., 2022), inadequate nutritional status negatively impacts the humoral and cell-mediated immune response, impairing patients' capacity to withstand the stress of surgery and hindering wound healing, which in turn diminishes overall postoperative recovery. Identifying and providing medical nutritional therapy for those at risk of developing malnutrition before surgery could reduce the number and severity of operative complications, accelerate recovery, save resources, and shorten hospital stays (Golder et al., 2023). Moreover, studies have shown that malnutrition is the only preoperative variable significantly associated with surgical outcomes (Tebou et al., 2017).

The Malnutrition Universal Screening Tool (MUST) is reportedly used by hospitals to assess patients. However, only half of the patients identified as at nutritional risk are referred to a dietitian (Reddy & Chaithanya., 2019). Barriers such as inadequate awareness among healthcare professionals about the importance of nutritional intervention and systemic issues within healthcare settings hinder the referral process (Mason et al., 2020). Timely dietary intervention improves recovery rates, enhances overall health outcomes, and reduces malnutrition-related complications (Coulston et al., 2017).

Research done by (Prado et al., 2022) showed that up to 65% of the patients who were admitted for surgical procedures presented with malnutrition or were at risk of malnutrition. Moreover, in the study done by (Ford et al., 2022) it reported that 66% of the patients who presented to the hospital for general surgery were malnourished or at risk of malnutrition, and, these patients were three times more at risk of developing post-surgical complications compared to patients who have attained adequate nutritional status (Wischmeyer et al., 2018). The overall prevalence of those who were at intermediate risk of malnutrition in the study conducted by Venianaki et al. (2021) was 28.1% of the study population and a total of 14.6% of the patients were at high risk of malnutrition.

The mean age group in a study done by (Reddy et al., 2021) was 45.7 years, and it consisted of 69% of males and 31% of females, and, among them 74.5% of males and 25.5% of females fell into the high-risk MUST score. In contrast to this study, the mean age group of those at risk of malnutrition was 75 years (Venianaki et al., 2021). Multiple comorbidities are found to be causing severe malnutrition among the majority of hospitalized patients (Marinho et al., 2020) Among them, the most common non-communicable, chronic illness includes hypertension and Diabetes mellitus.(Karim et al., 2018). It has been found that these underlying comorbidities cause postoperative complications in patients undergoing surgery (Chen, 2022). Another research, by Ahmed et al. (2022), showed that 48.2% of patients were diabetic surgical patients and had moderate malnutrition and 10.6% of the patients were severely malnourished. Similarly, a study by (Bilbeisi et al., 2019), showed that 9.4% of the patients having an underlying disease were at high risk of malnutrition. In contrast to this setting, anticipated elective surgeries, planned interventions, and postoperative complications occurred in 50 patients from 248 patients (Moris et al., 2023).

The attributed acute nature of emergency surgeries and the deranged physiology at the time of surgery leads to high postoperative complications (Huda et al., 2022). This finding was also supported by Trubuddharat et al. (2019), that emergency surgery has poor outcomes with high mortality. In addition to the deranged nutritional status, and physiology, prolonged intraoperative hypotension and tachyarrhythmias are important factors that cause surgical complications in emergency surgeries (Sun et al., 2023).

In another study, Huda et al. (2022) discovered that 14.29% of 112 patients who underwent elective laparotomies experienced postoperative problems, and 12.5% of those individuals had an underlying medical condition. Numerous studies have demonstrated that in terms of pain, and negative postoperative effects, laparoscopic operations are superior to open surgeries Vigneshwaran S. 2023. Supporting evidence for these claims come from (Claudia et al., 2022), who found that using Enhanced Recovery After Surgery (ERAS) protocols in conjunction with lower abdominal pressure during laparoscopic procedures resulted in low severity grades of the Clavien Dindo classification.

A comparable study by (Reddy et al., 2019) found that the group with the highest percentage of postoperative complications (41.17%) was those who had been assigned a high-risk MUST score. Comparatively, 33.30% of the medium-risk group and 18.30% of the low-risk group had complications. A study done by Venianaki et al (2021) showed that patients who were at medium or high risk of malnutrition needed to stay in the hospital for longer than the lower-risk group. The findings of this study also indicated a directly proportional relationship between a high MUST score and postoperative complications. There was also a favorable postoperative result at 1 week corresponding with a good nutritional status (Tebou et al., 2017).

Huda et al. (2022) showed that patients with perforation peritonitis had the

highest proportion of complications, accounting for 74.3% of the study population when comparing the indication for surgery and Clavien Dindo classification. According to a study by Bolliger et al (2018) among those who did develop complications, class IIIb complications made up the majority of the recorded complications which was 27.6%, followed by grade II complications at 20.7%, as per the Clavien Dindo classification. Contrary to this, a study done by Rapaka (2020), showed that 62% of the surgical patients experienced complications and among those, 34% of them were classified as Clavien Dindo Grade II complication, having the highest number, which was followed by 20% of Grade I complications

Objective

Throughout the research, the study aimed to understand the risk of Malnutrition among admitted patients undergoing surgery under the surgery department of IGMH and subsequently assess how this risk affects the development of surgical complications.

Methodology

Study design

This study was a hospital-based prospective cross-sectional study conducted in IGMH between 16th February 2024 and 16th May 2024.The study consisted of two parts; Assessment of MUST category and its related variables and of CD grades and its related variables.

Assessment of MUST category and related variables

- **Obtaining MUST category:** MUST categorization requires information on values for body mass index, unplanned weight loss in the last 3-6 months, and acute illness effect, evidenced by no or unlikely oral intake for over the past 5 days.
- **Age and sex:** Demographic information such as age and sex that can contribute to the MUST category will be asked in a patient interview.
- **Comorbidities:** As existing illness can contribute to MUST category, the International Classification of Disease (ICD)-10 code for diagnosed illnesses other than the diagnosis related to the current surgery will be recorded.

Assessment of CD grade and related variables

- **Obtaining CD grade:** Grading according to the CD classification was done by thorough evaluation of the patient's medical records and identifying the treatments given to the patient.
    1. **Grade I:** Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions. Allowed therapeutic regimens are: drugs as antiemetics, antipyretics, analgesics, diuretics and electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside.
    2. **Grade II:** Requiring pharmacological treatment with drugs other

than such allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included.

3. **Grade III:** Requiring surgical, endoscopic, or radiological intervention.
4. **Grade IV:** Life-threatening complication (including central nervous system (CNS) complications)) requiring IC/ICU management
5. **Grade II:** Requiring pharmacological treatment with drugs other than such allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included.
6. **Grade III:** Requiring surgical, endoscopic, or radiological intervention.
7. **Grade IV:** Life-threatening complication (including central nervous system (CNS) complications)) requiring IC/ICU management
   IVa: Single organ dysfunction (including dialysis)
   IVb: Multiorgan dysfunctio
8. **Grade V:** Death of a patient (Dindo et al., 2004)

- **Type of surgery:** Emergency or elective surgery (Smith et al ., 2017)
  - **Emergency:** Any surgery that due to its acuity, performed during the same hospital visit that the decision to proceed with surgery was made, or after an outpatient waiting interval of <48 hours. (Smith et al., 2017)
  - **Elective:** Procedures performed on patients who are brought to a medical facility for a scheduled surgery on the day of their operation. (Mullen et al., 2017)
- **Surgical Site:** Upper gastrointestinal tract, hernia, hepatobiliary system, cholecystectomy, lower gastrointestinal tract, and soft tissue/thyroid/other. (Venianaki et al., 2021)
- **Indication for surgery:** The primary reason for operation based on clinical presentation, preoperative diagnostic studies, and intraoperative findings. (Alvarez-Lobos et al., 2005). The 10th revision of the International Classification of Diseases (ICD-10) diagnosis, recorded in the Hinai database, IGMH's computer-based medical records, was used to assess this.
- **Method of surgery:**
  i.Open surgery: Include any surgical procedures performed entirely under direct visualization through an incision in the skin. (Carr et al., 2018)
  ii. **Elective:** Procedures performed on patients who are brought to a medical facility for a scheduled surgery on the day of their operation. (Mullen et al., 2017)

Sample size

The population of this study were admitted patients who underwent surgery under the surgery department of IGMH in the study duration. All patients eligible for the study during the study duration based on the following inclusion criteria were enrolled: (1) Being older than 18 years, (2) providing consent, (3) being admitted as an in-patient (4) undergoing surgery under the department of surgery

of IGMH. Patients were excluded from the study based on the following criteria: (1) undergoing surgery for trauma involving multiple organs/ systems and (2) if the MUST category could not be assessed. The sample size at the end of the three months duration was 161.

Data collection

Data collection took place in two phases.

In phase 1, data required for MUST categorization was taken at bedside through patient interview (unintentional preoperative weight loss in the past 3-6 months, any acute illness causing cessation of nutritional intake for more than 5 days in perioperative period, age) and by taking height and weight measurements required to calculate BMI. Form 1 (Appendix -) for collecting this data was used. Phase 1 of data collection was conducted on all days with scheduled elective surgeries and all the days where there was an emergency admission during the three month period.

In phase 2 of data required for CD grading (all treatments used) was collected from Hinai data base.The site of surgery, type, method and indication for surgery from the database were also obtained. Form 2 (Appendix -) was used to collect this data. Phase 2 was conducted at the end of the three month period.

Data analysis

All of the data from the two google forms were collected in google sheet documents which was then combined into one common google sheet document. The data was cleaned and coded. This document was then exported to Statistical Package for Social Sciences by the team.These documents were only accessible to the research team, supervisor and coordinator.

Descriptive statistics were done for the percentage of those at high risk of malnutrition, and the percentage of people who developed surgical complications. Descriptive and inferential statistics were done for the relationship between MUST score and CD grade, CD grade and surgical factors, and MUST score and patient factors. To understand the relationship between age, gender, comorbidities and Malnutrition, Pearson's Chi-Square analysis was done. The association between surgical factors (site of surgery, type of surgery, method of surgery, indication of surgery) and surgical complication (CD) was tested by using the Chi-Square test. The relationship between MUST grade and surgical complication CD was done using the Chi-Square test.

Ethical Considerations

Data was ed after getting approval from The National Health Research Council (NHRC) and the Maldives National University (MNU), and IGMH.
Only patients who gave informed consent were enrolled in the study. For those who were unable to give consent due to mental or physical incapacitation, their legal guardian gave consent in their place.

This is documented in the informed consent form which describes what the study is, how it will be carried out, its benefits and how the information will be used. It also states that the patient has the right to withdraw from the study at any

time and that it will not affect their care.

All patient data was kept anonymous. Their names were not recorded for the research and identification data (hospital ID number) was destroyed after the data analysis was completed. Confidentiality was strictly maintained throughout the research process

Results

A total of 161 patients were included in the final analysis of the study. The percentage of people who were at risk of malnutrition are demonstrated in figure 1.0.

Among the 161 patients who underwent surgeries, (13%) of them were at high risk (MUST score > 2) of malnutrition. Majority of patients (75.2%) were at low risk (MUST <1) of malnutrition and (11.8%) of people were at medium risk (MUST = 1) of malnutrition.

Table 1.0
Description of distribution of those at risk of malnutrition in the study sample.

	MUST Score		
	Low	**Medium**	**High**
Percentage of patients at risk of malnutrition	75.2%	11.8%	13.0%

Chi-square analyses were applied to check the association between age, gender and comorbidities with the risk of malnutrition. Results are demonstrated in Table 2.0.

Age was categorized into 5 groups; most participants were from age group 31 to 40 years. Most patients who developed a high MUST score belong to the age group greater than 60 years olds, whereas the lowest frequency of high MUST category was observed in two age group categories, 18 to 30 years and 51 to 60 years. Chi-square test applied to see any association between age and risk of malnutrition showed a value of (p=0.729**) (Fisher's exact test) which indicates that there was no statistically significant relationship between age and High MUST score. Gender was fairly equally distributed with a slight predominance by (51.6%) in the female population in our sample. It was observed that a higher proportion of males had a high MUST score (7.5%) in comparison to females with (5.6%) who had high MUST scores. Chi-square test was run to test any association between gender and MUST score with a p value of 0.628 (p=0.628) which suggests that there was no significant correlation between gender and MUST score.

Majority of the patients did not present with comorbidity, those who had underlying conditions accounted for (43.5%) of the sample. Hypertension, diabetes, dyslipidemia were the most common comorbidities and (16%) of those who presented with comorbidities had all 3 conditions. In addition, (16%) had a variety of other diseases apart from diabetes, hypertension and dyslipidemia. Chi-square test was applied between those who presented with and without comorbidities with the MUST category and it resulted with a (p=0.964) which indicates there was no significant correlation between comorbidities and risk score.

Table 2.0
Demonstration of statistical analysis chi square between age and risk of malnutrition (MUST category), Gender and risk of malnutrition (MUST category) and comorbidity and risk of malnutrition (MUST category).

		MUST Category			Chi - Square
		Low	Medium	High	P value
Age (in years)	18-30	27	4	2	**0.729** Fisher's exact was used
	31-40	28	3	5	
	41-50	25	5	5	
	51-60	20	4	2	
	>60	21	3	7	
Gender	Male	56	10	12	**0.628**
	Female	65	9	9	
Comorbidity	Present	52	9	9	**0.964**
	Not present	69	10	12	

Majority of our study sample (55.3%) followed a normal postoperative course which is clavien dindo grade 1, followed by (36.6%) who fall under Clavien dindo grade 2 and then grade 3 with (7.5%) and grade 4 almost negligible with (0.6%).

Table 3.0
Description of distribution of Surgical Complication based on Clavien Dindo grading.

	Clavien Dindo grading			
	Grade 1	Grade 2	Grade 3	Grade 4
Percentage of patients who developed surgical complication	55.3%	36.6%	7.5%	0.6%

Soft tissue surgeries were the most prevalent with (41%) and among those who acquired a complication greater than grade 3 complications were also most frequent in this category. Gallbladder surgeries had the fewest complications with no patient developing a complication greater than grade 3. The chi square which was run to see if there was an association between site of surgery and surgical complication did not find any significant association($p = 0.091$).

The most common indication for surgery was found to be anorectal diseases with (19.9%), followed by hernias (15%). The least common indication was found to be acute abdomen conditions constituting (6.3%). It was found that patients who underwent surgery for anorectal, breast, thyroid and gallbladder conditions did not develop complications greater than Clavein Dindo grade 3. Among the

patients who underwent surgery for skin related conditions (47.3%) developed surgical complications greater than Grade 3 Clavein Dindo. A chi-square analysis with a p=<0.001 suggests that there is an association between indication for which surgery was performed and severity of surgical complications.

Majority of the surgeries performed (80%) were planned elective procedures and among them those who developed severe complications was (2.5%). In contrast to elective surgeries, among those who underwent emergency surgery (5.6%) of them developed complications greater than grade 3 Clavien Dindo grade. With a p=<0.001 from chi-square analysis suggests that type of surgery has a significant association with the occurrence of severe complications.

The most common method of conducting surgery was open surgery accounting for (76%) of the surgeries, out of which (8%) developed surgical complications surpassing Clavien Dindo grade 3. Compared to open surgeries laparoscopic procedures were performed much less (24.2%) with no complications exceeding Clavien Dindo grade 3. Chi-square analysis had a p=0.01 which indicates that selection of surgical methods is significantly associated with the occurrence of severe complications.

Table 4.0

Demonstration of statistical analysis chi square between Site of surgery and Surgical complication (measured by Clavien Dindo grade), Surgical indication and Surgical complication (measured by Clavien Dindo grade), type of surgery and Surgical complication (measured by Clavien Dindo grade), and method of Surgery and Surgical complication (measured by Clavien Dindo grade).

		Clavien Dindo Grades			**Chi - Square**
		1	2	>3	P value
Site of Surgery	Anorectal	13	15	3	**0.091** Fisher's exact was used
	Gallbladder	15	2	0	
	Hernias	17	7	1	
	Gastrointestinal Tract	7	10	2	
	Soft Tissue	35	24	7	
	Others	2	1	0	
Surgical Indication	Anorectal Diseases	16	16	0	**<0.001** Likelihood Ratio was used
	Breast Diseases	12	7	0	
	Thyroid Diseases	10	6	0	
	Others	16	6	1	
	Gastrointestinal Diseases	2	6	2	
	Hernias	17	7	1	
	Gallbladder Diseases	15	2	0	
	Skin Diseases	5	5	9	

Type of Surgery	Emergency	8	13	9	**<0.001**
	Elective	81	46	4	
Method of Surgery	Laparoscopic	29	10	0	**0.01**
	Open	60	49	13	

Majority of the patients had low or medium risk of malnutrition and most experienced surgical complications rated as Clavien Dindo grade 1 which is the normal post -operative source. Among those at high risk of malnutrition, (1.2%) developed surgical complications exceeding Clavien Dindo grade 3. The Chi-Square analysis resulted in a p=0.035 which suggests an association between high risk of malnutrition and severity of surgical complication.

Table 5.0

Demonstration of statistical analysis chi square between risk of Malnutrition (measured by MUST score) and surgical complication (measured by Clavien dindo grade).

		MUST Category			**Chi - Square**
		Low	**Medium**	**High**	**P value**
Clavien Dindo Grade	1	66	10	13	0.035** Fisher's exact was used
	2	49	4	6	
	>3	6	5	2	

Discussion

This research evaluated the correlation between surgical complications and malnutrition risk in patients undergoing general surgery. It also looked at comorbidities, age, and gender as additional variables that could influence the risk of malnutrition. The study also investigated variables that could impact the development of surgical complications, including the type, location, and indication of the procedure. Utilizing the MUST method, which assigns patients to three risk categories—low, medium, and high—we evaluated the patients' likelihood of malnutrition. Clavien Dindo grading, which assigns patients to one of five categories based on post-operative progress and care, was employed to evaluate the surgical complications.

Studies show that more than 60% of the patients undergoing general surgery are at a risk of malnutrition (Ford, et al., 2022). However, Based on MUST score, this study showed that 75.2% of the participants are at low risk of developing malnutrition, followed by high risk (13%), and then medium risk (11.9%). The study also showed that there was no relationship between age and the risk of malnutrition. One possible reason could be due to the small sample size, and the restricted number of patients above the age of 60. It could also be that the study could not identify malnutrition of people above 65 years of age, or they show lower risk compared to the actual risk. A study done in 2023 showed similar results to our study, where more than 60-year old's were found to be more prone to develop

malnutrition (Dent, Wright, Woo, & Hoogendijk, 2023). This can be due to several other factors such as the patients' diet, malabsorption of the nutrients, impaired swallowing, as well as consumption of drugs that alter the taste and appetite (Venianaki et al., 2021)

In the study sample, there was a slight female predominance compared to males. There was also no significant relationship between gender and the MUST score, which could be because there are other factors that affect nutritional status such as health, diet and so on. The study also revealed that more males fall into the high-risk category compared to females. This aligns with a study done in 2021 (Venianaki et al., 2021). Despite our p value, this observation supports the existing literature which states that males are more likely to be at a high risk for malnutrition.

The most common comorbidity found within the study sample was hypertension, followed by dyslipidemia, and diabetes. There was no significant relationship between comorbidities and MUST score, which suggests that the presence of a comorbidity alone does not significantly affect nutritional status. This could be because of the small sample size, and variations in the severity of the individual diseases. In contrast to this study, a study done in 2022 showed that malnutrition and poor physical function are associated with increased comorbidities (Amasene et al., 2022).

Majority of the surgical complications in the study were classified as Clavien Dindo grade 1 (55.4%), followed by grade 2 (36.6%). Some of the other studies showed different results to the current study, which states that the majority of the classifications were classified as 3b, followed by grade 2 (Bolliger et al., 2018). However, another study showed that grade 2 complications were the most common, followed by grade 1 complications (Rapaka & Venkata Reddy, 2020). These differences could be because of the variations in the patient groups, type of surgeries and health care settings across the studies.

The most common indication and site in this study was found to be anorectal surgery (19.9%) followed by hernia repairs (15.5%). Interestingly, soft tissue surgeries were found to have the highest >3 clavien dindo grading, which could be due to the increased number of cellulitis and necrotizing fasciitis we encountered during our study. Gallbladder surgeries were found to have the lowest complication rates with a low Clavien dindo 2 grading and no >3 grade complications, which could be due to the laparoscopic approach used in gallbladder surgeries which is definitely associated with fewer postoperative complications. This study is both supported and contrasted by other existing studies. One study shows that the patients with perforation peritonitis had the highest proportion of complications (74.3%), which supports the relationship between the surgical indication and the development of complications (Rai et al., 2022). However, it also differed from our finding of soft tissue surgeries having the most complications compared to their finding of perforation peritonitis (Rai et al., 2022).

Majority of the surgeries in the current study was done on an elective basis (81.1%). Elective surgeries had a higher number of grade 1 complications and a fewer grade 3 and above complications based on clavien dindo grading. In contrast to this, emergency surgeries were found to have a higher proportion of grade 2 and above complications. There was a significant relationship between the type of surgery and development of surgical complications, which suggests that emergency surgeries are associated with a higher risk of surgical complications. The finding aligns with one study done in 2022 , which states that acute nature of emergency surgeries and deranged physiology at the time of the surgery leads to high postoperative complications (Rai et al., 2022).

The most common method of surgery was found to be open, which was also found to have a higher number of complications compared with laparoscopic

surgeries. The study shows that there is an association between the method of surgery and development of surgical complications. This could be because open surgeries have a higher chance of contamination due to larger incision size and prolonged exposure of the internal organs to the external environment compared to laparoscopic surgeries. The findings are supported by existing literature such as a study done in 2022 which states that laparoscopic surgeries results in lower severity grades of clavien dindo classification (Brusasco et al., 2022). Another study done in 2023 also supports our findings (Vigneshwaran & Aakthibalan, 2023).

Finally, there was a significant association between risk of malnutrition and surgical complications, suggesting that patients who are at higher risk of malnutrition are more likely to develop surgical complications. Our finding is supported by existing literature. For example, a study conducted by (Wischmeyer et al., 2018) reported that malnourished patients are at 3 times more risk of developing post-surgical complications compared to patients who were well nourished. Similarly, another study found that the group with the highest percentage of postoperative complications (41.17%) was those who had been assigned a high-risk MUST score (Reddy & Chaithanya, 2020). Additionally, a study done in 2017 observed a favorable postoperative result at 1 week corresponding with a good nutritional status (Vigneshwaran & Aakthibalan, 2023).

While the research provides important insights into the topic, there are certain limitations that might have influenced the results. One of the main limitations of this study is its focus on a single institution, with patients only taken from IGMH and surgeries solely performed by the general surgery department. Hence, surgeries from other specialties such as gynecology and orthopedics were not included. In addition, the study excluded elderly and pediatric population, patients undergoing traumatic surgeries and individuals unable to provide consent which eventually resulted in a small sample size. Moreover, the use of the MUST tool and malnutrition risk assessment was limited by the inability to obtain some measurements in immobilized or bedridden patients.

Conclusion

According to this research, most patients who had surgery at our institution had low risk of malnutrition, and the majority of them had a normal postoperative course (Clavien-Dindo grade 1). However, there was a statistically significant correlation ($p=0.035$) between postoperative complications (Clavien-Dindo grade >3) and patients who were at high risk of malnutrition (13%). Patients undergoing emergency surgeries or open procedures and those with specific indications, such as skin-related conditions, showed a higher likelihood of severe complications. These results suggest that preoperative nutritional assessment and intervention could be pivotal in reducing complications in high-risk groups. Therefore, we recommend implementing the Malnutrition Universal Screening Tool (MUST) as a routine part of preoperative evaluation in the general surgery department at IGMH. Early identification of patients at risk for malnutrition would enable timely interventions, such as referral to dieticians for tailored nutritional plans aimed at optimizing preoperative nutritional status. This proactive approach could mitigate postoperative complications, improve patient recovery, and enhance overall surgical outcomes.

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Conflict of interests

Authors declare there are no conflicts among the researchers.
school workload and various other commitments.

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