Original

Nutritional status and associated factors of gastrointestinal surgical patients at Hanoi Medical University Hospital between 2021 and 2022

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ABSTRACT: *Background/Purpose*: In patients following gastrointestinal surgery, a poor early post-operative nutritional status or risk is linked to a longer post-operative length of stay. Thus, this study aimed to examine the prevalence of nutritional status and the some related factors of gastrointestinal post-operative patients. *Methods:* A cross-sectional study was conducted on 101 patients with gastrointestinal surgery at the Department of General Surgery, Hanoi Medical University Hospital from October 2021 to July 2022. We used the Global Leadership Initiative on Malnutrition (GLIM) criteria (1), for the diagnosis of malnutrition,which includes the identification of a phenotype and an etiology. Besides, we used some laboratory tests for hemoglobin (Hb), serum albumin, and pre-albumin to evaluate nutritional status. *Results:* The proportion of malnutrition according to GLIM was 66.3%, of that, 44.5% of patients were classified as severe malnutrition. Malnutrition according to BMI was 32.7%. The majority of gastrointestinal surgical patients have low levels of albumin and prealbumin. Surgical diseases with obstruction (eg: pyloric stenosis induced by gastric cancer/tumor, intestinal obstruction) increased the odds of malnutrition by 3.23 times, compared to diseases without obstruction. *Conclusion:* This study determined that the prevalence of malnutrition in GI surgical patients was very high. Surgical diseases with obstruction (eg: pyloric stenosis induced by gastric cancer/tumor, intestinal obstruction increased the odds of malnutrition. Therefore, surgical patients need to be evaluated nutritional status in order to give reasonable nutrition intervention.
Keywords: nutritional status**,** gastrointestinal surgical patients, malnutrition, Hanoi Medical University Hospital.

INTRODUCTION

The nutritional status is one of the independent factors that influence post-operational outcomes. An often present complication of perioperative sickness is malnutrition (2). This is possibly due to intolerance to oral foods, and clinical manifestation includes symptoms such as nausea, vomiting, and/or diarrhea. In malnourished or at-risk malnutrition patients, the organic response to surgical trauma has greater repercussions and negatively influences the results. According to studies, 40% to 50% of surgical patients admitted to the hospital are undernourished (3-4). In particular, patients undergoing gastrointestinal surgery are at risk of malnutrition as a result of anorexia, dietary restriction, malabsorption or increased intestinal losses.

Various methods for nutritional evaluation have been proposed, using clinical, biochemical, and anthropometric evaluation tests, as well as corporal composition exams. In general, the anthropometric methods are practical, simple, non-invasive and without additional costs and, when associated with other objective parameters (laboratory, for example), they improve precision and the accuracy of the diagnosis of the nutritional disorder.

In Vietnam, only one research suggests that patients undergoing surgery for gastrointestinal (GI) are particularly at risk of malnutrition in Bach Mai Hospital (4). At Hanoi Medical University Hospital (HMUH), malnutrition has been noticed more frequently in every specialty. There is limited data on the nutritional status of gastrointestinal surgical patients. And in these patients, which type of surgery could be at higher risk of malnutrition as compared to the others is an unclear question. Because malnutrition and its associated complications are a substantial issue for surgical patients with GI, further research is needed to determine which associated factors can predict patients' nutritional status outcomes. Thus, this study aimed to examine the prevalence of nutritional status and some related factors of gastrointestinal surgical patients to establish a rationale and direction for future research in this area.

METHODOLOGY

Study design and subjects

A cross-sectional study was conducted on postoperative patients with gastrointestinal surgery at the Department of General Surgery, Hanoi Medical University Hospital from October 2021 to July 2022. Patients who were 18 years of age or older; (2) staying conscious and stable hemodynamic; (3) length of stay at the department ≥ 48 hours; (4) patients who have complete information and laboratory results in the

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electronic medical record were included in our study. We excluded patients requiring postoperative transfer to the ICU or pregnancy.

We applied convenience sampling to recruit participants. Post-operative patients met the above-mentioned inclusion criteria were invited to participate in the study. Thus, the total number of selected patients was 101.

Nutritional status of all participants was evaluated within 24 – 48 hours right after the transmission from operation room to the General Surgery Department. Demographic and medical information including sex, age, date of admission of the department, admission diagnosis, history of diseases, and some laboratory tests regarding nutritional status were collected.

Assessment of nutritional status

Anthropometry

Anthropometric indices of participants were evaluated by height and weight. Bodyweight and height were measured when participants had light clothing without shoes. We used a Tanita scale and a wooden parameter with an accuracy of 0.1 kg and 0.1 cm to measure the weight and height of participants. Body Mass Index (BMI) was computed as the ratio of weight (kg) per height squared (m^2). According to the Asia-Pacific classification of BMI, BMI <18.5 kg/m^2 was considered underweight, 24.9 > BMI ≥ 23 was overweight, and BMI ≥ 25 was obesity.

GLIM criteria

We followed the Global Leadership Initiative on Malnutrition (GLIM) (1), the diagnosis of malnutrition includes both the identification of a phenotype and an etiology. Phenotypic criteria involve unintentional weight loss, low BMI, and reduced muscle mass. Etiology includes reduced food intake or assimilation and disease burden. Patients eligible for at least one phenotypic criterion and one etiologic criterion would be diagnosed as malnutrition. Then, we classified the severity of malnutrition based on phenotype as follows:

Phenotype	Weight loss (%)	Low body mass index (kg/m2)	Reduced muscle mass
Stage 1/Moderate Malnutrition (Requires 1 phenotypic criterion that meets this grade)	5-10% within the past 6 mo, or 10 -20% beyond 6 mo	<20 if < 70 yr, <22 if ≥ 70 yr	Mild to moderate deficit [a]
Stage 2/Severe Malnutrition (Requires 1 phenotypic criterion that meets this grade)	>10% within the past 6 mo, or >20% beyond 6 mo	<18.5 if < 70 yr, <20 if ≥ 70 yr	Severe deficit [b]

a, b: Due to the unavailability of validated assessment methods such as bioelectrical impedance analysis (BIA), CT or MRI, and dual-energy absorptiometry, we used physical examination to evaluate muscle mass loss (5))

Determination of energy requirements: energy target was set at 25 kcal/kg/day, as it is recommended by the European Society of Parenteral and Enteral Nutrition (ESPEN) (6). We determined the reduction of caloric by the proportion of actual oral intake and total energy requirement.

Laboratory tests

We used hemoglobin (Hb), serum albumin, and pre-albumin to evaluate nutritional status. According to the World Health Organization, anemia is that Hb is less than 130g/L in adult males, and less than 120g/L in adult females (7). Serum albumin < 35g/L (8) was classified as hypoalbuminemia, and pre-albumin < 20 mg/dL was classified as low level (9).

Statistical analysis

EpiData version 3.1 was used to enter all variables, data of general information, anthropometry, weight loss, prefeeding serum potassium, phosphorus, or magnesium, type of surgery, admission diagnosis. All variables are listed in table 2.1.

Stata version 15.0 will be used for data analysis. Data screening will be done before analyzing the data. Data were expressed as mean ± SD, n, %. For comparison of categorical variables, chi-square was used, and for continuous variables, student T-test and Mann – Whitney U test were used, T-test was for normal distribution and Mann – Whitney for non-normal distribution. The probability level of $p < 0.05$ was set for statistical significance. Logistic regression analysis test will be used to determine the association between malnutrition and some factors such as types of surgery and locations of surgery.

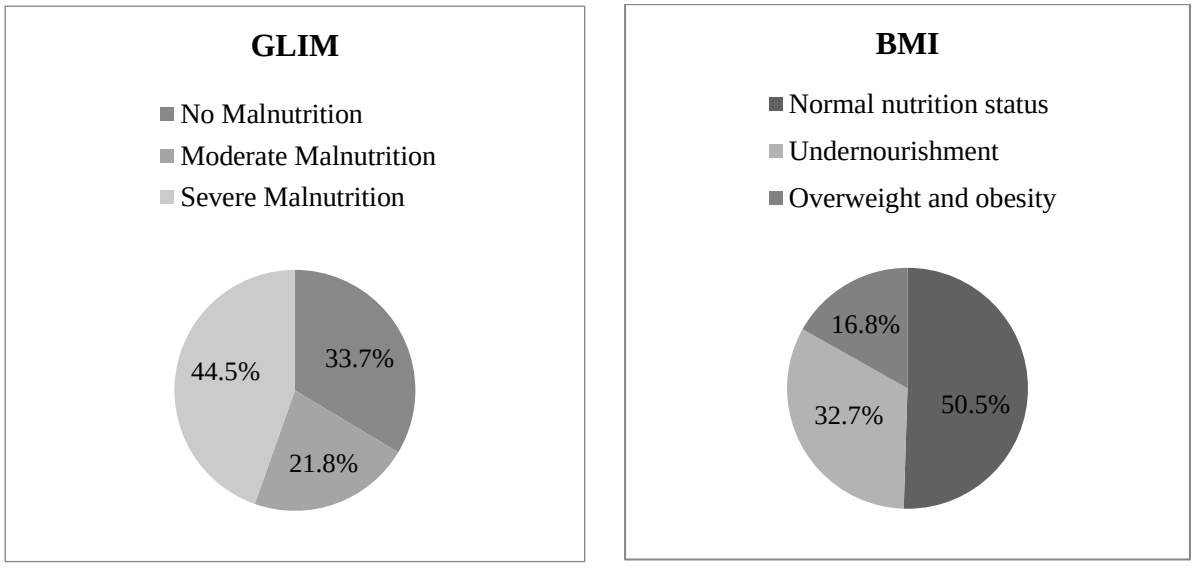
RESULTS

Table 1 includes demographic information, admission diagnosis and history of diseases of all patients. The majority of patients were male (62.4%). Mean age was 60.91 ± 15.1 years old. In terms of admission diagnosis, colorectal cancer was the most common disease, followed by acute diseases such as peritonitis of bowel obstruction. The proportion of gastric cancer accounted for the lowest figure, which was 11.9%. There were only 1% of patients having more than 3 comorbidities, the majority of patients had 1 comorbidity. Among these, hypertension was the most common comorbidity.

Table 1. General characteristics of the study participants

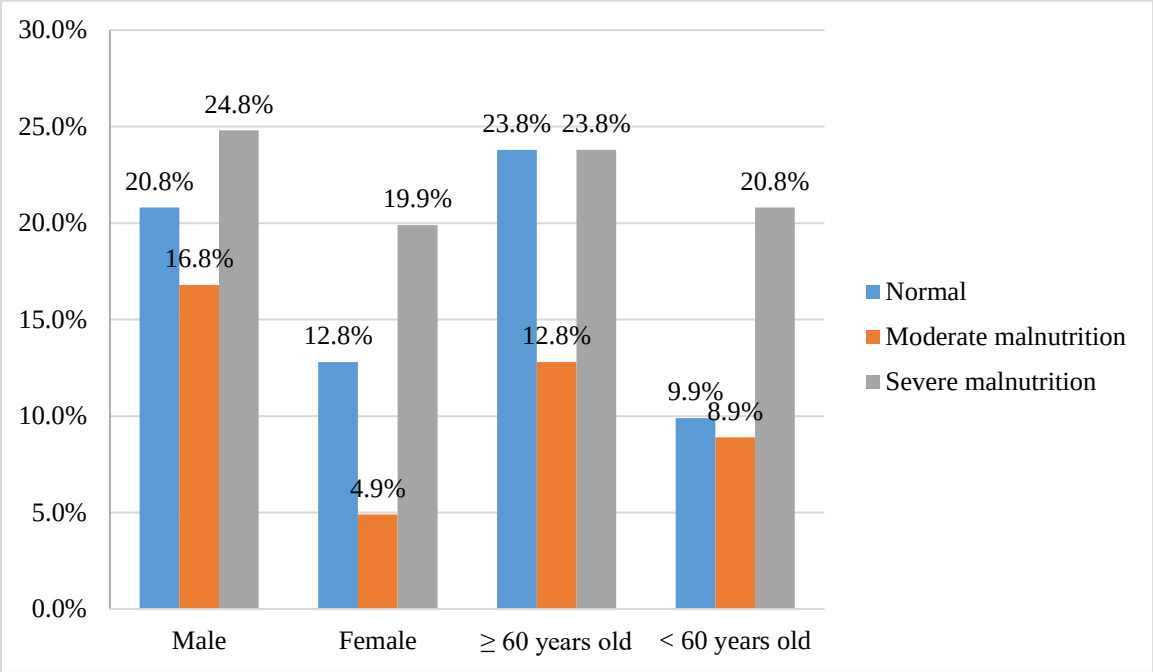
General information		n (%)	
Sex	**Male**	63 (62.4)	
	Female	38 (37.6)	
Admission diagnosis	**Esophageal cancer**	16 (15.8)	
	Gastric cancer	12 (11.9)	
	Colorectal cancer	28 (27.7)	
	Pyloric/duodenal stenosis	20 (19.8)	
	Peritonitis/ bowel obstruction	25 (24.8)	
History of diseases	**Hypertension**	22 (22.2)	
	Diabetes	17 (17.2)	
	Cirrhosis	2 (2.0)	
	1 comorbidity	43 (42.6)	
	2-3 comorbidities	21 (20.8)	
	More than 3 comorbidities	1 (1)	
	$\bar{X}$ ± SD	**Min**	**Max**
Age	60.9 ± 15.1	28	94

Figure 1: The prevalence of malnourished patients by GLIM and BMI.



The proportion of malnutrition according to GLIM was 66.3%, of that, 44.5% was classified as severe malnutrition. Malnutrition according to BMI was 32.7%. There was 17% of patients classified as overweight and obesity according to BMI.

Figure 2: The prevalence of malnourished patients (GLIM) by gender, age (%)



It can be seen that severe malnutrition was distributed similarly in all genders and age groups. The proportion of moderate malnutrition was seen as the highest in males (16.8%) and the lowest in females (4.9%).

Table 2. The percentage of symptoms according to malnutrition of GLIM criteria

Symptoms		n	%
BMI	**Moderate: <20 if < 70 yr, <22 if 70 yr**	20	19.8
	Severe: <18.5 if < 70 yr. <20 if 70 yr	37	36.6
Weight loss in >= 6 months	**Moderate**	23	22.8
	Severe	27	26.7
Reduced muscle mass	**Mild to moderate**	22	21.8
	Severe	22	21.8
Reduced food intake	**< 50% of ER**	13	12.9
	< 75% of ER	6	5.9
Inflammation		74	73.3

Table 2 shows the percentage of individual symptoms according to thresholds for severity grading of malnutrition of GLIM criteria. Regarding phenotypic criteria, severe BMI and weight loss were more common than severe muscle mass reduction. The percentage of severe and moderate muscle mass reduction was the same (21.8%).In terms of etiologic criteria, 12.9% of patients had an oral intake of less than half of their energy requirement, and 73.3% of patients had malignant diseases, categorized as inflammation.

Table 3. Biochemical tests of all participants classified by gender

		Male (n, %)	Female (n, %)	Total (n, %)
Hemoglobin	Amenia	32 (32.3)	17 (17.2)	49 (49.5)
	No anemia	30 (30.3)	20 (20.2)	50 (50.5)
Albumin	Hypoalbuminemia	30 (39.5)	22 (28.9)	52 (68.4)
	No hypoalbuminemia	17 (22.4)	7 (9.2)	24 (31.6)
Pre-albumin	Low prealbumin	19 (48.7)	13 (33.3)	32 (82.7)
	Normal prealbumin	6 (15.4)	1 (2.6)	7 (17.9)

The proportion of anemia among all study participants was very high (49.5%), of that, males had higher percentage of anemia than females. Malnutrition according to albumin and pre-albumin accounted for 68.4% and 82.7% respectively. Males had higher proportion of malnutrition according to both albumin and pre-albumin.

Table 4. Malnutrition and some associated factors

		Malnutrition			
		Yes (n, %)	**No (n, %)**	**p**	**OR (95% CI)**
Locations of GI surgery (n=101)	**Upper GI (n= 48)**	34 (70.8)	14 (29.2)	0.37	1.47 (0.63 – 3.42)
	Lower GI (n= 53)	33 (62.3)	20 (37.7)		
Types of surgery (n=101)	**Emergency surgery (n= 25)**	19 (76)	6 (24)	0.24	1.85 (0.65 – 5.24)
	Elective surgery (n= 76)	48 (63.2)	28 (36.8)		
Characteristics of surgical diseases (n=101)	**Total/partial obstruction (n= 45)**	36 (80)	9 (20)	**<0.01**	3.23 (1.26 – 8.23)
	No obstruction (n=56)	31 (55.4)	25 (44.6)		

*Chi-square test

Some associations between surgical characteristics and malnutrition was indicated in table 4. We found that surgical diseases with obstruction (eg: pyloric stenosis induced by gastric cancer/tumor, intestinal obstruction) increased the odds of malnutrition by 3.23 times, compared to diseases without obstruction.

DISCUSSION

Our rate of 32.7% for undernourishment of BMI and 66.3% for malnutrition of GLIM. The report rates of malnutrition in patients with undergoing gastrointestinal operations vary from 14% to 55%, with the rate higher in patients with malignancy (2) (10-11). This means that our study reveals that the prevalence of malnutrition in GI surgical patients was very high. However, there was an inconsistency of the prevalence between GLIM and BMI. Specifically, the proportion according to GLIM was doubled than that of BMI. This is because GLIM involves BMI criteria, of that, the threshold of BMI of GLIM was wider than that of isolated BMI. Besides, the rate of undernourishment of BMI in our study is 33%, which was slightly lower than the study in Bach Mai Hospital has 48% of participants with BMI<18.5 (4). In each case when BMI is less than 15 kg/m2, there is a noticeable rise in morbidity. On the other hand, this study showed that moderate malnutrition was more common in males (16.8%), which was the same in other studies (12-13).

Our study found manifestations of severe malnutrition accounted for a loud proportion of BMI and weight loss (36.6% and 26.7%, respectively). Malnutrition was associated with a significant risk of anastomotic leakage and wound infection. One research reported that preoperative malnutrition increased the rate of anastomotic leakage in which patients underwent low anterior resection (12). In that research, anastomotic leakage increased hospital length and cost. Kang et al. further supported this finding that malnutrition (OR, 2.81; 95% CI, 2.32-3.40), on multivariate analysis, was an independent risk factor for anastomotic leakage after anterior resection for rectal cancer in patients (14). Another study reported that malnutrition is a significant risk factor for postoperative infectious and wound complications in patients undergoing major surgery (15).

In the present study, both albumin and pre-albumin in GI surgical patients are at low levels. Multiple regression analyses showed that post-operative complications correlated positively with old age, recent weight loss, low serum albumin, and infrequent nutritional support, which corroborated findings from other studies (16). A few studies found that the other indicators of poor preoperative nutritional status, such as low serum albumin and preoperative weight loss, were also adversely associated with longer lengths of stay (17-19). Acknowledged that these findings should be interpreted with caution because there are limitations to the use of these parameters in assessing nutritional status. Low albumin levels may reflect an inflammatory response related to disease severity (20); however, albumin can still provide a significant marker of patients at risk of a problematic recovery who may benefit from nutrition intervention.

This study determined that pyloric/duodenal stenosis was more frequent in malnutrition patients (p=0.049), and the rate of malnutritional patients with and without colorectal cancer are the same (p=0.031). But other studies have demonstrated that patients at nutritional risk have higher complication rates after surgery for colorectal cancer (21). In surgical patients, the use of nutritional support was the attempt to correct malnutrition and, consequently, the malnutrition-associated adverse effects such as postoperative complications reduce.

CONCLUSION

This study determined that the prevalence of malnutrition in GI surgical patients was very high. Nutritional status is a significant modifiable preoperative risk factor associated with poor surgical outcomes. And some related elements with the nutritional status are admission diagnosis, and characteristics of surgical diseases. Therefore, if we want to improve the nutritional status of surgical gastrointestinal patients, we must enhance our capacity to detect patients at risk for perioperative malnutrition before surgery and use approaches for nutrition optimization based on scientific data.

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