

Original Article

Nutritional risk assessment in patient undergoing major gastrointestinal surgeries

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Abstract

Introduction: Malnutrition is prevalent in surgical patients in the range of 20–50%, depending on the population studied and method employed to determine nutritional status. Malnutrition is associated with adverse clinical outcomes, slow healing, increase in infection and longer hospital stay. There are several methods to assess the nutritional status of surgical patients. However, none has been universally accepted and there is no consensus on the best system. The Nutritional Risk Screening score (NRS 2002) was developed based on the presupposition that the severity of malnutrition indicates increased nutritional requirements and need for nutritional support. It has received approval from the European Society for Parenteral and Enteral Nutrition for use in the hospital setting. It is easy to administer in daily clinical practice and offers satisfactory reliability and reproducibility. The aim of the present study was to identify nutritional risk in patients undergoing major gastrointestinal surgeries using NRS2002 and to determine possible associations with postoperative complications.

Methods: This is a prospective study carried out in department of surgery, Nepal Medical College and Teaching Hospital from 1st August 2016 to 30th July 2017. All the major gastrointestinal surgeries performed during this period were included. The nutritional assessment was done by BMI, Serum protein /albumin and nutritional risk screening score (NRS 2002).

Results: Sixty three patients who underwent major gastrointestinal surgery were included in this study. Sixty percent patients (n=38) were male, 68.8% had BMI within ideal range (18.5-25.9 kg/m²), 71.4% (n=45) patients underwent elective surgery and 68.2% (n=43) had malignancy. A total of 44.4% (n=28) of the patients were classified as being “at nutritional risk” and 47.6% (n=30) had postoperative complications. The mean NRS score was significantly higher among the patients who had complications compared to those who did not have complication (3.7 ± 1.2 vs 3 ± 1 , $p=0.016$). Low serum albumin, BMI and absolute lymphocyte count correlated with presence of nutritional risk assessed by NRS 2002 and complications.

Conclusions: NRS 2002 is simple and easy to apply in routine clinical practice for nutritional assessment. It correlates with postoperative complications. Serum albumin, BMI and absolute lymphocyte count are also simple tools for nutritional assessment of surgical patients and can be used in supplementation with NRS 2002 for better accuracy.

Keywords: Albumin, Complications, Gastrointestinal surgery, Malnutrition, Nutritional risk screening

Introduction

Malnutrition is prevalent in hospitalised patients, with international studies estimating the prevalence to be in the range 20–50%, depending on the population

studied and method employed to determine nutritional status.¹⁻⁸ Existing research in the area suggests that patients undergoing surgery for upper gastrointestinal (GI) or colorectal cancer are particularly at higher risk of malnutrition.⁹ Prevalence of malnutrition in patients

with GI cancer vary greatly, with reported figures in the range of 22–62%.¹⁰ Several factors predispose patients undergoing surgery to malnutrition. Traditional surgical nutrition practices (for example nil-by-mouth periods) and side effects of adjuvant treatments can also reduce nutrient intake at a time when nutritional status is already compromised.⁹ Although it is evident that preoperative malnutrition is a considerable preoperative risk for patients with GI cancer undergoing surgery, the relationships between nutritional practices during the perioperative period and clinical outcomes among this patient group are less well established.¹¹

Malnutrition has consistently been associated with adverse clinical outcomes, slow healing, increases in infection and mortality rates, longer hospital stay and increased hospital costs.^{9,11} In the hospital setting, a lack of nutritional screening, non-supplemented diets for long periods and prolonged fasting after surgical procedures contribute to weight loss and malnutrition.¹²

There are several methods to assess the nutritional status in surgical patients. However, none has been universally accepted and there is no consensus on the best system.¹² The deficiency of one gold standard measure has led researchers to develop several nutritional indices to stratify patients at increased risk for poor outcomes.^{13,14} Traditionally, scoring systems have been based on objective measurements such as oral energy intake, body weight, weight loss, anthropometric data, total lymphocyte count, body composition analysis, creatinine–height index, hepatic secretory proteins and cell-mediated immunity. However, individual measurements of these objective parameters are not powerful enough to detect high risk malnourished patients.⁶

The principal prognostic indices currently used are the Nutritional Risk Index (NRI) and the Maastricht Index (MI), which are based on mathematical equations; the Subjective Global Assessment (SGA) and Mini Nutritional Assessment (MNA) which are based on clinical and subjective assessments.¹⁵⁻²⁰

Anthropometric data (skinfold thickness and arm muscle circumference), as well as clinical parameters, while useful in ambulatory patients, are significantly less accurate measures of malnutrition in the critically ill patient, particularly in those who have fluid overload or renal dysfunction.²¹ Nutritional Risk Screening (NRS 2002) is employed to detect malnutrition and the risk of developing malnutrition in the hospital setting. The NRS 2002 was developed based on the presupposition that the severity of malnutrition and an increase in nutritional needs stemming from

the underlying disease indicate the need for nutritional support.²² Nutritional Risk Screening-2002 (NRS-2002) consists of a first screening stage (4 simple questions) followed by a second stage which assesses nutritional status or rather malnutrition risk.²⁰ The NRS 2002 has received approval from the European Society for Parenteral and Enteral Nutrition (ESPEN) for use in the clinical practice.^{8,22,23,24} It is easy to administer in daily clinical practice and offers satisfactory reliability and reproducibility in predicting postoperative outcomes.^{25,26,27}

This study is designed to evaluate the current nutritional status of our surgical patients and formulate protocols to correct the nutritional deficit of these patients. The aim of the present study was to identify nutritional risk in patients undergoing major gastrointestinal surgeries and determine possible associations with postoperative complications.

Methods

This is a prospective study carried out in department of surgery, Nepal Medical College and Teaching Hospital, Kathmandu, Nepal from 1st August 2016 to 30th July 2017 (one year). All the major gastrointestinal surgeries (emergency and elective) performed during this period were included in this study. The nutritional assessment of the patients was done by Body Mass Index (BMI), Serum protein /albumin and Kondrup's nutritional risk screening score (NRS 2002). The mode of preoperative and postoperative nutritional therapy was recorded and correlated with outcomes. All major GI surgery with standard midline laparotomy incision were included in the study. Laparoscopic surgery, GI surgery with incision other than midline (subcostal, grid iron) and laparotomy for trauma were excluded from the study.

All data were collected by a single researcher. Nutritional risk was determined within the first 24 hours after hospital admission prior to surgery. This study received approval from the Ethical Committee of Nepal Medical College and Teaching Hospital. All patients signed a statement of informed consent.

Weight and height were determined using a standard scale for the calculation of the BMI. The criteria of the World Health Organization for adults and elderly individuals were used for the classification: < 18.5 Kg/m² = malnutrition; 18.5 to 24.9 Kg/m² = ideal range; 25 to 29.9 Kg/m² = overweight; and ≥ 30 Kg/m² = obesity. The percentage of weight loss in the previous six months was calculated. Weight loss greater than 5% was classified as clinically significant and suggestive of malnutrition or nutritional risk.

The NRS 2002 was used for the determination of nutritional risk. This questionnaire is divided into two steps: 1st step (initial screening): Four items addressing BMI, weight loss in the previous three months, food intake and stress stemming from the underlying health condition; 2nd step (final screening): Items addressing nutritional status and severity of the underlying health condition (only used if one of the answers in the 1st step was affirmative). The final NRS 2002 score ranges from 0 to 6 points. Age > 70 years was considered an additional risk factor. Thus, 1 point was added to the final score in such cases. The cutoff point for the diagnosis of nutritional risk was ≥ 3 points. Hospital stay was recorded in days from admission to discharge. Postoperative complications were monitored daily and recorded on the proforma.

Results

Sixtythreepatientswhounderwentmajorgastrointestinal surgery were included in this study. Sixty percent patients (n=38) were male and mean age was 51.3 ± 17.6 (15-84) years. BMI ranged from 16.6 to 33.4 Kg/m² (mean= 22.1 Kg/m²). Most of the patients (68.8%) had BMI within ideal range (18.5-25.9) , while 14.3 % had malnutrition (<18.5), 11.1 % were overweight (25-29.9) and 4.8% were obese (>30). (Figure 1)

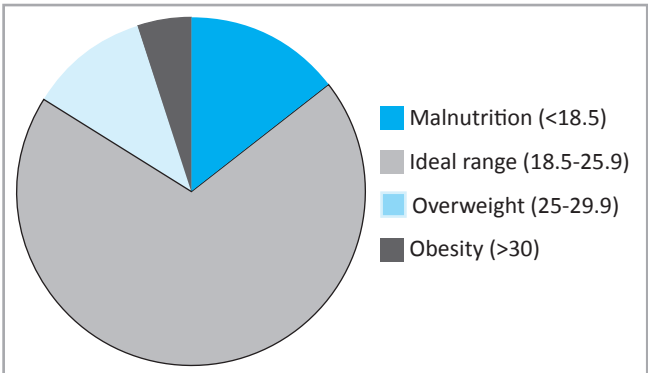


Figure 1. Body mass index (BMI)

A total of 71.4% (n=45) patients were submitted to elective surgery, among whom 68.3 % (n= 43) had malignancy (gastric carcinoma=27 , hepatobiliary and pancreatic carcinoma =9 and colorectal carcinoma= 17) . (Figure 2) Among the 28 patients who were operated in emergency setting , 6 patients (33.3%) had perforation repair , 5 patients (27.8%) underwent bowel resection for obstruction and 7 patients (38.9 %) underwent other procedures (appendectomy=2 , cholecystectomy =2, necrosectomy =1 , adhesiolysis =1and pelvic abscess drainage =1).

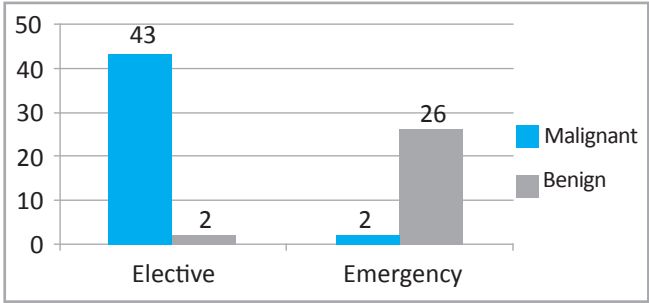


Figure 2. Emergency and elective surgery for benign and malignant diseases

The mean hospital stay was 12 ± 6.6 (5-42) days, absolute lymphocyte count was 1487 ± 1627 (285-9250), serum protein was 5.3 ± 1.1 (3.7-8.2) , albumin was 3.3 ± 0.7 (1.8-5) and NRS was 2.8 ± 0.9 (1-6) . A total of 73% (n=46) of the patients were classified as being “at risk” and 47.6% (n=30) had postoperative complications.

History of decreased food intake and weight loss did not correlate with the nutritional risk. There was no difference in the incidence of nutritional risk and complications among male and female patients as well as with benign and malignant diseases . Similarly, the nutritional risk was comparable between the patients operated electively and on emergency basis. All patients with BMI lower than 18.5 (malnutrition) were found to have nutritional risk (p=0.005). (Table 1)

Table 1. Clinical parameters and nutritional risk

Parameters		Nutritional assessment		P value
		At risk	No risk	
Gender	Male	21	14	>0.05
	Female	15	13	
Age (years)	<60	19	17	
	>60	17	10	
Food intake <50%	Yes	15	23	
	No	13	12	
Weight loss >5%	Yes	9	15	
	No	19	20	
Operation type	Elective	19	27	
	Emergency	9	8	
Diagnosis	Malignant	18	20	0.005
	Benign	10	15	
BMI (kg/m2)	<18.5 (malnutrition)	9	0	0.005
	>18.5	27	27	
Complications	Yes	22	8	0.013
	No	14	19	

Serum albumin was significantly low in patients who had complications (3 ± 0.6 vs 3.6 ± 0.6 , $P=0.001$). BMI (20.5 ± 2.5 vs 23.5 ± 4.3) was significantly low in patients who had complications. Absolute lymphocyte count was lower in patients with complications (1936 ± 2229 vs 1078 ± 515 , $p=0.035$). However, serum protein levels were comparable. The mean NRS score was higher among the patients who had complications compared to those without complications (3.7 ± 1.2 vs 3 ± 1) and it was statistically significant ($p=0.016$). (Table 2)

Table 2. Nutritional assessment parameters and complications

Nutritional assessment parameters	Complications		P value
	Yes	No	
Serum protein	5.2 ± 1.2	5.5 ± 1	0.37
Serum albumin	3 ± 0.6	3.6 ± 0.6	0.0001
Absolute lymphocyte count	1078 ± 515	1936 ± 2230	0.035
BMI	20.5 ± 2.5	23.5 ± 2.3	0.002
NRS score	3.7 ± 1.2	3 ± 1	0.016

Discussion

Malnutrition is prevalent in hospitalised patients, with international studies estimating the prevalence to be in the range 20–42%.¹ The incidence is even higher up to 60% in patients undergoing surgery for upper gastrointestinal (GI) or colorectal cancer.^{9,10} In our study the incidence of malnutrition assessed by NRS in surgical patients was 73 % and among GI cancer patients it was 55%, which is little higher than incidence reported in other studies.^{6,28,29,30} Almeida et al. evaluated 300 surgical patients using the NRS 2002 and found that 58% of candidates for gastrointestinal surgery were at risk. Correia et al. (2001) reported similar data among a group of 374 surgery patients with gastrointestinal conditions, 60.2% of whom were at nutritional risk.^{3,5}

Evaluating nutritional risk among 1086 surgery patients, Jie et al. found that a reduction in habitual food intake in the week prior to admission was the most sensitive indicator for identifying individuals in need of nutritional support.³⁰ Silva et al. found that 58.9% of clinical patients who reported food intake < 50% of habitual intake in the previous week were at nutritional risk.⁶ In the present study, 50% of individuals who reported food intake < 50% of habitual intake were

at nutritional risk, however it was not statistically significant.

Nutritional risk and malnutrition are more common in patients with GI cancer. In the present study, nutritional risk was found in 55% of GI cancer patients scheduled for surgery. This figure is higher than the rates reported by Schiesser et al. (40%) and Almeida et al. (37%), but lower than reported by Bruna et al who reported incidence of 69.4%.^{3,31,32}

Age is another aspect that exerts an influence on nutritional status, as elderly individuals exhibit a number of factors besides disease that affect nutrition, such as a diminished production gastrointestinal secretions, deficient dentition, social isolation and psychological disorders, such as depression.^{33,34,35} Silva et al. (2010) detected nutritional risk in 51.3% of elderly male and female patients using the NRS 2002.⁶ This is higher than the rate reported in the present study, in which 46% of patients aged 60 years or older were at nutritional risk although it was not statistically significant.

Most of the patients at nutritional risk had a BMI within the ideal range. However, all the patients who had BMI < 18.5 had nutritional risk. As the NRS 2002 addresses other nutritional parameters in conjunction with the underlying health condition, individuals within the ideal BMI range can exhibit other nutritional alterations, such as weight loss and/or diminished food intake, or may have a disease that affects their nutritional needs and are therefore classified as being at nutritional risk. Weight loss $\geq 5\%$ in the previous six months proved to be an effective screening variable for the identification of patients at nutritional risk. There is evidence that unintentional weight loss of 5 to 10% can have a negative impact on physiological functions.³ In a study involving the diagnosis of nutritional risk in 300 surgery patients using the NRS 2002, weight loss $\geq 5\%$ alone proved to be a reliable nutritional variable with higher sensitivity and specificity in comparison to the NRS 2002.^{3,31} However, our study showed different results. The patients with recent weight loss > 5 % were not found to have nutritional risk assessed by NRS 2002.

In their study, Bruna et al showed that patients at nutritional risk had a longer hospital stay in comparison to those not at risk ($p < 0.000$).³¹ Similar findings are described in a multi-center study carried out at 26 hospitals in Turkey, in which 32.6% of patients were at nutritional risk based on the NRS 2002 and had

more complications, a longer hospital stay and a higher mortality rate in comparison to patients not at risk.³⁶ Schiesser et al. found also a significant association with median hospital stay, which was 10 days among patients at nutritional risk in comparison to four days among patients not at risk.³² Levine et al. found that 45% of patients diagnosed with malnutrition upon admission had more postoperative complications and a longer hospital stay in comparison to those not at risk.³⁷ Likewise, Reilly et al. found that malnourished patients had more severe postoperative complications in comparison to those with an adequate nutritional status.^{4,38} In the present study, patients at nutritional risk were found to have significantly higher incidence of postoperative complications. Among the overall sample, 15.8% experienced complications and 71.4% of these patients were at nutritional risk ($p = 0.013$).

However, high rates of postoperative complications and mortality cannot be attributed exclusively to malnutrition. The type and extent of surgery, blood transfusions, experience of the medical team and type of anesthesia also play important roles in postoperative events.^{39,40,41} Studies have shown that blood loss during surgery is the most important factor associated with the development of postoperative complications.⁵ Thus, the influence of other variables can hinder the demonstration of statistical significance regarding the association between malnutrition and postoperative complications. Detailed information on co-morbidities and events occurring during surgery or anesthetic care also can influence the incidence of postoperative complications. In the present study, a high percentage of surgical patients were at nutritional risk, which is similar to findings described in the literature. Nutritional risk was associated with, low BMI, low serum albumin and low absolute lymphocyte count. However, in contrary to the findings in literature, nutritional risk was not associated with age ≥ 60 years, a diagnosis of neoplasm, non-elective surgery of the gastrointestinal tract, a reduction in habitual food intake and weight loss.

Conclusions

Surgical patients, especially the patients with gastrointestinal cancer are at nutritional risk. NRS 2002 is simple and easy to apply in routine clinical practice for nutritional assessment of such patients. It correlates with postoperative complications. Serum albumin, BMI and absolute lymphocyte count can be used in supplementation with NRS 2002 for better accuracy.

Conflict of interest- None declared.

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