Comparison of Subjective Global Assessment and Nutritional Risk Index on Outcome after Abdominal Surgery

Gupta DK, Sharma MR, Ghimire B, Vaidya P

Correspondence to: Dr. Dipesh Kumar Gupta, Department of Surgery

Tribhuvan University Teaching Hospital, Kathmandu, Nepal

Email: drdipeshgupta@yahoo.com

Abstract

Introduction: Preexisting malnutrition in surgical patients has been conclusively correlated with complications such as wound infection, anastomotic leakage, chest infection and myriad of other adverse outcomes during and after hospitalization. So, it is imperative to recognize and manage this status preoperatively in an effort to improve outcome. The aim of the study was to compare the Subjective Global Assessment (SGA) and Nutritional Risk Index (NRI) with outcome after abdominal surgery.

Methods: This is a prospective study conducted at the Department of Surgery, Tribhuvan University Teaching Hospital, Nepal, for the period of one year. The study included a total of fifty patients undergoing abdominal surgery. Patients were assessed with two types of nutritional assessment techniques, namely, SGA and NRI. The outcome parameters included were wound infection, chest infection, and length of hospital stay.

Results: No complications occurred in 24 of the 50 patients; 13 patients had more than one complication. The frequency of malnutrition was found to be 74% and 80% as assessed by SGA and NRI respectively. Morbidity rate was significantly higher in malnourished patients assessed by SGA group. Wound infection rate was significantly higher and length of hospital stay was also longer in malnourished patients when assessed by SGA. The area under the receiver operating characteristic curve for SGA and NRI revealed that SGA was better for predicting overall morbidity as well as specific complications than the NRI. Three patients died during treatment period.

Conclusions: Malnutrition is a marker of poor postoperative outcome. Subjective Global Assessment is better than Nutritional Risk Index to predict postoperative complications in patients undergoing abdominal surgery.

Keywords: Malnutrition, Nutritional assessment techniques, Nutritional Risk Index, Subjective Global Assessment

Introduction

Malnutrition remains a major health concern. Approximately one-third to one-half of hospitalized patients are malnourished at the time of admission.[1] Nutritional depletion not only adversely affects a surgical patient's clinical condition,[2, 3] but also increases his or her risk of a poor postoperative outcome.[4,5] It is associated with higher surgical complication rates and mortality.[6, 7] As the severity of the disease increases, the risk of malnutrition also increases. These patients are in a state of hypermetabolism with increased nutritional requirements, but usually have insufficient intake. In patients with gastrointestinal (GI) disease, the anatomical localization of the disease might also interfere with eating and swallowing, digestion, and absorption of food.[8]

It is well accepted that maintenance of adequate nutritional status is an important factor for the therapy and prognosis in several diseases. However, the most basic nutritional disturbance, malnutrition, is frequently ignored since it is considered as a complication of the chronic disease process, with possibly little bearing on the prognosis and therapeutic intervention. A critical review of the literature on this topic reveals that malnutrition is an independent risk factor in many disease processes and that treatment of malnutrition can indeed improve the patients' prognosis.[9]

Active nutritional support has been shown to improve outcomes and reduce cost of treatment in severely malnourished patients.[3,10,11] Numerous tools and scoring methods are used to screen for malnutrition in the community and hospitals.[6,7] Most of these tools are not validated clinically. Subjective Global Assessment (SGA) is used primarily by clinicians to assess nutritional status in hospitalized patients. It uses physical findings and four areas of medical history: change in weight over the previous two weeks and six months, change in dietary intake, gastrointestinal symptoms and functional capacity.[12] This technique has good inter-rater agreement,[12] good sensitivity and specificity[13] and predicts nutrition-related complications in certain populations, including surgical patients .[14, 15] Combining SGA with some of the traditional markers of nutritional status increased the ability to identify patients who developed complications from 82% to 90%. This also increased the percentage of patients identified as malnourished, but who did not develop a postoperative complication, from 25% to 30%.[14] The Nutritional Risk Index (NRI) is derived from the serum albumin concentration and the ratio of actual to usual weight with the equation. This index was used in the Veterans Administration Cooperative Study that evaluated the effect of peri-operative nutritional support.[16]

We have, therefore, prospectively assessed the prognostic value of two nutritional assessment techniques in determining outcome after abdominal surgery.

Methods

This prospective observational study included consecutive patients admitted to the surgical wards of Tribhuvan University Teaching Hospital between July 2007 to June 2008 admitted for elective abdominal surgery. Patients undergoing emergency surgery, or those on enteral/parenteral nutritional supplementation, taking immunosuppressive drugs and/or anticoagulant drugs, having known chronic disabling disease that required nursing help, those not able to participate in interviews and those with age less than 15 years were excluded.

Demographic data of the patients was recorded along with principal diagnosis, coexisting illness, medications, type of scheduled operation.

Approval was taken from Institutional review board before study.

Patients were assessed with two different techniques: SGA and NRI. No single nutritional index was considered a standard reference.

According to SGA, the patients were classified as well nourished (SGA A), moderately malnourished (SGA B), or severely malnourished (SGA C).

The second method, NRI was calculated after obtaining history and the serum albumin report. Based on this patients were categorized as 0 (NRI > 100), 1 (NRI 97.5 to 100), 2 (NRI 83.5 to 97.5), or 3 (NRI <83.5).

Blood investigations included hemoglobin, serum albumin, serum protein, total and differential leukocyte count (TLC and DLC). Albumin was measured by photometry on a Biotechnica Instruments automatic analyzer (model BT 2000 plus) and the TLC with an automated blood cell counter (Sysmex, Japan XT 1800i). The following value was considered as the reference range for our laboratory: albumin- 37-49 g/L.

Height was measured with a stadiometer. Weight was measured with either mechanical scales or bathroom scales. Postoperative complication was assessed in the hospital until discharge or death and up to 30 days after an operation following successful discharge.

The data was analyzed using the Statistical Program for Social Science (SPSS) for windows (release 14.0). Difference between the groups for categorical data was analyzed using the chi-squared test or Fisher's exact test, as appropriate. Different variables were analyzed using one way ANOVA. To assess the predictive value of the methods, likelihood ratios were calculated for the various strata of each method. P value of <0.05 was considered significant.

Results

A total of 67 patients undergoing elective abdominal surgery were eligible to participate in the study period. However, 17 patients, who did not meet inclusion criteria, were excluded from the study.

Patients were assessed using different parameters and mean values were calculated (Table 1). Male to female ratio was 1:1.17. The majority of the patients were in 5th and 6th decades of their lives (24% and 28% respectively). Mean

length of hospital stay in days was 15.74 ± 6.76 (SD); range being 7-30 days.

Primary diagnoses of the patients were as noted (Table 2). Among the patients number of patients with benign disorder was 17(34%).

Table 1. Demographic characteristics of the patients.

	Mean ± SD	Range
Age (years)	56.18 ± 15.17	20-83
Weight (kg)	47.54 ± 9.98	25-75
Height (m)	1.54 ± 0.075	1.34-1.73
Protein(g/L)	66.88 ± 8.15	48-87
Albumin(g/L)	36.10 ± 5.98	24-45

Table 2. Diagnoses of the patients (n=50).

Diagnosis	Frequency	Percent
Malignant		
Carcinoma stomach	11	22.0
Periampullary carcinoma	9	18.0
Cholangiocarcinoma	4	8.0
Carcinoma gall bladder	3	6.0
Carcinoma rectum	2	4.0
Pancreatic tail mass	2	4.0
Carcinoma ascending colon	1	2.0
Carcinoma sigmoid colon	1	2.0
Total	**33**	
Benign		
Symptomatic cholelithiasis	7	14.0
Choledocholithiasis	3	6.0
Polyposis colon	1	2.0
Portal hypertension	1	2.0
Pancreatic pseudocyst	1	2.0
Duodenal mass	1	2.0
Intestinal malrotation	1	2.0
Enterocutaneous fistula	1	2.0
Biliary stricture	1	2.0
Total	**17**	

At admission, 76% of the patients were malnourished according to the SGA and 80% of the patients according to the NRI in this set of patients. The mean age of the patients was comparable between the groups (Table 3). Weight was significantly lower and length of hospital stay was significantly longer in the malnourished group than in the well nourished group, according to the SGA. Weight loss percentage was higher and albumin level was lower in the malnourished group than in the well nourished group but these were not statistically significant (Table 3).

Table 3. Patient characteristics according to Subjective Global Assessmen (SGA).

	Subjective Global Assessment			p value
	A (n=13)	B (n=33)	C (n=4)	
Age (years)	54.38	56.33	60.75	0.778
Weight (kg)	53.0	46.52	38.25	0.018
Height (m)	1.57	1.54	1.51	0.25
Weight loss %	13.2	10.57	2.25	0.088
Albumin (g/L)	38.3	35.87	30.75	0.07
Length of stay (days)	11.69	17.09	17.75	0.03

According to the NRI, weight and albumin level were significantly lower in the malnourished group. Length of hospital stay was longer in the malnourished group but was not statistically significant (Table 4).

Table 4. Patient characteristics according to Nutritional Risk Index (NRI).

	Nutritional Risk Index				p value
	0 (n=10)	1 (n=7)	2 (n=22)	3 (n=11)	
Age (years)	54.4	57.29	57.82	53.82	0.889
Weight (kg)	56.5	47.57	45.09	44.27	0.01
Height (m)	1.55	1.55	1.53	1.56	0.72
Weight loss %	16.01	15.14	9.93	4.09	0.005
Albumin (g/L)	41.2	40.28	36.54	27.9	<0.001
Length of stay (days)	14.9	12.86	15.05	19.73	0.13

Overall postoperative complications were noted in 24 patients. Thirteen patients had more than one complication. Wound infection rate was highest among the group (32%). Three patients died during the treatment period because of the extensive procedure (Figure 1).

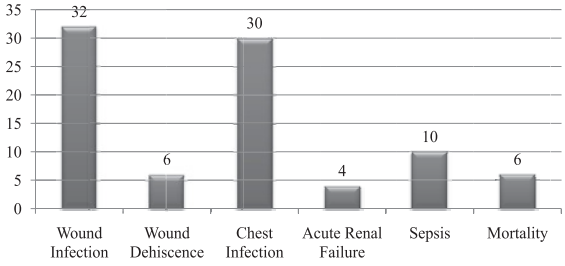

Figure 1. Overall postoperative complications.

A significantly higher number of complications was seen in the malnourished group. SGA was more predictive for wound infection (p=0.002) (Table 5), while the comparision of specific complications was not significant as assessed by NRI (Table 6).

Table 5. Subjective Global Assessment and specific complications.

	Subjective Global Assessment			p value
	A	B	C	
Wound infection	1	11	4	0.002
Wound dehiscence	1	2	0	0.851
Acute renal failure	0	2	0	0.585
Chest infection	1	13	1	0.105
Sepsis	0	5	0	0.239
Mortality	0	1	0	0.44

Table 6. Nutritonal Risk Index and specific complications.

	Nutritonal Risk Index				p value
	0	1	2	3	
Wound infection	2	1	8	5	0.427
Wound dehiscence	1	0	2	0	0.614
Acute renal failure	0	1	1	0	0.420
Chest infection	2	1	8	4	0.58
Sepsis	2	0	2	1	0.58
Mortality	2	0	1	0	0.195

Area under curve for overall complications in case of SGA and NRI was 0.718 and 0.630 respectively. For wound infection, area under curve for SGA and NRI was 0.726 and 0.629 and for chest infection, it was 0.620 and 0.596, respectively (Figure 2, Figure 3).

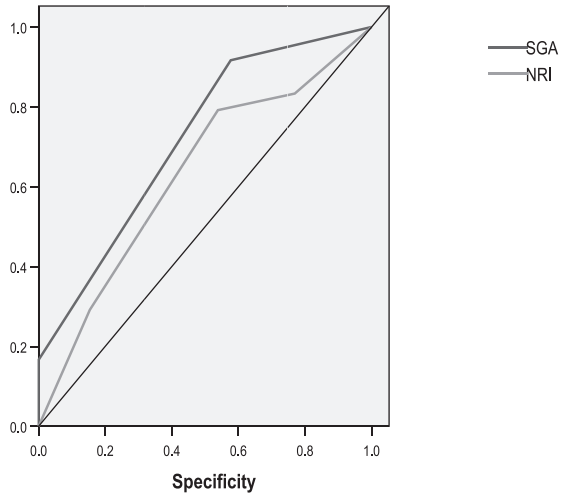

Figure 2. Receiver Operating Characteristics (ROC) curve for Subjective Global Assessment and Nutritional Risk Index to compare overall complications.

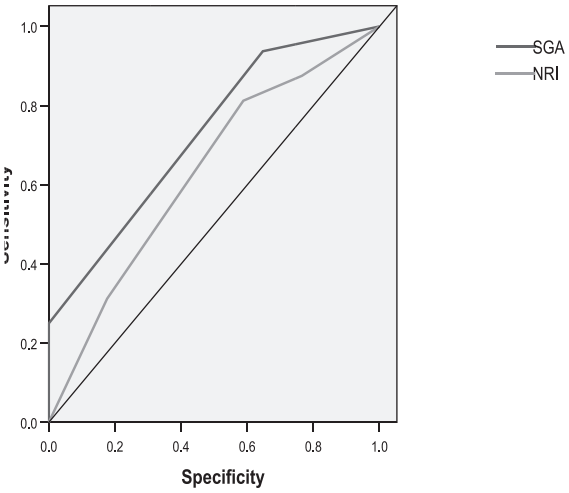

Figure 3. Receiver Operating Characteristics (ROC) curve for Subjective Global Assessment and Nutritional Risk Index to compare wound infection.

Discussion

Surgical complications occur frequently. One large study documented at least one complication in 17% of surgical

patients.[17] Quantifying the risk of death or morbidity related to malnutrition at an early stage during the hospital stay has a crucial impact on surgical practice.

Malnutrition is common in developing country. The incidence of malnutrition among children, according to the Nepal Demographic & Health Survey (NDHS, 2001), half (51%) of the children under 5 years were stunted and 21% severely affected with 10% of children wasted and 1% severely wasted. Overall, 48% children were underweight with 13% severely affected. Poor nutritional status of children in rural areas is well correlated with the high infant mortality. However, data of adult malnutrition is inadequate. Moreover, malnutrition among hospitalized patients is lacking.

Many studies have shown that prevalence of malnutrition in hospitalized patients is between 30% and 50%.[14] However, present work shows very high occurrence of malnutrition in this set of patients. It was 76% and 80% as assessed by SGA and NRI, respectively. It may be due to inclusion of more of malignant conditions that too in a tertiary care centre.

A weight loss of more than five percent in one month or of 10 percent or more over six months, a serum albumin of less than 3.2 g/dL and a total lymphocyte of less than 3.000/mm^3 (3 x 109/L) can signify an increased risk of postoperative complications.[18, 19] Albumin is commonly thought of as a good indicator of nutritional status and visceral proteins. In a study, in 54,215 patients undergoing major non-cardiac operations, a serum albumin less than 21 g/L was associated with a morbidity rate of 65% and a mortality rate of 29%. Albumin level was a better predictor of some type of morbidity, particularly sepsis and major infections, than many other preoperative patient characteristics.[20] In present study albumin is a component of NRI. This study also shows relation between low albumin level and poor postoperative outcome. Similarly, weight loss percentage shows correlation with poor outcome.

In 1936, Studley documented that, in patients operated on for chronic peptic ulcers, if preoperative weight loss was 20% or more the complications including mortality were 33.5%, compared with 3.5% in those who had lost less weight.[21] In another prospective study of patients undergoing elective surgery involving resection of a portion of the upper GI tract, patients with weight loss alone >10% fared no worse than control subjects without weight loss. However those patients with >10% weight loss with some evidence of physiologic impairment (defined by abnormal serum protein levels, maximal inspiratory pressure, hand grip dynamometry or body composition) sustained a significantly higher incidence of major complications.[22] However, in Windsor's study, weight loss alone wasn't a specific predictor, but when used in the scoring systems (SGA and NRI), the scoring systems were predictive for postoperative complications.[23]

In one study, SGA scores were significantly associated with adverse outcomes, mortality and hospital stay following cancer surgery.[24] Similarly, present study has shown SGA to be a good technique that can predict postoperative outcome. It shows SGA to be better than NRI in predicting postoperative outcome.

In a study by Detsky et al.,[13] five objective measurements (albumin, transferrin, delayed cutaneous hypersensitivity, anthropometry, creatinine–height index) were used together with the SGA and prognostic nutritional index to determine their value in predicting nutritionally associated complications in 59 surgical patients. The SGA was found to be the best nutritional assessment technique, with a sensitivity of 0.82 and specificity of 0.72.23. However, the Veterans Study[16] investigated the impact of perioperative total parenteral nutrition in surgical patients and found that the NRI was better than the SGA for determining which patients should receive perioperative total parenteral nutrition, although the difference was not statistically significant.

Postoperative complications and length of hospital stay are good indicators of resource usage and health-care costs.[16] Cost containment is important for patients in a country like ours are due to limited resources. Perioperative nutrition support is beneficial in malnourished patients. Identifying patients at nutritional risk is important, since health-care costs can be reduced by providing perioperative nutrition support to severely malnourished patients.[20]

Malnutrition is also related to the length of hospitalization.[22] According to a study, patients with low nutritional status stayed an average of 29 days in the hospital compared to 14 days if the nutritional status was normal (p less than 0.01).[25]

Conclusion

Malnutrition is a marker of poor postoperative outcome. SGA is a better nutritional assessment technique than NRI to predict postoperative complications in patients undergoing abdominal surgery.

Conflict of interest: None declared

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