Original Article

Subjective global assessment: a simple and reliable screening tool for malnutrition among Indians

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Background and Aims: Subjective global assessment (SGA) is a simple and reliable malnutrition-screening tool. The SGA has not been evaluated in India or in populations where chronic energy deficiency (CED) is rampant. We evaluated the value of preoperative nutrition, determined using the SGA, in predicting postoperative adverse outcomes in cancer patients. **Methods:** Two hundred and ninety-four cancer patients undergoing elective surgery were screened for malnutrition using a modified version of the SGA, and 266 patients (aged 14-73 years [median 50]; 165 male) were eligible. All patients were followed up till discharge, and number of days on antibiotics, length of postoperative stay, occurrence of major adverse events, and death within 30 days were recorded. The association of preoperative SGA scores (A, B, or C) and BMI groups (<18.5, 18.5-20 or >20 Kg/m^2) and four outcome variables were tested for statistical significance. **Results:** The cancer sites included head and neck region in 112, gastrointestinal tract in 53, thoracic organs in 28, and other sites in 73 patients. The SGA scores were A in 152, B in 98, and C in 16 patients. The BMI was <18.5 in 110 (41.8%) patients. The length of postoperative stay and the number of antibiotic days revealed a significant trend from SGA-A to SGA-C (p=0.000). Pre-defined adverse events occurred in 7.9%, 17.3% and 25% of SGA groups A, B, and C, respectively (p=0.025). The risk for adverse events was significantly higher in SGA-C group (OR 5.27, 95% CI 1.35-20.51, p<0.016) compared to SGA-A group. Three patients in SGA-B group and one in SGA-C group died within 30 days (p=0.04). No significant association was detected between the three BMI groups and duration of antibiotic use, length of postoperative stay, adverse events or mortality. **Conclusion:** SGA is a simple and inexpensive way to identify clinically relevant malnutrition in Indian patients undergoing cancer surgery. Low BMI was not associated with postoperative adverse outcomes, and its use for nutritional screening is likely to overestimate severe malnutrition in Indian patients. [*Indian J Gastroenterol* 2005;24:246-250]

Chronic energy deficiency (CED) and malnutrition are common in India.[1,2] Malnutrition increases morbidity, mortality, and cost of medical care.[3,4] Failure to diagnose malnutrition leads to neglect of nutritional support during illness. Active nutritional support has been shown to improve outcomes and reduce cost of treatment in severely malnourished patients.[3-7]

Numerous tools and scoring methods are used to screen for malnutrition in the community and hospitals.[8,9,10] Most of these tools are either not validated clinically, or are not user friendly in busy clinics. Body mass index (BMI) is a simple and objective measurement for determining the nutritional status and is an important component of several malnutrition screening tools.[9] Patients with BMI less than 18.5 Kg/m^2 are classified as severely malnourished by these tools. In the setting of widespread CED, BMI may be an unreliable marker of malnutrition.[11]

Subjective global assessment (SGA) scores, determined by medical history on seven items and clinical findings on four items, is a well-validated tool for screening for malnutrition.[12,13,14] Because of its simplicity, the SGA scoring can be done by paramedical staff and a patient-generated SGA is also possible through the internet.[15,16] SGA has been used for malnutrition screening in a wide variety of health-care settings including transplantation, geriatric care, radiotherapy, chronic liver disease, stroke, and pregnancy.[15-22] Although the SGA scores are determined in a subjective manner, it is the only screening tool recommended by the American Society for Parenteral and Enteral Nutrition (ASPEN).[10] There are no reports on the use of SGA for malnutrition screening from India or from communities where CED is widely prevalent.

We evaluated the usefulness of malnutrition screening using SGA in predicting postoperative outcome following major cancer surgery.

Methods

This prospective observational study included consecutive patients admitted to the Surgical Oncology

wards of our hospital between February 1999 and November 1999 for elective cancer surgery. Patients undergoing emergency surgery, endoscopic surgery, open biopsy, or planned surgery to rectify surgical defects (e.g., colostomy closure or plastic reconstruction) were excluded.

All patients who provided verbal consent were interviewed and screened for malnutrition. Information on demographic variables, malnutrition (BMI and SGA score), cancer site, and comorbidity were obtained before surgery. Type of surgery was recorded after the cancer surgery. The SGA scores were determined by one of the two research dieticians in our team using a modified version of SGA (Appendix).[12,13,14]

A large proportion of Indian patients are unable to recall their usual body weight to calculate the percentage weight loss (unpublished observations). Therefore, the original SGA scoring system was modified. The percent weight loss in past 6 months and in past 2 weeks were substituted with the patient's own subjective assessment of weight loss in three scores (weight gain, no change or mild weight loss [A], moderate weight loss [B] or severe weight loss [C]) as shown in the Appendix. Information on the remaining items on the SGA was obtained using the original SGA method and all the 11 items were subjectively scored as A, B or C. The final SGA score was arrived at subjectively by the interviewing dietician as: none or minimal malnutrition (A), moderate malnutrition (B), or severe malnutrition (C) as recommended originally (see Appendix). All patients were followed up until discharge, and occurrence of four outcome variables that indicate morbidity and mortality were obtained for every patient.

Definition of outcome variables

Adverse events: Any of the following events that resulted in the use of extra resources during the postoperative period: re-admission to ICU, repeat surgery, unplanned use of total parenteral nutrition, use of imaging ultrasonography or CT in the postoperative period, and change to a different antibiotics in the postoperative period. *Duration of antibiotic use:* Number of days the patients received antibiotics during hospital stay. *Postoperative hospital stay*: Duration in days from the date of the index surgery to the date of discharge. At the time of this study, the turnover of patients in our hospital was quicker than usual since half of the wards were closed for renovation. *30-day mortality:* Death due to any cause within 30 days of index surgery.

Statistical analysis

Data were analyzed using *EpiInfo* (version 6.5).[23] Patients were categorized into three groups according to BMI ($\leq$18.5, 18.5-20.0, >20.0 Kg/m^2) for analysis.[1,9] To account for variations in length of hospital stay (LOS) depending on the cancer site, hospital stay was analyzed after converting it into a binomial variable. Prolonged LOS was defined as LOS greater than or equal to the 75th percentile (in days) for each of the cancer sites. The 75th percentile of LOS was 2 days for breast cancer, 5 days for genito-urinary cancers, 9 days for head and neck cancers, 11 days for gastro-intestinal cancers, 14 days for bone and soft tissue cancers, and 14 days for thoracic cancers. Four patients who died in the postoperative period were excluded while calculating the LOS and antibiotic days.

Relationship of SGA score or BMI categories with each outcome variable was tested using either Kruskal-Wallis analysis of variance (for continuous variables) or *chi*-square test for trend (for categorical variables).

Results

During the study period, 294 consecutive patients who gave consent were screened for malnutrition using BMI and SGA, 1-3 days before surgery. Of these, 28 were later excluded because they underwent no surgery or only minor surgery (like endo-

Table 1: Clinical details and postoperative outcomes of the study patients

Parameters	Number	%
Cancer site		
Head and neck region	112	42.1
Gastrointestinal tract	53	19.9
Breast	30	11.3
Thorax	28	10.5
Genito-urinary tract	27	10.2
Bone and soft tissue	16	6.0
Co-morbid diseases	36	16.5
Body mass index (Kg/m^2)		
Median (range)	19.0 (11.8-37.2)	
>20	103	38.7
18.5-20	53	19.9
<18.5	110	41.4
Subjective global assessment scores		
A	152	57.1
B	98	36.8
C	16	6.0
Postoperative outcome events		
Adverse events occurred	33	12.4
Median days of antibiotics (range)		6.0 (1-38)
Median postoperative days (range)		6.0 (1-40)
30-day mortality	4	1.5

scopic biopsy, re-surgery and endoscopic resection) (n=16) or because of missing BMI data (n=12). Thus, data from only 266 patients (median age 50 years [range 14-73]; 165 male) were analyzed; locations of cancers in these patients (Table 1) were representative of the pattern of cancers in India. Most (n=235) underwent major resection surgery, and 31 had non-resectional palliative surgery. One or more co-morbidity was present in 36 (16.5%) patients.

The SGA assessment took 4-5 minutes to complete. The SGA score was A in 152 patients, B in 98 patients, and C in 16 patients. The preoperative BMI ranged from 11.8-37.2 (median 19.0) Kg/m^2 and below 18.5 Kg/m^2 (CED range) in 110 (41.8%) patients. The median BMI (Kg/m^2) was 20.9, 18.1 and 17.3, in SGA A, B and C, respectively (p<0.0001). The SGA scores A, B and C in patients with cancer of the head and neck, thorax and GI tract cancers were 99/152 (65.1%), 78/98 (79.6%) and 16/16 (100%), respectively, which was significantly worse than in the other three cancer sites (p=0.001).

Adverse events occurred in 33 (12.4%) patients after surgery (Table 1). The frequencies of adverse events in SGA groups A, B and C were 12/152 (7.9%), 17/98 (17.3%) and 4/16 (25%), respectively (p=0.025). The frequency of adverse events in the three BMI groups (<18.5 Kg/m^2, 18.5-20.0 Kg/m^2 and >20.0 Kg/m^2) were 12/103 (11.7%), 9/53 (17.0%) and 12/110 (10.9%), respectively (p=0.522). The odds ratios for the association of malnutrition with adverse events was 2.89 (95% CI 1.25-6.67) for SGA-B and 5.27 (1.35-20.51) for SGA-C compared with SGA-A. The odds ratios of the association of adverse events and BMI was 1.25 (95% CI 0.47-3.30) and 0.56 (0.22-1.43) for BMI <18.5 Kg/m^2 and BMI 18.5-20 Kg/m^2, respectively, as compared to BMI >20.0 Kg/m^2.

Table 2: Association between malnutrition scores and postoperative outcomes

Outcome variable	Pre-operative malnutrition scores			
	Nil-Mild	Moderate	Severe	*p*
Body mass index (Kg/m^2)	>20	18.5-20	<18.5	
Number of patients	103	53	110	
Adverse events (#)	12	9	12	0.52*
30-day mortality (#)	0	2	2	0.18*
Prolonged stay (#)	30	14	31	0.98*
Median postoperative days	6.0	7.0	6.0	0.19@
Median antibiotic days	6.0	7.0	6.0	0.12@
Subjective Global Assessment Scores				
	A	B	C	
Number of patients	152	98	16	
Adverse events (#)	12	17	4	0.025*
30-day mortality (#)	0	3	1	0.042*
Prolonged stay (#)	39	27	9	0.019*
Median postoperative days	5.0	7.0	10.0	0.000@
Median antibiotic days	6.0	6.0	10.0	0.000@

**chi*-squared test for trend

@Kruskal-Wallis H equivalent of *chi*-square for trend

Four (1.7%) patients died; all deaths occurred in patients with SGA-B or C scores.

The number of antibiotic days ranged from 1 to 38 (median 6) days and postoperative stay ranged from 1 to 40 (median 6) days. There was a significant increasing trend in the length of postoperative stay (p=0.000) and number of antibiotic days (p<0.000) with increasing malnutrition as determined by SGA-A, SGA-B and SGA-C. Prolonged LOS for each of the cancer sites was significantly higher with increasing malnutrition as determined by SGA scores (Table 2). There were no significant trends in the length of postoperative stay or antibiotics days among the three BMI groups.

Discussion

In our study, SGA scores were significantly associated with adverse outcomes, mortality and hospital stay following cancer surgery. The SGA scoring was also easy to use. Postoperative complications and length of hospital stay are good indicators of resource usage and health-care costs.[24] Cost containment is important for Indian patients due to limited resources. Perioperative nutrition support is beneficial in malnourished patients.[25] Identifying patients at nutritional risk is important, since health-care costs can be reduced by providing perioperative nutrition support to severely malnourished patients.[25]

Preoperative BMI and percent weight loss are important components of several malnutrition screening tools.[8,9] These tools categorize all patients with BMI <18.5 Kg/m^2 to be severely malnourished. We did not observe any significant association between the three BMI groups and adverse events, mortality, number of antibiotic days and prolonged stay during the postoperative period. National nutrition surveys have repeatedly shown that up to 50% of the Indian population have BMI below 18.5 Kg/^{2} in the CED range.[1,2] Soares *et al* using indirect calorimetry had demonstrated the problems of classifying all individuals with BMI below 18.5 Kg/^{2} as suffering from CED, because adaptation to chronic starvation occurs.[9] Our results in patients undergoing cancer surgery support this view of Soares *et al*.[11] As seen from Table 1, none of the four postoperative outcomes was worse in patients with BMI in the CED range (<18.5 Kg/^{2}) compared to those

in the normal range (BMI>20.0 $Kg/^2$). As seen from this study, using a BMI-based screening tool will result in many patients being misclassified as severely malnourished in populations with high prevalence of CED (BMI <18.5 $Kg/^2$).

Several limitations of this study need discussion. First, the modified SGA was neither revalidated nor checked for inter-observer agreement before applying in this study. The SGA tool has been evaluated in different patient populations around the world and has been used for over 20 years and produced consistent results. SGA is the only malnutrition screening tool recommended by the ASPEN board of directors, and a patient-generated SGA is in routine clinical use.[10] Second, we studied a heterogeneous group of patients with cancers at different sites, with varying outcomes. Patients with breast cancer may have better nutrition, fewer complications and shorter hospital stay than patients with cancer of the esophagus. We used a variety of cases to test if the SGA will work in our day-to-day oncology practice. Our results using prolonged stay for each cancer site also revealed a significant association with SGA. Third, we did not use multivariate analysis to overcome the issues of bias and confounding since our study was under-powered for this. We are undertaking another trial with larger sample size to include several covariates.

In conclusion, the SGA appears to be a good predictor of postoperative adverse outcomes in Indian cancer patients. Because of its simplicity, SGA can be included in routine pre-operative assessment.

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Appendix: Modified Subjective Global Assessment form

A.1 – Weight change over 6 months
- A: Weight gain or No change or Mild weight loss
- B: Moderate weight loss
- C: Severe weight loss

A.2 – Weight change in past 2 weeks
- A: Weight is increasing
- B: No change in weight
- C: Weight is decreasing

A.3 – Change in dietary intake
- A: No change or slight change for short duration
- B: Intake borderline and decreasing; Intake poor and increasing; Intake poor, no change based on prior intake
- C: Intake poor and decreasing

A.4 – Duration and degree of change
- A: Less than 2 weeks, little or no change
- B: More than 2 weeks, mild to moderate suboptimal diet
- C: Unable to eat or starvation

A.5 – Presence of GI symptoms
- A: Few or no symptoms intermittently
- B: Some symptoms for >2 weeks; severe symptoms that are improving
- C: Symptoms daily or frequently >2 weeks

A.6 –Functional status
- A: No impairment in strength, stamina and full functional capacity; mild-moderate loss and improving
- B: Mild to moderate loss of strength, stamina / some loss of daily activity or severe loss but now improving
- C: Severe loss of function, stamina and strength

A.7 – Disease state and co-morbidity
- A: No stress
- B: Low or moderate stress
- C: High stress

B.1 – Subcutaneous loss of fat
- A: Little or no loss
- B: Mild-moderate in all areas; severe loss in some areas
- C: Severe loss in most areas

B.2 – Muscle wasting
- A: Little or no loss
- B: Mild to moderate in all areas; severe loss in some areas
- C: Severe loss in most areas

B.3 – Edema
- A: Little or no edema
- B: Mild to moderate edema
- C: Severe edema

B.4 – Ascites
- A: No ascites or only on imaging
- B: Mild to moderate ascites or improving clinically
- C: Severe ascites or progressive ascites

Overall SGA score – A or B or C

How to finalize the SGA score

SGA is truly a subjective means of assessing the nutritional status. SGA classifies the patient as: A. Well-nourished; B. Moderately malnourished; C. Severely malnourished. Patients are placed into one of these categories based on their subjective rating in two broad areas: A. Medical History; B. Physical Examination. The clinician rates each medical history and physical examination parameter as A, B, or C on the SGA Scoring Sheet. Using the ratings of the parameters as a guide, an overall SGA score is given, which corresponds to his or her subjective opinion of the patient's nutritional status. SGA is not a numerical scoring system. Therefore it is inappropriate to score or add the number of A, B, and C ratings to arrive at the overall SGA classification. The items on the form are used by the nutritionist to obtain a general feel for the patient's status. If there are more B or C ratings, the patient is more likely to be malnourished. If the ratings are on the left-hand side, the patient is likely to be well nourished. For more details see references 12,13,14