Scientific Research Publishing

Subjective Global Assessment as a Pre-Operative Nutrition Status Screening Tool for Head and Neck Cancer Patients of a Tertiary Health Care Setting

Snany Surendran[1], Uma V. Sankar[2], Santhoshkumar Nochikkattil[3], Reena Cheekapravan[4], Narayanankutty Warrier[5], Sajith Babu[6]

[1]Department of Nutrition Oncology, MVR Cancer Centre & Research Institute, Kozhikkode, India
[2]Department of Clinical Research, MVR Cancer Centre & Research Institute, Kozhikkode, India
[3]Department of Head and Neck Surgical Oncology, MVR Cancer Centre & Research Institute, Kozhikkode, India
[4]Department of Clinical Nutrition & Dietetics, Malabar Cancer Centre, Kannur, India
[5]Department of Medical Oncology, MVR Cancer Centre & Research Institute, Kozhikkode, India
[6]Department of Head and Neck Surgical Oncology, Malabar Cancer Centre, Kannur, India
Email: drsnanysurendran@mvrccri.co, drumavsankar@mvrccri.co, dr.santhosh82@gmail.com, reepadmam@gmail.com, drnkwarrier@mvrccri.co, drsajith@gmail.com

Abstract

Introduction: In India, 57% of patients with head and neck cancers are documented with nutritional compromise. Active nutritional support has been shown to improve outcomes and reduce the cost of treatment in severely malnourished patients. The assessment of nutritional status should be a priority when initiating medical nutrition therapy. We evaluated the agreement between Subjective and Objective evaluation of pre-operative nutrition status of head and neck cancer patients in a tertiary cancer centre. **Methods**: Two hundred and thirty seven head and neck cancer patients who underwent surgery were eligible. The patients included both males (147) and females (90) with age varying between 23 - 88 years. All patients were screened for pre-operative nutrition status objectively as well as subjectively. The association of pre-operative SGA scores (A, B and C) subjectively, and PNS score (0, 1, 2) objectively were tested for statistical significance. **Results**: The cancer sites included tongue in 82, buccal mucosa in 30, thyroid in 28, alveolus in 18, glottis in 10, RMT in 10, nasal cavity in 9, FOM in 8. The pre-operative nutrition status based on subjective scores are A in 156 (65.8%), B in 75 (32%) and C in 6 (2.5%). The objective parameters obtained on the basis of BMI, % weight loss, PNI and S. albumin values are PNS 0 in 161 (67.9%), PNS 1 in 71 (30%) and PNS 2 in 5 (2.1%) patients. As the kappa coefficient p-0.56, there is moderate agreement between the pre-operative nutrition status subjectively

as well as objectively. **Conclusion**: Subjective global assessment is a simple and inexpensive way to screen the pre-operative nutrition status when compared to the other objective assessment tool. SGA has moderate agreement with expensive and complicated objective assessment tools. So it can be a reliable tool for assessing the pre-operative nutrition status.

Keywords

Subjective Global Assessment, Nutrition Assessment, Head and Neck Cancer

1. Background

Nutrition has been recognized as the second most important factor in predicting long term prognosis in head and neck cancer [1]. Subjects with head and neck cancer (HNC) are more likely to experience nutritional depletion than subjects with any other type of cancer during all phases of illness. At the time of diagnosis, 40% and 57% of subjects with HNC are documented with nutritional compromise [2] [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 the cost of treatment in severely malnourished subjects [5]-[10]. The assessment of nutritional status is essential for providing adequate medical nutrition therapy.

Numerous nutrition assessment tools and scoring methods are used to detect subjects who are nutritionally at risk or malnourished. Most of these tools are either not validated clinically, or are not user-friendly in busy clinics and preoperative sets [11] [12] [13] [14]. Objective evaluation of nutrition risk is time-consuming and not user-friendly. Subjective global assessment (SGA) is a simple and reliable malnutrition screening tool for cancer subjects. 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]. According to Subjective Global Assessment screening tool, subjects are classified as well nourished, moderately nourished or severely malnourished based on medical history and clinical findings [15] [16] [17]. 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) [18].

Validation of SGA tool was done among 505 cancer subjects in China and concluded that Subjective global assessment is a safe, inexpensive, reliable and easy to use clinically reliable method to assess the nutritional status of cancer subjects [19] [20] [21]. In 2005, there is a study conducted in 295 cancer subjects in

India evaluating the value of pre-operative nutrition determined using the SGA tool. But there are no studies on the agreement between SGA and objective evaluation tool of Pre-operative nutritional status of head and neck cancer subjects.

2. Methods

The objective of the study was to evaluate the preoperative nutrition status subjectively using a subjective Global Assessment (SGA) tool and objectively by assessing the weight, height, body mass index, albumin level, total lymphocyte count and prognostic nutritional index. We assessed the agreement between Subjective Global Assessment and objective evaluation in assessing the preoperative nutritional status of Head and Neck cancer subjects.

2.1. Study Design

It was an analytical, retrospective and cross-sectional study, in which two nutritional assessment tools were concomitantly applied to head and neck cancer subjects during their preoperative period, of both genders, in Malabar Cancer Centre (MCC), who accepted to participate in the study and had the informed consent form signed. We were collected the data of the subjects during the period of May 2016 to March 2017. We enrolled 237 subjects for the study and collected the socio-demographic profile, anthropometric parameters (height, weight, BMI), blood parameters (serum albumin, total lymphocyte count) and subjective global assessment tool results among these subjects.

2.2. Setting

Malabar Cancer Center (MCC) is a government tertiary cancer centre in the northern part of Kerala and the catchment area extends to 4 districts of Kerala. It is a 300-bedded autonomous institution under the department of Health & Family welfare, Government of Kerala, India.

2.3. Subjects

We included the Head and Neck cancer subjects, who underwent elective surgical management with curative intent at MCC. We identified the subjects through a unique hospital identification number from the operation theatre register and collected data from the case records.

2.4. Tools

Information on demographic variables, malnutrition (BMI and SGA score), cancer site, and comorbidity were obtained before surgery. The type of surgery was recorded after cancer surgery. The SGA scores were determined by one of the two research dieticians in our team. Subjects undergoing emergency surgery, endoscopic surgery, open biopsy, or planned surgery to rectify surgical defects (e.g., colostomy closure or plastic reconstruction), surgical management with palliative intent, subjects without follow-up visit/missing data and subjects with

cognitive impairment/psychiatric illness were excluded.

Based on the results of preoperative SGA recorded in the patient case sheet which was done by a nutritionist, the subjects were classified into 3 groups: well nourished (group A—well nourished, with adequate food consumption and without gastrointestinal symptoms), mildly to moderately malnourished (group B—signs of weight loss or loss of food consumption and demonstrating nutritional status impairment), and severely malnourished (group C—severe malnutrition, weight loss, reduction of muscle mass and loss of food consumption) subjectively.

By collecting the height, weight, serum albumin value, total lymphatic count from the case file, the Pre-operative nutrition status score was obtained objectively. The PNS score was derived from four objective and easily measurable criteria. Perioperative Nutrition Screen was developed using previously validated screening criteria (*i.e.*, Malnutrition Universal Screening Tool [MUST]) adapted for the preoperative patient. Specifically, PNS identifies nutrition risk on the basis of 4 commonly utilized malnutrition criteria: BMI < 18.5 for subjects ≤ 65 years old or BMI < 20 for subjects older than 65 years, unintentional weight loss > 10% in the last 6 months, <50% of normal oral diet intake in the last week, or a serum albumin level < 3 g/L. Each question in the PNS tool is assigned 1 point for a "positive" response. Any patient with PNS ≥ 1 *i.e.*, any positive response to the PONS questions) is considered at high risk for perioperative malnutrition. Subjects with a PONS ≥ 1 are then referred for further evaluation and management. The PNS score was developed to efficiently identify and screen for malnutrition risk in presurgical subjects. Based on PNS score, subjects are classified as well nourished (Group A), mildly to moderately malnourished (Group B), and severely malnourished (Group C). The data collection was performed by the same observer, who was trained and qualified for this function.

2.5. Definitions

- Subjective Global Assessment (SGA): Subjective Global Assessment is a validated tool to evaluate the pre-operative nutrition status subjectively. It is a simple bedside method of assessing the risk of malnutrition and identifying those who would benefit from nutritional support.
- Pre-operative nutrition status score: Pre-operative nutrition status score is to evaluate the pre-operative nutrition status objectively. The objective parameters are body mass index, % weight loss, serum albumin level and prognostic nutritional index (PNI).
- Body Mass Index: Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2).
- % weight loss: Percentage weight loss is the value obtained by dividing the amount of weight lost in kilograms by initial weight, and then multiplied by 100. Weight loss was highlighted as a common condition among subjects with cancer.

- Prognostic nutritional index: The prognostic nutritional index (PNI), is an objective parameter for assessing pre-operative nutrition status which is calculated based on the serum albumin concentration and peripheral blood lymphocyte count. It is also a useful tool for predicting short-term and long-term postoperative outcomes in subjects undergoing cancer surgery. {PNI = $10 \times$ serum albumin (g/dl) + $0.005 \times$ total lymphocyte count (per mm (3)}.
- Head and Neck cancer subjects: Head and neck cancer is a group of cancers that starts within the mouth, nose, throat, larynx, sinuses, or salivary glands.

The study was approved by the Institutional Ethics Committee (IEC regn: (IEC regn: 1616/IRB-SRC/13/MCC/18-02-17/1)) of MCC, Kannur, Kerala.

2.6. Statistical Analysis

Data was evaluated using the Statistical Package for the Social Sciences version 17.0 (SPSS Inc.; Chicago, IL, USA) software. Values of $p < 0.05$ were accepted to be statistically significant. The continuous variables age, PNI, and SGA exhibited a normal distribution. In the sample description, data is expressed as the mean ± standard deviation, or median (minimum and maximum values) for numeric variables, according to the normality of variables, and proportional to categorical variables. Cohen's Kappa Coefficient was used to evaluate the agreement between methods. Cohen suggested the Kappa result be interpreted as follows: values ≤ 0 as indicating no agreement and 0.01 - 0.20 as none to slight, 0.21 - 0.40 as fair, 0.41 - 0.60 as moderate, 0.61 - 0.80 as substantial, and 0.81 - 1.00 as almost perfect agreement.

3. Results

A study was conducted on 237 head and neck cancer subjects who underwent surgery at Malabar Cancer Centre of Kerala. All the 237 subjects screened for nutrition status pre operatively using SGA as well as PNS scoring methods. The characterization of the studied sample is described in Table 1 and Table 2. The mean age of the sample was 55.17 + 12.44 years. Male subjects (N = 147, 62%) are dominated over the female subjects (N = 90, 38%). The mean height and weight is 159.41 + 8.73 cm and 54.24 + 11.54 kg consecutively. Sites of cancer in these subjects (Table 3) represent the pattern of head & neck cancers in North Kerala.

Subjective evaluation of pre-operative nutrition screening using SGA can be done within 4 - 5 minutes. Among the study subjects, subjective scores are A in 156 (65.8%), B in 75 (32%) and C in 6 patients (2.5%). Objective screening was done using PNS scores like PNS 0 in 161 (67.9%), PNS 1 in 71 (30%) and PNS 2 in 5 (2.1%) patients. The PNS score is based on 4 objective parameters i.e. BMI, Pre-operative nutrition index, Albumin level and % weight loss. Distribution of SGA and PNS was depicted in Figure 1.

The average lymphatic count was (8864.98 + 7074.72) $\times 10^3$ cells/µL. We estimate the Kappa coefficient between 2 scales as 0.59 (moderate agreement between 2 measurement scales) and explained in Table 4.

Table 1. Demographic profile of the subjects.

Characteristics	Mean ± SD
Age	55.17 ± 12.44 cm
Height	159.41 ± 8.73 cm
Weight	54.24 ± 11.54 kg

Table 2. Distribution of variables among subjects.

Variables	Groups	N (%)
S. Albumin	0 (>3.5)	231 (97.5%)
	1 (<3.5)	6 (2.5%)
BMI	0 (>18.5)	170 (71.7%)
	1 (<18.5)	67 (28.3%)
PNI	0 (≥45)	237 (100%)
	1 (<45)	0
% Weight loss	0 (>5%)	209 (84.3%)
	1 (≤5%)	28 (11.3%)
PNS	0 (Well Nourished)	161 (67.9%)
	1 (Moderately Nourished)	71 (30%)
	2 (Severely Malnourished)	5 (2.1%)
SGA	0 (Well Nourished)	156 (65.8%)
	1 (Moderately Nourished)	75 (32%)
	2 (Severely Malnourished)	6 (2.5%)

Table 3. Sites of cancer among the study subjects.

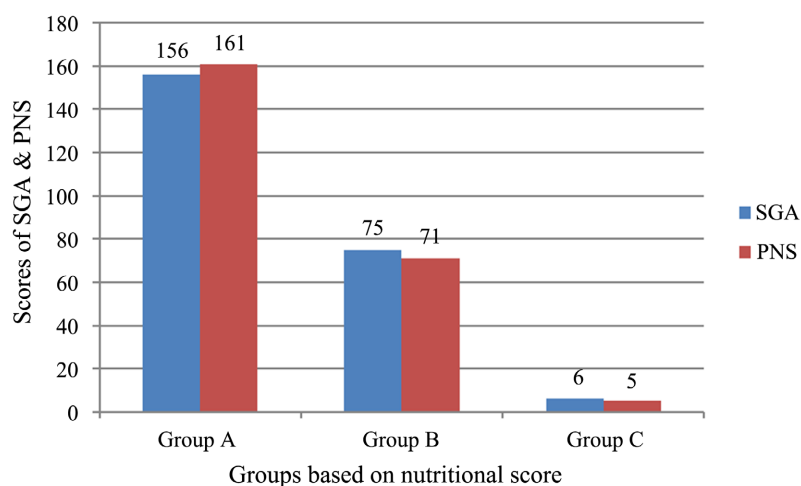| Site of cancer	N (%)
Tongue	85 (35.9%)
Larynx	12 (5.1%)
Thyroid	30 (12.7%)
Buccal mucosa	56 (23.5%)
Lower lip	6 (2.5%)
Lower alveolus	21 (8.9%)
Tongue	9 (3.8%)
Floor of mouth	10 (4.2%)
Parotid	8 (3.4%)

Figure 1. Distribution of SGA & PNS among subjects.

Table 4. Agreement between SGA and PNS in head and neck cancer subjects.

Variable	% agreement Well nourished	% agreement Moderately malnourished	% agreement severely nourished	Cohen's Kappa	p value
SGA/PNS	76.2	40.6	52.8	0.59	<0.05

4. Discussion

The study concomitantly evaluated the subjects preoperative nutritional status using both subjective and objective method and classified them as three groups respectively. There was moderate agreement were found among all 3 groups. Great disagreement was found among the group classified as moderately nourished and severely nourished. The same result found in the study of Pimenta *et al.* where the study assessed the agreement between SGA and WHO growth curves in children and adolescent [22]. This differences can be explained by the fact that the subjective methodology consist of qualitative questions and more efficient way to identify the nutritional risk and deficiencies at an earlier period.

The SGA scoring was also an easy to use and user-friendly tool. Cost containment is important for Indian subjects due to limited resources [16] [22]. Perioperative nutrition support is beneficial for reducing the length of hospital stay and reducing the number of complications among the subjects, especially in malnourished patients [17] [18]. Early identification of subjects at nutritional risk is important, since healthcare costs can be reduced by providing perioperative nutrition support to severely malnourished patients. It is already available in health care settings. Subjective methodology consists of qualitative questions, and thus, it is efficient in the early identification of nutritional risk and nutritional alterations [19].

SGA allows more concise and simple way of collecting a large part of patient history and nutritional risk. The early diagnosis of these conditions allows the establishment of adequate diet therapy, which contributes to the treatment and

improvement of the prognosis and hospital discharge of the individual [20] [21] [22]. Both physicians and nurses were able to learn and apply the method with ease. As per previous studies, SGA has good interrater agreement.

The fact that the assessments were made by only one observer is a limitation of the other studies. It was aversion bias [22]. However, every precaution was taken to minimize possible errors by including a number of observers/assessors. Furthermore, the authors emphasize the need for further studies that address this issue.

The limitation is that SGA excludes visceral protein levels and only focuses on nutrient intake and body composition. SGA also has limitations, namely the need for training and experience of the observer. Another limitation is limited sample size. The Kappa agreement measure between two measurements can improve if the sample size is improved.

5. Conclusion

This was a hospital-based study done on 237 head and neck cancer patients. It showed moderate agreement with the objective assessment tool—PNS. So, it showed the advantage of the subjective assessment tool over the objective assessment method. It is an easy tool to use and measure for any health professional.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Locher, J.L., Bonner, J.A., Carroll, W.R., *et al.* (2011) Prophylactic Percutaneous Endoscopic Gastrostomy Tube Placement in Treatment of Head and Neck Cancer: A Comprehensive Review and Call for Evidence-Based Medicine. *Journal of Parenteral and Enteral Nutrition*, **35**, 365-374. https://doi.org/10.1177/0148607110377097

[2] Vissink, A., Jansma, J., Spijkervet, F., *et al.* (2003) Oral Sequelae of Head and Neck Radiotherapy. *Critical Reviews in Oral Biology & Medicine*, **14**, 199-212.

[3] Beer, K.T., Krause, K.B., Zuercher, T., *et al.* (2005) Early Percutaneous Endoscopic Gastrostomy Insertion Maintains Nutritional State in Subjects with Aerodigestive Tract Cancer. *Nutrition and Cancer*, **52**, 29-34. https://doi.org/10.1207/s15327914nc5201_4

[4] Isenring, E.A., Capra, S. and Bauer, J.D. (2004) Nutrition Intervention Is Beneficial in Oncology out Subjects Receiving Radiotherapy to the Gastrointestinal or Head and Neck Area. *British Journal of Cancer*, **91**, 447-452. https://doi.org/10.1038/sj.bjc.6601962

[5] Brookes, G.B. (1985) Nutritional Status—A Prognostic Indicator in Head and Neck Cancer. *Otolaryngology—Head and Neck Surgery*, **93**, 69-74. https://doi.org/10.1177/019459988509300114

[6] Neumayer, L.A., Smout, R.J., Horn, H.G. and Horn, S.D. (2001) Early and Sufficient Feeding Reduces Length of Stay and Charges in Surgical Patients. *Journal of Surgical Research*, **95**, 73-77. https://doi.org/10.1006/jsre.2000.6047

[7]   Heys, S.D., Walker, L.G., Smith, I. and Eremin, O. (1999) Enteral Nutritional Supplementation with Key Nutrients in Subjects with Critical Illness and Cancer: A Meta-Analysis of Randomized Controlled Clinical Trials. *Annals of Surgery*, **229**, 467-477. https://doi.org/10.1097/00000658-199904000-00004

[8]   Smedley, F., Bowling, T., James, M., Stokes, E., Goodger, C., O'Connor, O., *et al*. (2004) Randomized Clinical Trial of the Effects of Preoperative and Postoperative Oral Nutritional Supplements on Clinical Course and Cost of Care. *British Journal of Surgery*, **91**, 983-990. https://doi.org/10.1002/bjs.4578

[9]   Potter, J., Langhome, P. and Roberts, M. (1998) Routine Protein Energy Supplementation in Adults: Systematic Review. *British Medical Journal*, **317**, 495-501. https://doi.org/10.1136/bmj.317.7157.495

[10]   Lewis, S.J., Egger, M., Sylvester, P.A. and Thomas, S. (2001) Early Enteral Feeding versus "Nil by Mouth" after Gastrointestinal Surgery: Systematic Review and Meta-Analysis of Controlled Trials. *British Medical Journal*, **323**, 773-776. https://doi.org/10.1136/bmj.323.7316.773

[11]   Canzan, F., Caliaro, A., Cavada, M.L., Mezzalira, E., Paiella, S. and Ambrosi, E. (2022) The Effect of Early Oral Postoperative Feeding on the Recovery of Intestinal Motility after Gastrointestinal Surgery: Protocol for a Systematic Review and Meta-Analysis. *PLOS ONE*, **17**, e0273085. https://doi.org/10.1371/journal.pone.0273085

[12]   Jones, J.M. (2002) The Methodology of Nutritional Screening and Assessment Tools. *Journal of Human Nutrition and Dietetics*, **15**, 59-71. https://doi.org/10.1046/j.1365-277X.2002.00327.x

[13]   Kondrup, J., Allison, S.P., Elia, M., Vellas, B., Plauth, M. and the Educational and Clinical Practice Committee, European Society of Parenteral and Enteral Nutrition (ESPEN) (2003) ESPEN Guidelines for Nutrition Screening 2002. *Clinical Nutrition*, **22**, 415-421. https://doi.org/10.1016/S0261-5614(03)00098-0

[14]   ASPEN Board of Directors and the Clinical Guidelines Task Force (2002) Guidelines for the Use of Parenteral, Enteral Nutrition in Adult and Pediatric Patients. *Journal of Parenteral and Enteral Nutrition*, **26**, 1SA-138SA.

[15]   Jeejeebhoy, K.N. (1994) Clinical and Functional Assessments. In: Shils, M.E., Olson, J.A. and Shike, M., Eds., *Modern Nutrition in Health and Disease*, 8th Edition, Lea and Febiger, Philadelphia, 126-154.

[16]   Detsky, A.S., Baker, J.P., Mendelson, R.A., Wolman, S.L., Wesson, D.E. and Jeejeebhoy, K.N. (1984) Evaluating the Accuracy of Nutritional Assessment Techniques Applied to Hospitalized Patients: Methodology and Comparisons. *Journal of Parenteral and Enteral Nutrition*, **8**, 1539. https://doi.org/10.1177/0148607184008002153

[17]   Detsky, A.S., McLaughlin, J.R., Baker, J.P., Johnston, N., Whittaker, S., Mendelson, R.A., *et al*. (1987) What Is Subjective Global Assessment of Nutritional Status? *Journal of Parenteral and Enteral Nutrition*, **11**, 8-13.

[18]   (1993) Guidelines for the Use of Parenteral and Enteral Nutrition in Adult and Pediatric Patients. American Society for Parenteral and Enteral Nutrition. *Journal of Parenteral and Enteral Nutrition*, **17**, 1SA-52SA.

[19]   Silva Fink, J., Daniel de Mello, P. and Daniel de Mello, E. (2015) Subjective Global Assessment of Nutritional Status—A Systematic Review of the Literature. *Clinical Nutrition*, **34**, 785-792. https://doi.org/10.1016/j.clnu.2014.12.014

[20]   Wu, B., Yin, T.T., Cao, W., Gu, Z.D., Wang, X., Yan, M. and Liu, B. (2010) Validation of the Chinese Version of the Subjective Global Assessment Scale of Nutritional Status in a Sample of Subjects with Gastrointestinal Cancer. *International Journal of Nursing Studies*, **47**, 323-331. https://doi.org/10.1016/j.ijnurstu.2009.07.003

[21]   Shirodkar, M. and Mohandas, K.M. (2005) Subjective Global Assessment: A Simple and Reliable Screening Tool for Malnutrition among Indians. *Indian Journal of Gastroenterology*, **24**, 246-250.

[22]   Pimenta, F.S., Oliveira, C.M., Hattori, W.T. and Teixeira, K.R. (2018) Agreement between Subjective Global Nutritional Assessment and the Nutritional Assessment of the World Health Organization. *Jornal de Pediatria* (*Rio J*), **94**, 602-608. https://doi.org/10.1016/j.jped.2017.09.007