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Accuracy of global subjective assessment versus objective determination for assessment of nutritional status in cancer patients: A single-center observational study

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Abstract

Introduction: The study's objective was to determine the accuracy of the Global Subjective Assessment(GSA) versus the Objective Assessment (OA) of the nutritional status of cancer patients.

Methodology: This observational study was carried out at the IESS Hospital in Santo Domingo-Ecuador from January to May 2018. Patients with cancer of any organ were included, and the variables were age, sex, and type of neoplasia. OA uses body mass index (BMI), % body fat, upper arm circumference, upper arm muscle circumference, serum albumin, and hemoglobin. The Subjective Global Assessment test used internationally by FD Ottery, 2000 was applied

Results: A total of 114 patients were analyzed, 59 men (51%). The average age was 69 ± 13.6 years in men and 55 ± 15.7 years in women. Within the GSA-A (Well Nourished) category, 62.7% are men, and 69.1% are women. In the GSA-B & C categories (moderate and severe malnutrition), 37.3% of men and 30.9% of women had malnutrition. The BMI was 28.8 Kg/m^2 in GSA-A and 24.2 in GSA-B & C, P<0.0001. The % body fat was 31.3% in GSA-A and 24.7% in GSA- B & C (P=0.0047). Arm circumference in GSA-A was 30.3 cm, and in GSA-B & C, it was 25.97 cm (*P*<0.0001). Sensitivity (S) of 12.8% of the GSA for body mass index, specificity (Sp) 100%; accuracy (A) 70.2%; GSA for % body fat S: 41.0%, Sp: 88%, A: 71.9%. GSA for arm circumference S: 71.8%, Sp: 65.3%, A: 67.5%.

Conclusion: When relating the subjective global assessment versus body composition in anthropometry, it indicates a high correlation, with the body mass index and percentage of fat mass, showing high sig- nificance value p:(0.000), highlighting a greater commitment in the classification of caloric-energy mal- nutrition, between the subjective global assessment relationship versus brachial circumference and mean arm circumference, obtaining a high significance (0.002) in protein-energy reserve.

Keywords:
MESH: neoplasms; nutritional status; nutritional epidemiology; nutritional surveys.

Introduction

Cancer patients have great difficulty maintaining or improving their nutritional status; this determines the need to identify early measures of nutritional support or surveillance, which can prevent progressive deterioration induced by the disease itself, metabolic alteration induced by the tumor, physiological changes produced by the effects of cancer treatment and the pres- ence of symptoms (stress, depression, anorexia, vomiting, diarrhea, pain), deterioration, which frequently triggers severe protein-calorie malnutrition, exacerbated by increased energy ex- penditure and poor intake, leading the patient to tumor cachexia syndrome with a complex of interactions between proinflammatory cytokines and host metabolism characterized by weight loss, reduced fat and muscle mass, anorexia with reduced intake, early satiety, hypoal- buminemia, anemia, and progressive weakness [1].

It is estimated that the incidence of malnutrition in cancer patients ranges from 15-40% at the time of diagnosis and increases to 80-90% in cases of advanced disease. Its maximum expression is tumor cachexia, which affects 15-40% of patients [2]. The consequences will imply the appearance of more complications after surgery, more extended hospital stays, re- duced effectiveness of chemotherapy and radiotherapy, increased risk of toxicity, reduced functional capacity, and higher mortality [3].

Although weight loss may be the most apparent indicator of deteriorating nutritional status in cancer patients, this is only one of several aspects that can be evaluated for a correct diagnosis of nutritional compromise. The clinical history, significant morbid history, presence of anorexia, food consumed, skin and pharyngeal alterations, edema, evaluation of folds, cur- rent drug treatments, and laboratory tests are essential, as they provide relevant information about the patient's condition [4]. Various methods for estimating nutritional status are cur- rently used, which can be divided into objective and subjective methods. The different meth-ods vary in their specificity for detecting malnutrition [4].

The objective nutritional evaluation is based on measurements of different parameters, which reflect the nutritional status; the frequent measurements are anthropometric measurements, estimation of body composition, and biochemical laboratory tests, the latter being frequently used due to their easy access. , relatively low cost and reproducibility [5].

The Global Subjective Assessment (GSA) is a valuable tool with information such as weight evolution, current dietary intake about usual intake, digestive symptoms present in the last two weeks, functional capacity and metabolic requirements, early identification of mal- nourished patients or at-risk of being malnourished in order for them to benefit from intensivenutritional support.

The GSA has a sensitivity of 96-98% and a specificity of 82-83% in cancer patients and an inverse correlation between the variation in the GSA and the quality of life of these patients; its usefulness is given by the ease with which it detects whether the patient is at risk of suffering complications derived from their inadequate nutritional status, and it is used to make deci- sions about monitoring the nutritional status and its treatment [6].

The recognition that nutrition in oncology has determined that specialists state from different forums that it is crucial to maintain a good nutritional state during the therapeutic process of cancer patients; for this, nutritional strategies must be structured within reach of medical personnel and nutritionists.

For these reasons, the diagnosis of nutritional status is unavoidable; it is considered that an important tool is the GSA of the patient to obtain effective results in the application of the therapeutic plan, and the intervention of the oncologist and nutritionist is essential for good nutritional management. of the patient, so it is necessary to implement an appropriate care protocol so that all patients diagnosed with cancer start their treatment with a nutritional as- sessment at regular intervals with more significant support in the stages of radiotherapy or chemotherapy. The purpose of intervening quickly is to reduce the risks of malnutrition or in- creased risk of nutritional complications due to their illness or due to the treatments applied.

This research analyzes the accuracy of the subjective global assessment versus the ob- jective determination for evaluating nutritional status in cancer patients, considering that the GSA is a quick method that does not imply higher costs but provides handy information to identify the nutritional conditions of the patient.

Materials and methods

Study design

The present study is observational-descriptive, and the source is prospective.

Study area

The study was carried out in the outpatient service of the Oncology service of the Ecuadorian Institute of Social Security Hospital in Santo Domingo, Ecuador. The study period was from January 1, 2018, to May 30, 2018.

Universe and scenery

The universe was made up of all the patients registered in the institution. The sample size calculation was nonprobabilistic, census type, where all incident cases in the study period were included.

Participants

Cases of patients diagnosed with cancer of any organ who agreed to participate in the re- search were included. Patients with severe cases who could not answer the questions were excluded.

Variables

The descriptive variables were age, sex, type of neoplasia, and time of evolution. Objective assessment of nutritional status used body mass index, body compromise, upper arm circum- ference, arm muscle circumference, serum albumin, and hemoglobin. The subjective global assessment test was performed.

Procedures, techniques, and instruments.

The data on age, sex, time of evolution, and type of neoplasia were collected from the institu- tional electronic medical record (AS400) in a form designed exclusively for this purpose. For the objective assessment of nutritional status, measurements were made in situ using the following procedures depending on the measurement taken.

- The subject's body weight, a Tanita Model TBF Bioimpedance scale was used.

- Height cm, a Seca brand stadiometer was used.

A Tanita Model TBF-511 impedance balance was used.

- Arm Circumference: To calculate the protein-energy reserves, the measurement of the average arm circumference was taken; for this, the patient was standing, with his arms at his sides and his palms facing the trunk, and the arm circumference was identified. The midpoint of the arm through the technique: Keep the arm flexed at 90°, locate the distal point of the acromion toward the olecranon, measure the distance, mark the midpoint, leave the arm re- laxed and take the measurement, an instrument to use Anthropometric tape, dry brand, with reference by age and sex.

- Mean Arm Muscular Circumference: To determine the protein reserve, the result of the brachial circumference and the measurement of the tricipital fold was used. With these nu- merical data, the following equation was used:

= Arm circumference - Triceps fold.

Subjective Global Assessment: To record the information on the Global Subjective Assessment, an instrument designed for this purpose was used, and for data collection, subjec-tive global assessment instructions were used.

Avoidance of bias

To guarantee the reliability of the information, the researchers were trained in data collection. A double checklist was used to include the cases. The data were validated and cured by the principal investigator.

Statistical analysis

Once the information was compiled in an Excel spreadsheet, it was entered into a data matrix of SPSS™ 25.0 software (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version
25.0. Armonk, NY: IBM Corp.). Descriptive statistics were used based on frequencies and per- centages for the qualitative variables and the quantitative measures of central tendency. A diagnostic test was performed to determine sensitivity and specificity.

Results

The analysis included 114 patients.

Clinical characterization

59 men (51%) and 55 women (49%). The average age was 69 ± 13.6 years in men and 56 ± 15.7 years in women. The minimum age was 26 years in men and 20 years in women, and the machine age was 89 years in men and 84 years in women. The type of cancer is presented inTable 1.

Table 1 . Type of cancer present in study participants

Type of cancer in man	No.=59	Type of cancer in women	No.=55
Prostate	24 (21.05%)	Mother	14 (12.28%)
lymphoma	15 (13.15%)	Gastrointestinal	13 (11.40%)
Skin	6 (5.26%)	Cervix, ovary, and vulva	11 (9.64%)
Head and neck	2 (1.75%)	Thyroid and lymphoma	9 (7.89%)
testicle and bladder	3 (2.63%)	Skin	5 (4.38%)
Thyroid, lymphoma, and adrenal	5 (8.4%)	Others	3 (2.63%)
Others	4 (3.5%)		18 (8.96%)

Subjective overall assessment

Within the category A Well Nourished, 62.7% of the male sex and 69.1% of the female sex were classified. In categories B, moderately malnourished, and C, severely malnourished, 37.3% were male and 30.9% were female (Table 2).

Table 2. Subjective overall assessment.

Nutritional category	Men No.=59	Women No.=55
A	37 (62.7%)	38 (69.1%)
B and C	22 (37.3%)	17 (30.9%)

Objective assessment of nutritional status

Table 3 shows the group of diagnostic tests used for the objective assessment of nutritional status. Table 4 shows the averages of the objective variables of the nutritional state for the states of normal nutrition (A) and malnutrition (B and C). Table 5 shows the comparative diagnostic tests between objective assessment versus subjective assessment.

Table 3. Objective assessment of nutritional status.

	Half	Variance	Minimum	Maximum
Body mass index (kg/m2)	27.25 ± 5.6	31.40	15.3	15.3
% body fat	29.00 ±11.93	142.31	5.7	5.7
Arm circumference (cm)	28.79 ± 4.72	22.30	16.0	16.0
Arm muscle circumference (cm)	25.50 ± 3.30	10.88	14.7	14.7
Albumin (g/dl)	4.21 ± 0.58	0.339	2.2	2.2
Hemoglobin (g/dl)	12.7 ± 1.94	3,764	4.7	4.7
Hematocrit (%)	39.73 ± 5.2	27.44	17.5	17.5

Table 4. Objective assessment of nutritional status and subjective assessment.

	A	B and C	P
Body mass index (kg/m2)	28.81	24.24	<0.0001
% body fat	31.25	24.67	0.0047
Arm circumference (cm)	30.25	25.97	<0.0001
Arm muscle circumference (cm)	24.39	28.79	<0.0001
Albumin (g/dl)	4.29	4.06	0.0472
Hemoglobin (g/dl)	13.1	11.93	0.0019
Hematocrit (%)	40.7	37.86	0.0055

Table 5. Diagnostic tests for subjective global assessment of the nutritional status

		GSA				
		Yes No.=39	Nope No.=75	Sensitivity	Specificity	Accuracy
DG. body mass index	Yes	5	0	12.8%	100%	70.2%
	Nope	3. 4	75			
DG. total body fat	Yes	16	9	41.0%	88.0%	71.9%
	Nope	23	66			
DG. arm circumference	Yes	28	26	71.8%	65.3%	67.5%
	Nope	eleven	49			
DG. arm muscle circumference	Yes	30	39	76.9%	48.0%	57.9%
	Nope	9	36			

GSA: Global subjective assessment.

Discussion

The present study was carried out on patients of both sexes with a sample of 114 patients (59 men, 55 women) with cancer who attended the IESS Santo Domingo General Hospital outpa- tient clinic, with a minimum age of 20 years and a maximum of 89 years, with a predominance for both sexes of the type of gastrointestinal carcinoma with 24%, 24% determined for pros- tate, and 14% for breast. The accuracy of the subjective global assessment was 70.2% in measuring the body mass index, 71.9% in estimating the percentage of body fat, 67.5% in es- timating the arm circumference, and 57.9% in estimating the muscular arm circumference.

Malnutrition is a frequent complication in cancer patients; the results of the nutritional status of the patients are found and evaluated by subjective global assessment (GSA) based on the following parameters: weight, food intake, moderate gastrointestinal symptoms, bio- chemical tests, functional capacity, nutritional needs, physical examination, and physical ex- amination of the patient evaluating three aspects: fatty tissue, muscle mass, and hydration status.

According to the Global Subjective Assessment of Cancer Patients, 62.7% of male pa- tients and 69.1% of female patients were classified as category A or "Well Nourished." In cat- egories B, which corresponds to "moderately malnourished," and C, "severely malnourished,"37.3% of male patients were classified, and 30.9% were female.

As observed in table 4, the states of malnutrition B and C of the subjective assessment corresponded to the lowest measured values of body mass index, percentage of body fat, lower arm circumference measured in centimeters, lower albumin, hemoglobin, and hemato-crit, all of which were statistically significant with a P value <0.05.

Global subjective assessment is a means to assess nutritional status based on clinical parameters; the intention is to determine the usefulness of the GSA for clinical nutrition to verify whether patients with malnutrition are adequately identified. As is known in chronic dis- eases such as renal failure, obesity has been a protective factor [7] and has not been suffi- ciently studied in cancer patients.

A scored version for cancer patients includes a numerical score and the overall global rating [8]. The scoring system allows patients at risk of malnutrition to be identified and eval- uated for nutritional intervention. It may be helpful to monitor short-term changes in nutritional

status, as it was recently validated against GSA and has been accepted as the gold standard for nutrition assessment for cancer patients; it has a sensitivity of 96-98% and a specificity of 82-83% by the American Dietetic Association Oncology Nutrition Dietary Practice Group [9].

New prospective studies in the future should address the issue of obesity and survival incancer patients.

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Conclusions

When relating the subjective global assessment versus body composition in anthropometry, it indicates a high correlation, with the body mass index and percentage of fat mass, showing high significance value p:(0.000), highlighting a greater commitment in the classification of caloric-energy malnutrition, between the subjective global assessment relationship versus brachial circumference and mean arm circumference, obtaining a high significance (0.002) in protein-energy reserve.

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Administrative information

Abbreviations

GSA: global subjective assessment.BMI: Body mass index.

Additional Files

None declared by the authors.

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Author contributions

Lilian Narcisa Moya García: conceptualization, validation, visualization, methodology, project management, writing: review and editing.

Silvia Gallegos Espinoza: conceptualization, data curation, formal analysis, fundraising, research, resources, software, writing - original draft.

All authors read and approved the final version of the manuscript.

Ethics committee approval

It does not apply to observational studies.

Consent for publication

It does not apply when the patients' images, X-rays, or tomographies are not published.

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