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IDENTIFICATION OF NUTRITIONAL RISK IN CANCER PATIENTS TREATED AT A SPECIALIZED OUTPATIENT CLINIC OF A PUBLIC HEALTH HOSPITAL

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ABSTRACT

Malnutrition is commonly found in cancer patients, being one of the most frequent complications, caused by the metabolic and physical effects of cancer, or by the side effect of treatment. This study evaluated nutritional status according to the Subjective Global Assessment Produced by the Patient (SGA-PP) and associated clinical and nutritional factors in cancer patients. This was a cross-sectional study conducted with adult and elderly patients diagnosed with cancer treated at the Chemotherapy Center of the Hospital de Clínicas of the Federal University of Triângulo Mineiro, in Uberaba, Minas Gerais (2021-2022). After signing the informed consent, the patients answered a form with sociodemographic, clinical, and nutritional data, and SGA-PP. Weight, height, and the evaluation of arm and calf circumference were also evaluated. For all analyses, $p<0.05$ was considered significant. A total of 90 patients participated in the study, most of whom were men (61.11%), with a higher prevalence of gastrointestinal tract neoplasms (54.44%). When applying SGA-PP, 83.33% of the patients were classified as suspected or moderately malnourished and severely malnourished. The adjusted regression model showed that patients in urgent need of nutritional management presented the use of oral supplementation as a protective factor (PR: 0.72; 95%CI: 0.54-0.97) and were associated with a higher prevalence of PC, inadequate AC, and inadequate BMI. The patients in this study had a high prevalence of malnutrition according to SGSA-PP, BMI, CP and percentage of adequacy of the AC. Patients malnourished according to SGA-PP were associated with lower anthropometric measurements and poorer quality of life.

Keywords: Malnutrition. Neoplasms. Nutritional status. Nutritional Assessment.

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INTRODUCTION

Cancer is considered a chronic non-communicable disease (NCD), characterized by the disordered growth of cells. It is one of the most complex public health problems that the Brazilian health system faces, given its epidemiological, social and economic magnitude (INCA, 2011). In Brazil, the estimate for the three-year period from 2023 to 2025 points out that there will be 704 thousand new cases of cancer, and the distribution of incidence by geographic region shows that the South and Southeast regions concentrate about 70% of the incidence, and in the Southeast Region, half of the cases are found (INCA, 2022).

Malnutrition is commonly found in cancer patients, and one of the most frequent complications can be induced by the metabolic and physical effects of cancer, or can be a side effect of anticancer treatment (Yin et al., 2021; Fabiano and Buttow, 2024). The prevalence of malnutrition can range from 15 to 20% at the time of diagnosis and increase up to 80-90% in cases of advanced disease (Slobodianik and Feliu, 2023; Ferreira *et al*., 2024).

To date, the Subjective Global Patient-Produced Assessment (SGA-PP) is the only assessment tool specially developed to assess the nutritional status of cancer patients (Yin *et al*., 2021). The earlier the identification of nutritional status, the better the possibilities to prevent complications of malnutrition, improve quality of life such as initiation, tolerance and response to treatment (Lopes *et al*., 2024; Slobodianik and Feliu, 2023).

Technological and medical advances have expanded the possibilities of early diagnosis and treatment, however, cancer remains an experience of great complexity, affecting multiple aspects of the individual's life (De Matos *et al*., 2025; De Souza *et al*., 2024).

In view of the context and analyzing the importance of identifying the nutritional status of cancer patients and the set of factors that influence the nutritional status of these patients, this study aimed toevaluate the nutritional status according to the SGA-PP and associated clinical and nutritional factors in cancer patients.

METHODS

STUDY DESIGN

The study had a cross-sectional, analytical and associative design carried out with adult and elderly patients diagnosed with neoplasia treated at the Chemotherapy Center of

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the Hospital de Clínicas of the Federal University of Triângulo Mineiro (HC-UFTM), located in Uberaba, Minas Gerais.

SAMPLE SERIES AND SAMPLE SELECTION

The population was composed of adult and elderly patients who underwent nutritional follow-up at the outpatient clinic of the Chemotherapy Center of the HC-UFTM.

A minimum sample was calculated and estimated at a prevalence of 40% of malnutrition for cancer patients (Dos Santos *et al.*, 2012), considering a power of 90%, design effect of 1.0, level of significance and error of 5%. For a 95% confidence level, 73 volunteers were to be recruited for the research, plus an additional 10% for possible losses and 10% for confounding factors, generating a total of 90 participants. The sample size was calculated using the OpenEpi software program (Dean AG, Sullivan KM, Soe MM.). The calculation took into account the confidence level of 95%, maximum permissible error of 5% and power stipulated at 80%. To maintain the quality of the study results, the Strengthening *the Reporting of Observational Studies in Epidemiology* (STROBE) checklist for observational studies was adopted.

All patients aged 18 years or older with a diagnosis of neoplasia who were being followed up at the Chemotherapy Center of the HC/UFTM and who were treated by the Clinical Nutrition team were invited to participate in the study. Patients who did not have a diagnosis of neoplasia and who were not seen by the Clinical Nutrition team or who did not accept to participate in the research were not included.

Patients who met the eligibility criteria signed the Informed Consent Form (ICF), based on the research project approved by the Research Ethics Committee of the HC-UFTM, with CAAE number: 48147321.3.0000.8667 and opinion 4.856.25.

DATA COLLECTION PROCEDURE

The evaluation of the patients who agreed to participate in the research took place on the day of the appointment with the Nutrition team, at the Chemotherapy Center. After signing the ICF, the collection began with the completion of the semi-structured form that contained sociodemographic, clinical, and nutritional data, and the application of the Subjective Global Assessment Produced by the Patient (ASG-PP).

The ASG-PP consists of two sections, the first includes questions about recent weight loss, food intake, symptoms that may interfere with food intake, and patients' level of

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physical activity. The second section includes the identification of weight loss, metabolic stress, the presence of disease and its relationship with nutritional needs, in addition to the physical examination. Each item of the ASG-PP has a separate score, and the individual items are summed together to obtain the final score. A score ≥9 was set as an indication of malnutrition in this study due to the current cut-off score of 9 being appropriate for initiating an urgent nutritional intervention (Yin *et al*., 2021). The SGA-PP was also used according to the categories defined in A: well nourished, B: suspected or moderate malnutrition, and C: severely malnourished.

Some clinical data such as type of neoplasm, medications used, and type of treatment were obtained from the patients' electronic medical records through the Management Application for University Hospitals (AGHU). The patients were asked about the use of food supplements, number of meals, consumption of water, alcoholic beverages, smoking, sleep quality, food consumption and company for meals.

ANTHROPOMETRY

Body weight and height were measured on an electronic digital mechanical scale with a built-in stadiometer of up to 2 meters, of the Filizola® brand, with a maximum capacity of 150 kg and sensitivity of 100g. BMI (kg/m²) was calculated and classified according to the cutoff points defined by the World Health Organization (WHO, 1995) for adults and according to the Pan American Health Organization (PAHO, 2002).

Arm and calf circumference were measured using an inelastic tape measure, using the patient's right side. With the measurement of the AC, the adequacy of the BC was calculated, using the standard values of the 50th percentile of Frisancho (1990). The classification of nutritional status was according to Blackburn & Thornton (1979). The classification of calf circumference (NC) was considered adequate when NC ≥ 33cm for women and NC≥34cm for men (Barbosa *et al*., 2016).

ADJUSTMENT VARIABLES

Sociodemographic information was the adjustment variables for the multivariate analyses. For this, the following information was collected in a standard form used in the study: gender and age.

DATA ANALYSIS

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The digitization of the data took place in the Google Sheet spreadsheet, (Google® application). Soon after, it was transferred to the conference and organization of the data in the Microsoft Excel program (Microsoft®, Albuquerque, New Mexico, USA), Office Professional version 365®. The data verification was carried out by two researchers, independently.

Data analysis was performed using the Stata® statistical software. To check normality and data distribution, the Kolmogorov-Smirnov normality test and interpretation of the histogram of the variables were used. After this interpretation, parametric or non-parametric tests were selected. The descriptive analysis of the quantitative variables (discrete and numerical) was presented in the values of mean, median, standard deviation (SD) and interquartile range. Categorical variables were presented with the values of absolute and relative frequencies by means of tables.

Pearson's Chi-Square and Chi-Square Linear Trend analyses were performed using the classification of SGA-PP into two categories: Eutrophic - well nourished and malnourished - suspected or moderate malnutrition and severely malnourished. The Man-Whitney test was performed using the SGA-PP categorized as ≥9 points and < 9 points, as this score is appropriate for the initiation of an urgent nutritional intervention.

Crude and adjusted Poisson regression was used to verify the association between the SGA-PP score and the clinical and anthropometric variables evaluated in the study. The regression data were presented and interpreted with the crude and adjusted prevalence ratio (PR), 95% confidence interval (95%CI) and p.

Explanatory variables that obtained a p-value of less than 20% ($p<0.200$) were included in the adjusted regression model. For all analyses, $p<0.05$ was considered significant.

RESULTS

A total of 90 patients participated in the study, predominantly men (61.11%) with a mean age of 64.14±10.38 years, who self-declared themselves white (60.0%) and mostly married (46.67%).

When verifying the clinical characteristics, it was observed that most types of neoplasms were of the gastrointestinal tract (54.44%), followed by the respiratory tract (16.67%) and blood (11.11%), genitourinary tract and other neoplasms corresponded to 8.89%, respectively. The most cited type of clinical treatment was chemotherapy and

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concomitant radiotherapy (24.44%), followed by chemotherapy (24.44%). It was observed that 60% of the patients had one or more comorbidities diagnosed by a physician and that 54.44% used four or more medications daily per day (Table 01).

Table 01 – Clinical characteristics of cancer patients treated at an oncology outpatient clinic in Minas Gerais, 2021-2022 (N=90)

Type of Cancer	N	%
Gastrointestinal Tract	49	54,44
Respiratory Tract	15	16,67
Blood red	10	11,11
Genitourinary tract	8	8,89
Other	8	8,89
Type of Treatment		
Didn't start	17	18,89
Chemotherapy	19	21,11
Chemotherapy and radiotherapy	22	24,44
Chemotherapy and surgery	5	5,56
Chemotherapy, radiotherapy, and surgery	5	5,56
Other	15	16,67
Radiotherapy	7	7,78
Comorbidities		
No	36	40,00
One	27	30,00
Two	12	13,33
Three or more	15	16,67
Daily medication		
No	9	10,00
One	13	14,44
Two or three	19	21,11
Four or more medications	49	54,44

N: sample size; %: percentage

Regarding the patients' lifestyle habits, 48.89% reported not consuming alcoholic beverages and 41.11% had stopped consuming. Regarding smoking, 40.0% reported having quit smoking and 21.11% still continued with the habit. When asked about sleep quality, 52.23% reported regular or poor sleep, and 36.67% of the patients required sleep medication in the last month. The participants' average sleep was 7.16±1.99 hours/day.

Regarding the consumption of nutritional supplements, 43.33% reported not using them, 13.33% of the patients evaluated used a nasoenteral tube. The frequency of 1 time/day of oral supplement consumption was the most cited (53.85%).

The symptoms that were most described were pain (51.11%) and asthenia (57.78%) and other complaints (60.0%), with the other complaints described as anxiety, depression, dental problems, panic syndrome and irritability. Symptoms such as nausea (46.67%),

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diarrhea (12.22%), constipation (40.00%), change in food taste (37.08%), dry mouth (44.44%) and dysphagia (41.11%) were also identified (Table 02).

Table 02 – Symptoms presented by patients with neoplasia, treated at an oncology outpatient clinic in Minas Gerais, 2021-2022 (N=90)

Symptoms	N	%
Nausea		
Yes	42	46,67
No	48	53,33
Diarrhoea		
Yes	11	12,22
No	79	87,78
Constipation		
Yes	36	40,00
No	54	60,00
Vomiting		
Yes	23	25,56
No	67	74,44
Pain		
Yes	46	51,11
No	44	48,89
Changing taste of food		
Yes	33	37,08
No	56	62,92
Dry Mouth		
Yes	40	44,44
No	50	55,56
Wounds		
Yes	17	18,89
No	73	81,11
Dysphagia		
Yes	37	41,11
No	53	58,89
Asthenia		
Yes	52	57,78
No	38	42,22
Other Complaints		
Yes	54	60,00
No	36	40,00

N: sample size; %: percentage.

When checking the anthropometric data, 61.11% of the patients were underweight according to BMI, 63.64% had NC classified as inadequate, in relation to the adequacy of the AC, and 61.80% were malnourished (Figure 01).

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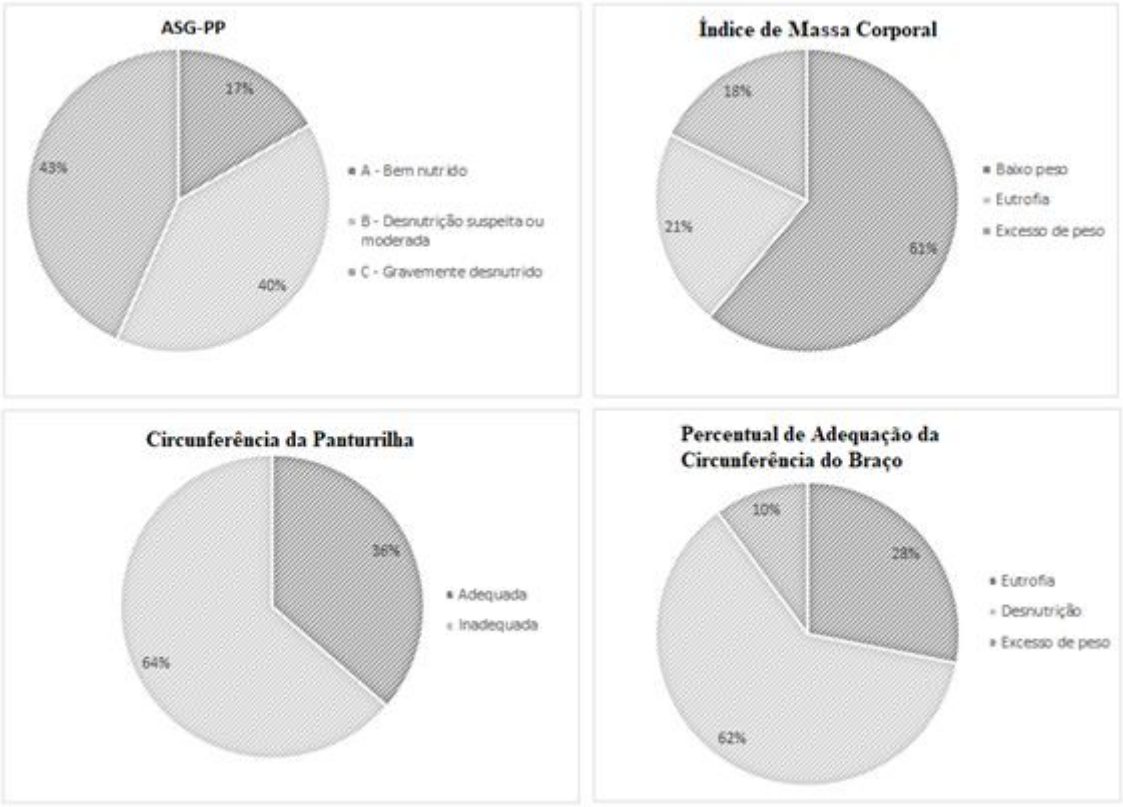
Figure 01 – Nutritional status according to the Subjective Global Assessment Produced by the Patient and anthropometric data of patients treated at the oncology outpatient clinic of a public health hospital (N=90).



When applying SGA-PP, 40.0% of the patients were classified as having suspected or moderate malnutrition and 43.33% were identified as severely malnourished. The mean SGA-PP score was 14.08±7.54 (Figure 01). When assessing the need for nutritional intervention according to the SGA-PP score, it was found that 75.56% of the patients had a score greater than or equal to 9, 18.89% had a score between 4 and 8, and 4.44% had a score between 2 and 3.

Patients malnourished according to SGA-PP were associated with not having the presence of company during meals (93.75%), using oral supplementation (89.74%), having inadequate NC (91.07%) and malnutrition according to the adequacy of BC (90.91%) and BMI (90.91%) ($p<0.05$) (Table 03).

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Table 03 – Association between SGA-PP and clinical and anthropometric variables of patients treated at the oncology outpatient clinic of a public health hospital (N=90)

Variables	ASG-PP		P value
	Eutrophs N (%)	Malnourished N (%)	
Meal company[1]			
Yes	13 (27,66)	34 (72,34)	0,015*
No	2 (6,25)	30 (93,75)	
Use of Oral Supplementation[1]			
No	11 (28,21)	28 (71,79)	0,041*
Yes	4 (10,26)	35 (89,74)	
CP			
Proper	9 (28,13)	23 (71,88)	0,018*
Inadequate	5 (8,93)	51 (91,07)	
Adequacy of the BC			
Eutrophy and Overweight	9 (26,47)	25 (73,53)	0,224
Malnutrition	5 (9,09)	50 (90,91)	
BMI			
Eutrophy and overweight	10 (28,57)	25 (71,43)	
Malnutrition	5 (9,09)	50 (90,91)	0,016*
Brown/black/indigenous	3 (8,57)	32 (91,43)	

N: sample size; %: percentage. Pearson's Chi-square test and Fisher's exact test.
ASG-PP: criteria B and C = malnourished
*p<0.05: statistical significance.

Regarding the need for nutritional intervention, patients with ≥9 scores had lower BMI, WC and NC values (p<0.05) (Table 04). The adjusted regression model showed that patients in urgent need of nutritional management presented the use of oral supplementation as a protective factor (PR: 0.72; 95%CI: 0.54-0.97) and were associated with a higher prevalence of NC, adequate AC, and inadequate BMI (Table 4).

Table 04 - Association between the level of nutritional intervention according to the SGA-PP and anthropometric variables of patients seen at the oncology outpatient clinic of a public health hospital (N=90).

Anthropometric variables	ASG-PP		P value
	<9 Points Average±DP	≥9 points Average±DP	
Body mass index	25.29±6.83	20.26±4.93	0,001*
Arm circumference	29.73±4.70	25.78±5.06	0,011*
Calf circumference	34.62±3.91	31.35±5.02	0,002*

Note: BMI: body mass index, CB: arm circumference, CP: calf circumference. *p<0.05: statistical significance. Man-Whitney Test

DISCUSSION

The present study aimed to evaluate the nutritional status according to SGA-PP and associated clinical and nutritional factors in cancer patients treated at the Chemotherapy Center of a public health hospital. The association of SGA-PP with the clinical and anthropometric data of cancer patients was evaluated. The study found a high prevalence of malnutrition both by the application of the SGA-PP and by the anthropometric

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assessment. Malnutrition due to SGA-PP was associated with lack of company during meals, the use of oral supplementation, and the inadequacy of the anthropometric measurements evaluated. Patients malnourished by SGA-PP and in need of immediate nutritional intervention were the ones with the highest prevalence of inadequate anthropometric measurements.

Malnutrition is caused by a lack of nutrient intake or absorption and nutritional risk screening is recommended for all inpatients on admission and outpatients at the first visit (Bullock *et al*., 2019). Its prevalence can vary between 20 and 50% in hospitalized adults, being 40 to 60% at the time of patient admission, in Latin American countries (Toledo *et al*., 2018).

In this study, patients diagnosed with gastrointestinal tract neoplasia prevailed. Cancer of the gastrointestinal tract has a high prevalence of cases in Brazil, being one of the most incident types of cancer (Oliveira *et al*., 2023). Malnutrition is common in these patients, and can reach up to 80% of cases. The high prevalence may be due to obstruction of the digestive system by the tumor or to the presentation of symptoms such as dysphagia, odynophagia, nausea, vomiting, abdominal pain, sensation of gastric fullness, loss of appetite and weight loss, side effects of surgery and associated therapies (Lopes *et al.*, 2024, Defteros *et al,* 2021).

The study found different types of symptoms that interfere with the intake and absorption of nutrients, such as constipation, dry mouth, asthenia, dysphagia and other alterations that also corroborate the high prevalence of malnutrition in the evaluated public and lower quality of life. For this reason, nutritional screening is necessary even when nutritional risk is not manifestly present, since the impact of early nutritional intervention on the quality of life of cancer patients has been proven (Bezerra *et al*., 2024).

The ASG-PPP has been used to screen and monitor the nutritional status of cancer patients, being an instrument of easy applicability, allowing an immediate analysis of nutritional status and risk, enabling early intervention (INCA, 2016). The SGA-PP has a score that allows the identification of patients at nutritional risk, who can thus be referred to different levels of nutritional intervention (Gonzalez *et al.*, 2010).

The association between patients malnourished by SGA-PP with anthropometric measurements and those with scores greater than or equal to nine also with anthropometric measurements, demonstrates the importance of screening and early nutritional assessment in this population. Most patients had inadequate BMI, NC and BC adequacy

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measurements. Weight loss above 10% of basal total body weight is known to lead to a decreased response to chemotherapy and a reduced survival rate (Tavares *et al*., 2023). Malnutrition in these patients can progress to cachexia, a condition of severe protein-energy malnutrition that can progress to death (Frio *et al*., 2015).

The presence of sarcopenia is common in individuals with cancer, and it is defined as low musculoskeletal mass, grip strength, and gait speed (Fabiano and Buttow, 2024). There are several reasons for muscle mass loss in cancer patients, such as exacerbated energy expenditure, anorexia, inflammation, and unbalanced cancer metabolism (Deng *et al*., 2021).

The literature reinforces that after identifying the nutritional risk, the objectives of nutritional therapy should be outlined. Aiming to provide a sufficient amount of energy, proteins, minerals and vitamins (INCA, 2016). It is worth noting that the supply of nutrients is not always associated with consumption and proper use by the body. Several factors are involved in the process of malnutrition, which is often neglected in the clinical environment, among which the presence of anorexia, activation of the systemic inflammatory response, alteration in nutrient metabolism and resting energy expenditure can be highlighted (Valenzuela-Landaeta *et al*., 2012). These factors lead to complications that lead to a worse immune response, delay in the healing process, high risk of surgical and infectious complications, greater probability of developing pressure ulcers, increased length of hospital stay, and risk of mortality (Toledo *et al*., 2018, Bullock *et al*., 2020; Lopes *et al.,* 2024).

Dietary intake and utilization measures are essential to diagnose malnutrition, as these changes in consumption or assimilation can lead to calorie deficit and consequent weight loss (Bullock *et al*., 2020). In this study, the use of food supplements was a protective factor. Oral nutritional supplementation is a strategy that can be used in cancer patients to complement nutritional needs. It is indicated for patients who are at nutritional risk, malnutrition, insufficient food intake through the conventional oral route, as well as for pre- and postoperative patients in order to avoid complications and reduce hospitalization time (Ferreira *et al*., 2024).

The importance of the nutritionist in the nutritional monitoring of cancer patients together with the multidisciplinary team is emphasized. Performing nutritional screening early allows nutritional conducts to be instituted that go beyond the provision of an

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adequate nutritional intake of macronutrients and micronutrients, including the improvement of the outcome over time (Lopes *et al.*, 2024).

STRENGTHS AND LIMITATIONS

This study has as a limitation the non-use of dietary surveys to assess food consumption and the non-use of biochemical tests that could be used to detect inflammatory processes and contribute to the assessment of nutritional status. However, we highlight the use of validated methods for the evaluation of cancer patients through the application of ASG-PP (Gonzalez *et al.*, 2010) and the acquisition of anthropometric measurements that were used simultaneously with the aim of increasing the sensitivity of the assessment methods. Anthropometric data were able to identify patients with malnutrition, and this method is simple, easy to apply, and low cost, and can be easily applied in outpatient consultations.

CONCLUSIONS

The results of the present study showed that cancer patients treated at the Chemotherapy Center of a public hospital had a high prevalence of malnutrition according to SGA-PP, BMI, NC and percentage of AC adequacy. Patients malnourished according to SGA-PP were associated with lower anthropometric measurements and poorer quality of life.

The early identification of malnutrition in cancer patients and the rapid establishment of therapeutic approaches is essential to reduce morbidity and mortality, providing better quality of life and response to the treatment instituted.

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