MEDICINE

Nutritional profile of cancer patients treated at an outpatient oncology center in the south region of Brazil

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ABSTRACT. To evaluate the nutritional profile of cancer patients treated at an oncology center in South Brazil. This is a descriptive, exploratory and sectional study that was developed in a process that involved 100 patients aged between 18 and 75 years old, suffering from cancer. The anthropometric variables studied were weight, height, Body Mass Index (BMI), arm circumference (AC), arm muscle circumference (AMC), triceps skinfold (TSF) and corrected arm muscle area (cAMA). For subjective nutritional assessment, we used the Patient-Generated Subjective Global Assessment (PG-SGA). Nearly half of the patients evaluated had a critical need for nutritional intervention. There was a statistically significant association between cAMA and marital status, age and gender; between AC and age, gender and staging; between AMC and staging; between BMI and marital status and age; and between TSF and marital status. Patients diagnosed with IV stage had the lowest values for nutritional variables. There was no significant association between nutritional status of patients obtained by the PG-SGA instrument and sociodemographic characteristics. Malnutrition should be diagnosed as soon as possible, aiming at early intervention and improving survival and quality of life. Therefore, early nutritional assessment in cancer patients is required, combining subjective and objective methods.

Keywords: nutritional profile; cancer patient; anthropometric variables.

Introduction

Cancer is admittedly a public health issue and represents the second leading cause of death among the global population (World Health Organization [WHO], 2020). In Brazil, for the biennium 2018-2019, it is estimated the occurrence of four hundred and ninety thousand (490.000) new cases, excluding the non-melanoma skin cancer, which would add about one hundred and seventy thousand (170.000) new cases. In view of its multifactorial etiology and influence of genetic and epigenetic factors, the nourishment has been shown as an important influential element in the carcinogenesis. There are evidences that a balanced diet, rich in natural food and limited in ultra-processed food, can prevent up to four million new cases of cancer per year worldwide (Santos, 2018).

Malignant neoplasms are associated with evident metabolic and nutritional changes, including intense catabolism, immune dysfunction, weight loss and lean body mass loss (Chindaprasirt, 2015). The assessment and diagnosis of the cancer patient's nutritional risks allow to improve the prognosis by avoiding the establishment of real malnutrition (Lennon, Sperrin, Badrick, & Renehan, 2016). In contrast, many neoplasms were considered associated with the obesity, such as breast, endometrial, ovarian, prostatic, colon, renal cell, pancreatic, liver, gallbladder and esophageal adenocarcinomas (Silva et al., 2018).

Therefore, the present study aimed to assess, objectively and subjectively, the nutritional profile of ambulatory cancer patients treated at an oncology center in the south region of Brazil.

Material and method

Ethical considerations

The study Protocol was approved by the Research Ethics Committee of the Health Area of the UniCesumar (Process nº 3.373.230), and complied with Resolution nº 166/12 of the National Health Council and the main ethical principles of the Declaration of Helsinki.

Patients studied

This is a cross-sectional exploratory descriptive study of cross-sectional design and quantitative approach, performed in a town of the South of Brazil. Took part in the study one hundred (100) patients of both genders, from 18 to 75 years of age, previously diagnosed from anatomopathological examination with malignant neoplasia, linked to the Oncology Department of Santa Rita Hospital, at the city of Maringá, Paraná, Brazil.

In the study were considered eligible individuals with: age equal or over 18 years of age; clinically capable of answering the questionary and be submitted to a subjective and anthropometric assessment; and with diagnosis of malignant neoplasia, confirmed by a histologic examination. The patients with non-melanoma skin cancer or with cancer recurrence; previously submitted to surgery, radiotherapy and/or chemotherapy were excluded.

The sample recruitment occurred from the first appointment, when the patients received all the necessary information regarding the questionnaires, data collect and research goals, being solved all the possible doubts. Upon acceptance and signing of the free and informed consent form, a semi-structured instrument for a sociodemographic assessment was applied. For the clinical-pathological staging characterization, it was used the classification established by the *Cancer Staging Manual* published by the *American Joint Committee on Cancer* (AJCC) (Edge & Compton, 2010).

In sequence, the patients were submitted to a subjective and objective assessment of the nutritional state, as described below.

Anthropometry

Anthropometric data were obtained by health professionals and graduate students from the nutrition course, who received special training aimed at standardization the study. The weight was measured using a Filizola® scale. When the measurement was not possible, the weight was estimated by the equation proposed by Chumlea, Roche and Steinbaugh (1988). For that it was calculated the percentage point (PP) utilizing the formula: Current Weight - Usual Weight/Usual Weight x 100. It was considered significant weight loss equal or superior to 5% in one month; equal or superior to 7.5% in three months; and equal or superior to 10% loss in six months (Lohman & Champaign, 1992).

The height measurement was performed utilizing a stadiometer coupled to the same Filizola® scale, according to procedures recommended by the literature (Aguiar et al., 2019). When the measurement was not possible, it was estimated by the equation of Chumlea, Guo, and Steinbaugh (1994) in the case of patients up to 59 years old, or of Chumlea, Roche and Steinbaugh (1985) in the case of patients 60 years old and over.

For the body mass index (BMI) calculation, it was utilized the formula proposed by Quetelet (1842). The adult patients classified according to the World Health Organization [WHO] (1997) and the elderly (aged 60 years old and over) according to the cutoff points recommended by the Pan American Health Organization in the 'health, well-being and aging' project (SABE) (Pan American Health Organization [PAHO], 2001).

For the arm circumference measurement, the patient's arm was flexed toward the chest, forming an 90° angle. With a flexible tape, the arm was contoured at the midpoint between the acromion and the olecranon. The triceps skinfold (TSF) was measured to evaluate changes in the calorie reserves in the form of fat. For the AC e TSF classification of adult patients the cutoff points established by Frisancho (1990) were used. For the elderly, the recommendations of Barbosa, Souza, Lebrão, and Marucci (2006) were applied.

With the goal to assess the quantity and variation rate of the muscle protein, the arm muscle circumference (AMC) was calculated according to the formula of Gurney and Jelliffe (1973), and classified according to Frisancho (1981) for adult individuals, and Barbosa et al. (2006) for elderly patients.

The corrected arm muscle area (cAMA) was also calculated and assessed to verify the muscle tissue reserve by correcting bone area. For the calculus, the equations proposed by Heymsfield, McManus, Smith, Stevens, and Nixon (1982) were chosen. The Frisancho (1990) recommendations were applied for the adult's classification and the Barbosa et al. (2006) cutoff points were used for the elderly.

Nutritional assessment

The Patient-Generated Subjective Global Assessment (PG-SGA) is a subjective assessment method of the nutritional status validated for cancer patients. From this questionnaire, aspects involving weight loss, alterations in food intake, gastrointestinal symptoms, symptoms associated with the neoplastic treatment or the tumor itself, functional changes and physical examination of the patient were assessed. Thus, the patients were classified into three categories (A = well nourished, B = moderate or suspected malnutrition and C = severe malnutrition), besides generating a numerical score (Ravasco, Monteiro-Grillo, Vidal, & Camilo, 2013).

Statistical analysis

At first, a descriptive analysis of the results was performed to obtain graphs and frequency tables, in order to characterize the patients assessed. To verify the existence of an association between the qualitative variables, the chi-square test for association was applied (Sheskin, 2003). For the assessment of the relationship between the variables, the Pearson's correlation coefficient was applied. All the analysis was performed with the aid of the R statistical environment (R Development Core Team, 2015), version 3.3.1.

Results

The sociodemographic and clinical characteristics of one hundred (100) study participants are presented in Table 1 and the classification of frequencies of each nutritional variable are shown in Table 2.

Table 1. Distribution of sociodemographic and clinical characteristics frequencies of the study participants.

Factors	n (%)
Age	
From 28 to 40 years old	8 (8%)
From 41 to 60 years old	43 (43%)
61 years old and over	49 (49%)
Gender	
Female	43 (43%)
Male	57 (57%)
Income	
From R$ 880,00 to R$ 1.760,00	58 (58%)
From R$ 1.760,00 to R$ 3.520,00	33 (33%)
From R$ 3.520,00 to R$ 5.280,00	3 (3%)
From R$ 5.280,00 to R$ 7.040,00	0 (0%)
From R$ 7.040,00 to R$ 8.800,00	1 (1%)
Over R$ 8.800,00	0 (0%)
Unknown	5 (5%)
Years of study	
None / illiterate	13 (13%)
1 to 5 years	41 (41%)
5 to 10 years	22 (22%)
More than 10 years	23 (23%)
Not informed	1 (1%)
Religion	
Catholic	67 (67%)
Evangelical	25 (25%)
Not informed	3 (3%)
Other	5 (5%)
Marital Status	
Married	55 (55%)
Single	9 (9%)
Divorced	14 (14%)
Widower	17 (17%)
Other	3 (3%)
Not informed	2 (2%)
Skin Color	
White	63 (63%)
Brown	27 (27%)
Yellow	0 (0%)
Black	8 (8%)
Red/indigenous	0 (0%)
Did not answer	2 (2%)
Comorbidities*	
None	38 (38%)
Systemic Hypertension	48 (48%)
Diabetes Mellitus	20 (20%)
Renal Insufficiency	3 (3%)
Stroke	5 (5%)
Acute myocardial infarction	4 (4%)
Thrombosis	4 (4%)
Osteoporosis	2 (2%)
Others	15 (15%)
Staging	
I	16 (16%)
II	32 (32%)
III	26 (26%)
IV	22 (22%)

* One patient can have more than one comorbidity.

Table 2. Distribution of frequencies and descriptive measures of the variables related to the nutritional classification of the study participants.

Nutritional variable	n (%)	Average
cAMA (Adults)		
Mild Malnutrition	4 (8.51%)	
Severe Malnutrition	12 (25.53%)	41.74
Normal	31 (65.96%)	
AC (Adults)		
Malnutrition Risk	12 (25.53%)	
Malnutrition	10 (21.28%)	
Eutrophy	17 (36.17%)	30.29
Obesity	8 (17.02%)	
AMC (Adults)		
Malnutrition Risk	5 (10.64%)	
Malnutrition	10 (21.28%)	24.24
Adequate	32 (68.09%)	
BMI (Adults)		
Thinness grade 1	2 (4.26%)	
Thinness grade 2	0 (0%)	
Thinness grade 3	2 (4.26%)	
Eutrophy	19 (40.43%)	
Pre-obese	13 (27.66%)	26.25
Obesity grade 1	9 (19.15%)	
Obesity grade 2	0 (0%)	
Obesity grade 3	2 (4.26%)	
TSF (Adults)		
Malnutrition	5 (10.64%)	
Fat Deficit	3 (6.38%)	
Fat Deficit Risk	8 (17.02%)	19.45
Normal	22 (46.81%)	
Excess Fat	9 (19.15%)	
cAMA (Elderly)		
Malnutrition Risk	4 (7.55%)	
Malnutrition	14 (26.42%)	47.84
Adequate	31 (58.49%)	
Not Measured	4 (7.55%)	
AC (Elderly)		
Malnutrition Risk	4 (7.55%)	
Malnutrition	9 (16.98%)	
Adequate	17 (32.08%)	
Overweight	9 (16.98%)	31.38
Obesity	12 (22.64%)	
Not Measured	2 (3.77%)	
AMC (Elderly)		
Malnutrition Risk	9 (16.98%)	
Malnutrition	4 (7.55%)	25.66
Adequate	37 (69.81%)	
Not Measured	3 (5.66%)	
BMI (Elderly)		
Underweight	13 (24.53%)	
Adequate Weight	16 (30.19%)	
Pre-obese	7 (13.21%)	
Obesity	15 (28.30%)	27.08
Obesity grade 1	1 (1.89%)	
Obesity grade 2	0 (0%)	
Obesity grade 3	1 (1.89%)	
TSF (Elderly)		
Malnutrition Risk	3 (5.66%)	
Malnutrition	12 (22.64%)	
Adequate Weight	26 (49.06%)	
Overweight	6 (11.32%)	18.08
Fat Excess	2 (3.77%)	
Obesity	2 (3.77%)	
Not Measured	2 (3.77%)	

Abbreviations: cAMA - corrected arm muscle area; AC - Arm circumference; AMC - Muscle Circumference; BMI - Body Mass Index; TSF - Triceps skinfold.

Nine patients were excluded due to the incomplete form filling, making it impossible to calculate the PG-SGA scores. Thus, the final sample was composed of ninety-one (91) patients.

Through the numerical score measured in the PG-SGA, almost half of the assessed patients presented a critical necessity of a nutritional intervention (score ≥ 9). However, when considering those with a 4 to 8 score, it is observed that 72% of the patients needed nutritional intervention (Table 3). The results of

the association test between the variables relevant to the study of the research participants are presented below (Table 4).

Table 3. Distribution of grade and score frequencies of the patients measured by the PG-SGA.

Classification and PG-SGA score	n (%)
PG-SGA grade	
Well nourished (grade A)	31 (31)
Moderate or suspected malnutrition (grade B)	47 (47)
Severe malnutrition (grade C)	13 (13)
PG-SGA score	
0–1: No need for an intervention	2 (2)
2–3: Education of the patient and family members	17 (17)
4–8: Necessity of a nutritional intervention	28 (28)
≥ 9: Critical necessity of a nutritional intervention	44 (44)

PG-SGA, global subjective assessment produced by the patient himself

Table 4. Association test results between the demographic characteristics and the nutritional classifications of the research participants.

Characteristics	cAMA		AC		AMC		BMI		TSF	
	χ^2	p-value	χ^2	p-value	χ^2	p-value	χ^2	p-value	χ^2	p-value
Skin Color	6.55	0.886	12.13	0.435	3.21	0.781	24.66	0.076	19.53	0.360
Education	35.98	0.055	26.89	0.310	11.39	0.496	34.19	0.363	36.28	0.456
Marital Status	51.35	0.009*	42.77	0.061	20.23	0.163	70.50	0.002*	66.19	0.021*
Age	83.81	< 0.001*	46.53	< 0.001*	8.87	0.181	72.83	< 0.001*	71.53	< 0.001*
Religion	19.73	0.348	16.23	0.577	12.38	0.192	25.34	0.388	15.81	0.957
Income	17.49	0.827	17.59	0.822	8.31	0.761	24.89	0.811	26.91	0.864
Gender	18.00	0.006*	18.56	0.005*	7.19	0.066	14.58	0.068	9.36	0.405
Staging	19.88	0.339	37.60	0.004*	20.02	0.018*	28.07	0.257	26.39	0.497

*p-value < 0.05. Abbreviations: cAMA - corrected arm muscle area; AC - Arm circumference; AMC - Muscle Circumference; BMI - Body Mass Index; TSF - Triceps skinfold.

It is noticed that when establishing the significance level at 5%, there are evidences of association of cAMA with the marital status (p-value of 0.009), with age (p-value < 0.001) and with gender (p-value of 0.006). In addition, the AC measurement was associated with age (p-value < 0.001), gender (p-value of 0.005) and staging (p-value of 0.004).

When considering the AMC of the patients, it is shown that it was significantly associated only with staging (p-value of 0.018), while the BMI had indications of association with marital status (p-value of 0.002) and age (p-value < 0.001). Also, the TSF measurement presented association with marital status (p-value of 0,021) and age (p-value < 0.001). Finally, it was observed that despite an apparent difference in TSF and BMI measurements according to gender, it was not possible to detect significance in the association between these variables.

The distribution of the nutritional variables regarding the characteristics that presented significant association is shown in Figure 1.

When analyzed the variables related to the nutritional status of the individuals in contrast to marital status, it was observed that divorced individuals presented smaller measures of cAMA, AC, AMC and TSF.

It is also noteworthy that the group of widowed individuals had the highest measurements of cAMA, AC and AMC. Still, when observing the individuals regarding the age classification, the 28 to 40 years old patients seem to present smaller BMI measures and larger TSF measures, while the ones 61 years old and over apparently show the smallest TSF measures. Regarding gender, it appears that there is an apparent difference in the distribution of all variables, and the measures tend to be smaller among women.

Still, it is possible to notice that the patients who present staging classified as IV, in general, presented the smaller values for the nutritional variables.

The Table 5 shows the association test between the sociodemographic characteristics of the research patients and their classifications by the PG-SGA instrument. It is possible to notice that there was no significant association between the nutritional classification of patients obtained by the PG-SGA instrument and the sociodemographic characteristics.
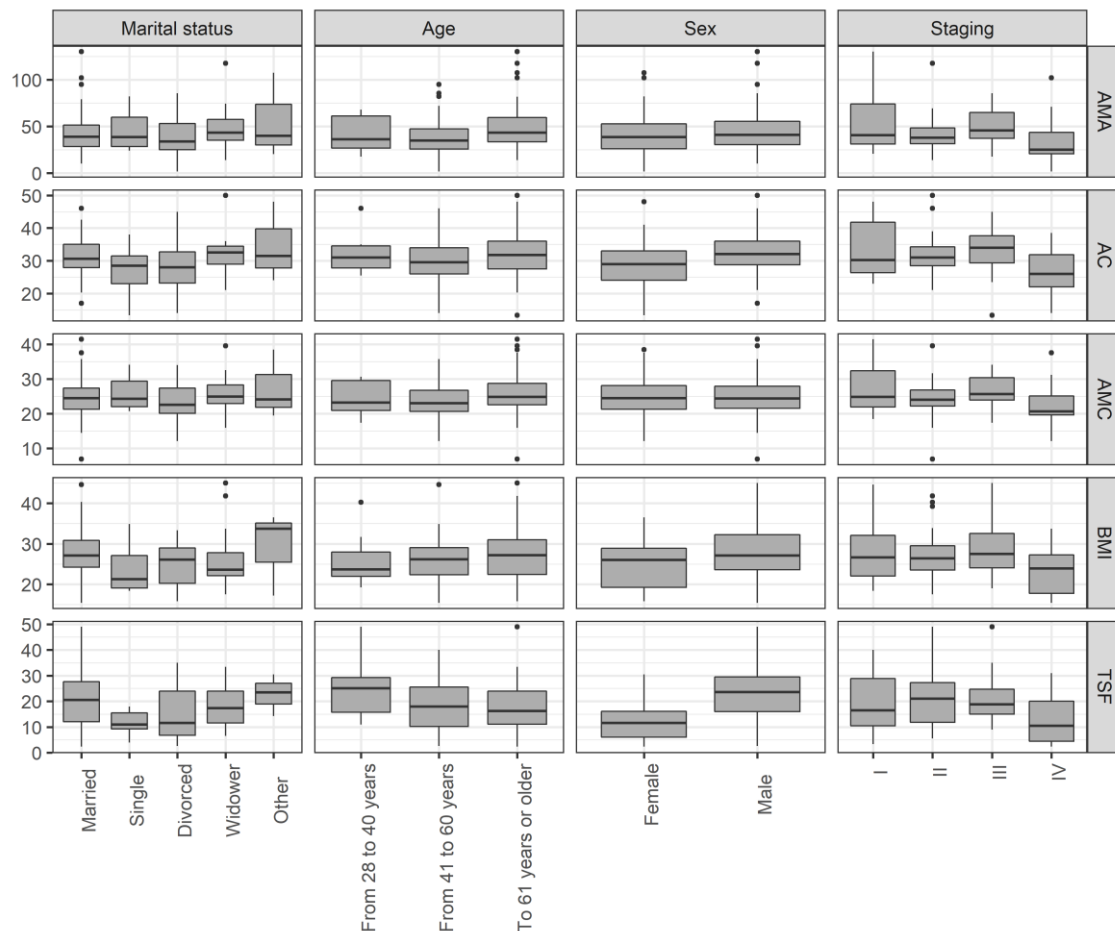
Figure 1. Distribution of nutritional variables versus characteristics of the research patients.

Table 5. Association test results between the sociodemographic characteristics of the research participants and their classifications by the PG-SGA grade.

Characteristic	Grade (PG-SGA)		Score (PG-SGA)	
	χ^2	p-value	χ^2	p-value
Skin Color	2.40	0.663	4.44	0.618
Education	12.10	0.060	13.79	0.130
Marital Status	10.16	0.427	12.54	0.637
Age	9.33	0.053	10.72	0.097
Religion	5.14	0.526	10.43	0.317
Income	12.89	0.116	15.13	0.234
Gender	1.38	0.500	4.14	0.247
Staging	9.86	0.131	12.66	0.179

*p-value < 0.05 PG-SGA, global subjective assessment produced by the patient himself.

Discussion

The PG-SGA is an essentially clinical method that includes composition and functional changes in the body of the patient, being highlighted among the tools used for cancer patients (Cunha et al., 2014). Also, other tools have been described in the literature, such as the NRS-2002 instrument, Malnutrition Universal Screening Tool (MUST) and the Mini Nutritional Assessment (MNA). However, like all subjective methods, both have their observer-dependent diagnostic accuracy (Fruchtenicht et al., 2015; Brown, Feliciano, & Caan, 2018).

Still, objective analyses were proposed to complement the nutritional assessment. Laboratory parameters allow the clinician to assess the body protein reserve and predispose its immune competence, being useful even in monitoring the effectiveness of nutritional therapy (Fruchtenicht et al., 2015; Pin, Barretos, Sofá, Bonneto, & O'Connell, 2019). However, both the PG-SGA and the other nutritional assessment tools available to date, have important limitations when applied alone, and there is no ideal tool (gold-standard). Therefore,

the combination of different methods is suggested in order to increase specificity and sensitivity in the nutritional profile assessment (Brown et al., 2018; Santos, Christofaro, Gomes, Junior, & Gobbo, 2017).

It is a fact that the cancer incidence increases with advancing age, becoming especially high in individuals over 65 years of age (Silva, Borges, Cruz, & Pena, 2018), which is possibly associated with longer exposure to risk factors. In the present sample, approximately half of the individuals were 61 years old and over. In the study carried out by Silva et al. (2018), whose goal was to assess the association between nutritional status and grip strength in cancer patients, the elderly population reached 70% of the sample.

Not only the diagnosis, but also treatment and prognosis of cancer can be influenced by comorbidities (Williams et al., 2016). Comorbid patients present shorter survival, higher risk of toxicity to antineoplastic drugs and, consequently, higher chance of hospitalization when compared to patients without comorbidities (Gomes & Maio, 2017). In this study, 62% of the patients reported the coexistence of at least one underlying pathology, with hypertension and diabetes mellitus being the most prevalent, present in 48 and 20% of the cases, respectively. In the study of Gomes and Maio (2017), performed with 30 patients with an average of 49.1 ± 16.4 years of age, 13.3% of the patients reported being hypertensive; 10%, diabetics; 3.3%, hypertensive and diabetics; while 73.3% showed no comorbidity. The significant difference in the prevalence of comorbidities between the two samples may be explained by the age of the selected individuals, pointing to the fact that the older the individual, the greater is the chance of associated diseases and the greater need for care, especially when choosing the institution of treatment.

The BMI, for it is an easy-to-use tool, it has been used for decades to classify the patients as underweight, eutrophic or obese (Silva et al., 2018). In our study, more than 50% of adults and 45% of the elderly presented BMI above the ideal for the age group. Pointing to the tendency of overweight in cancer patients, Silva et al. (2018), in a study with 68 patients from the oncology and chemotherapy outpatient clinic, showed that 67.6 and 69.1% of the patients were overweight by the BMI and TSF, respectively, with an average BMI of 29.5 kg m^{-2}.

However, when assessed the muscle mass through cAMA, although a significant portion of the evaluated sample had some degree of overweight, more than 30% of both adults and elderly, presented cAMA below the ideal for their age, pointing to a loss of lean mass. This shows that there is a concomitance between lean mass reduction and excess adiposity, called 'sarcopenic obesity' (Pin et al., 2019), which is defined by the coexistence of sarcopenia and excess body fat (Lima et al., 2017).

The muscle loss, both in quantity and function, is defined as sarcopenia, and in cancer patients is related to the release of proinflammatory mediators (tumor necrosis alpha factor, interferon gamma, interleukin 1 beta and interleukin 6), release of catabolic substances by the tumor, action of neurohormones, nutritional deficiency, low physical activity, antineoplastic and other drugs, surgery or radiotherapy involving muscle areas, immunotherapy and hormone therapy (Chindaprasirt, 2015; Rodrigues et al., 2019). This data alerts to the need to devote an adequate attention to the nutritional status of the individual with cancer.

Thus, it is appropriate in this context, to address the 'obesity paradox', which refers to the fact that, although obesity is associated to a high mortality rate in the general population, when it comes to cancer patients, there is an imminent protective effect on overweight and obese patients (Silva et al., 2018). In a study performed by Meyerhardt et al. (2017), for example, with patients with colorectal cancer (CRC), it was concluded that weight loss was significantly associated with high mortality of these patients, while weight gain was not associated with CRC mortality or even overall mortality. Also, it was found a 15% increase in specific mortality by CRC for every 2% of weight loss. In addition, Baracos and Arribas (2018) report that sarcopenic obesity is independently associated to high mortality and high rate of complications in the systemic therapy and surgical treatment of neoplasia.

Moreover, the BMI showed a statistically significant correlation with age and marital status, as did the cAMA and TSF variables. Rodrigues et al. (2019), in a study with 127 patients admitted to the hematology ward, also found a significant correlation between BMI and age; however, no significant association was found between age and AC.

As the disease progresses, it is common for cancer patients to develop cachexia, a metabolic disorder resulting from altered energy metabolism and muscle protein turnover, leading to the weight loss in these individuals (Santos, Souza, Santos, Santos, & Oliveira, 2017). The advanced staging at initial diagnosis (observed in 48% of cases) can be related to the low monthly family income and the low level of education of the sample here studied, given that such part of the population has reduced access to healthcare and, when they have it, the delay in performing complementary examinations and/or proper referral influence greatly on the staging of the disease.

In turn, the stage IV of the disease was correlated with worse results in nutritional variables and there was a statistically significant association between staging and AC and AMC variables. It is pertinent to point out that in advanced stages of the disease, there is a greater decrease in muscle mass, due to the pathophysiological mechanisms previously mentioned, added to important metabolic dysfunctions and worsening nutritional status, being characterized as an indicator of worse prognosis, worsening of physical capacity and a reduction in survival and quality of life (Vale et al., 2015).

In our study, it was observed a statistically significant association between marital status and cAMA, BMI and TSF variables. In addition, divorced individuals presented lower measures of cAMA, AC, AMC and TSF and widowed presented higher measures of cAMA, AC and AMC. However, no studies assessing this association were found in the literature.

Regarding the nutritional status assessment through the PG-SGA tool, 47% of the patients were classified as having moderate or suspected malnutrition and 44% of patients presented a score ≥ 9, which points out to a critical need for nutritional intervention. These data are corroborated by the result obtained by Vale et al. (2015), whose sample of 188 patients from the Chemotherapy Service of the University Hospital at the Federal University of Pelotas (UFPel), using the same assessment scale, obtained 40.4, 46.8 and 12.8% of patients classified in grades A, B and C, respectively. Also, 44.2% of the patients presented a score ≥ 9, and it was significantly associated with age > 60 yrs, stage III disease, head, neck and lung tumors. In our study, there was no significant association between PG-SGA grade and score with the sociodemographic characteristics assessed.

As already mentioned, 60% of the patients in our study, through PG-SGA, showed some degree of malnutrition. Possible factors related to this data are the metabolic changes and anorexia inherent to the clinical condition. The study of Gomes and Maio (2017) pointed out that 46.4% of the assessed patients reported they were eating less due to gastrointestinal symptoms secondary to the treatment, such as nausea, hyporexia and xerostomia.

This study aimed to assess, objectively and subjectively, the nutritional profile of ambulatory cancer patients treated at an oncology center in the south of Brazil. Malnutrition and sarcopenia are common conditions in cancer patients, due to the association of factors involving poor nutrition, altered energy metabolism, increased catabolism rate, release of tumor-derived factors and neurohormonal action.

It was found that 60% of the individuals assessed had some degree of malnutrition and 44% were in critical need of nutritional intervention, according to the PG-SGA. A total of 45.2% of the elderly and 51% of those under 60 years of age presented BMI above the one considered normal for the age. In contrast, more than 30% of the sample presented cAMA lower than the recommended for the age, pointing to the significant prevalence of 'sarcopenic obesity'.

There was a statistically significant association between marital status and cAMA, BMI and TSF; age and cAMA, AC, BMI and TSF; gender and cAMA and AC; and between staging and AC and AMC. There was no significant association between PG-SGA and sociodemographic variables. In 48% of cases, the advanced staging was found at the initial diagnosis, which establishes an urgent necessity for public awareness about screening programs, as well as greater efficiency in referring patients to referral centers.

Conclusion

Malnutrition, which is already known as an indicator of worse prognosis, should be diagnosed as soon as possible, aiming at early intervention and improving survival and quality of life. Therefore, we strongly recommend the nutritional assessment of patients diagnosed with cancer to be performed as early as possible, combining subjective and objective assessment methods.

As limitations of the study, we can mention the fact that the sample number is not enough to subdivide patients according to the location of the primary tumor, which could contribute to identify the types of neoplasia that most lead to nutritional deviations.

Acknowledgements

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