



# Quality of life and its relation with nutritional status in patients with incurable cancer in palliative care

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## Abstract

**Background** Nutritional impairment is common in cancer patients and adversely affects quality of life (QoL). The aim of this study was to investigate the association between nutritional status and QoL in incurable cancer patients in palliative care.

**Methods** A prospective cohort with incurable cancer patients referred to the specialized Palliative Care Unit of the National Cancer Institute in Brazil was conducted. The nutritional risk (NR) was assessed using the Patient-Generated Subjective Global Assessment short form (PG-SGA SF), and cancer cachexia (CC) was defined according to the international consensus. QoL was evaluated using the Quality of Life Questionnaire Core 15 Palliative (QLQ-C15-PAL). Multivariate linear regressions analyses were performed to assess the relationship between the nutritional status and QoL scores.

**Results** A total of 1039 consecutive patients were included. A high prevalence of NR (85.4%) and CC (78.7%) were observed. The patients with worse nutritional status presented significantly poorer physical, emotional, symptoms domains scales, and overall QoL. CC were significantly associated with QoL scores for dyspnea ( $p = 0.013$ ), insomnia ( $p = 0.046$ ), and appetite loss ( $p = 0.015$ ), while NR were associated with all the QoL domains scales covered in QLQ-C15-PAL.

**Conclusion** Our findings support that impaired nutritional status was associated with poor QoL in incurable cancer patients. NR assessed by PG-SGA SF better reflects physical, emotional, symptom burden, and overall QoL scores. Thus, this tool may contribute in identifying patients at risk of deterioration QoL.

**Keywords** Nutritional status · Cachexia · Malnutrition · Incurable cancer · Quality of life · Palliative care

## Introduction

Cancer is one of the leading causes of death worldwide, and in developing countries, the majority of tumors are diagnosed at an incurable stage [1]. Patients with incurable disease often experience multiple symptoms and functional deficits. The most important goals in palliative care are symptom control and the improvement or maintenance of the quality of life

(QoL) of patients as well as their caregivers, who will also be distressed by the incurable nature of the disease [2]. QoL is a subjective and multidimensional concept that involves functionality, emotional, and cognitive and social functions relating to personal perceptions of health status and the presence of symptoms [3].

The prevalence of nutritional impairment increases as the disease progresses. Malnutrition in palliative care patients is common and diverges according to assessment method, tumor site, and clinical setting [4–7]. In a previous study, we showed that up to 83% of palliative cancer patients were malnourished [8]. Poor nutritional status is associated with negative predictors of outcome in cancer patients including QoL [9–11]. Therefore, nutritional assessment is recommended at all stages of the disease, from diagnosis to end-of-life, making nutrition management a significant component of multimodal cancer care [12].

Suitable nutritional interventions can improve the well-being and QoL of this population [13, 14]. Patients with incurable cancer present additional challenges when it comes to

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supplying patient-centered care. Since nutritional status is potentially modifiable factors known to have a negative impact on prognosis, it is an urgent need to encourage the incorporation of nutritional care into the agenda of oncology health professionals' teams [15].

The relationship between nutritional status and reduced QoL has also been reported in other studies [16–19], but these have involved patients at different stages of the disease and not necessarily in palliative care. In addition, despite the high prevalence of poor nutritional status in incurable cancer patients, there is still a paucity of data in the literature regarding its impact on QoL, particularly in South America.

This study therefore sought to establish the prevalence of nutritional burden determined by two key diagnostic measurements of nutritional status used in clinical practice and to investigate the influence of nutritional status on the QoL of patients in palliative care at a reference cancer care center in Brazil.

## Methods

### Study population

The INCA Ethics Committee (registration number 1.407.458 of 2016) approved this protocol, and all the patients signed informed consent form before participating in the study. The data were collected prospectively at the specialist palliative care unit (PCU) of José Alencar Gomes da Silva National Cancer Institute (INCA) in Rio de Janeiro, Brazil, between June 2016 until June 2018. This PCU is a 56-bed exclusive palliative care in comprehensive oncology center that comprise a tertiary institute for cancer prevention, control, and treatment in Brazil. All newly consecutive referred patients were evaluated during their first visit to the PCU and inpatients within 48 h of hospital admission.

The trained researchers recorded the Karnofsky Performance Status (KPS) score ranges from 0 (death) to 100% (full function), wherein a higher score indicated a better ability to carry out normal daily activities, self-care, and work [20]. The eligible criteria were incurable cancer (defined as not curable but might receive antineoplastic treatment aimed at alleviate symptoms) of any tumor site, both genders, age  $\geq$  20 years, and KPS score  $\geq$  30%. The following data were collected from the electronic medical records: primary cancer site, extent of metastatic disease (if present), previous antitumor treatment, and comorbidities. Furthermore, socio-demographic data (age, gender, and ethnicity), anthropometry, nutritional risk (NR), and QoL were obtained by researchers with patients and recorded in a study-specific questionnaire. A routine laboratory analysis was performed on the day of enrollment at the PCU.

### Anthropometry

Measurements of weight (kilograms; kg) and height (meters; m) were obtained with the patients wearing light clothing and no shoes. A calibrated portable digital scale (Wiso®, model 905, Brazil) with an accuracy of 0.1 kg and 180 kg capacity was used to weigh the patients. For those patients who were unable to stand, an in-bed scale system was used [Stryker®, Go Bed II; Stryker Medical, United States of America (USA)]. Height was measured within 0.5 cm using a tape stadiometer on the wall. When this was not possible, height was estimated using knee height, which was measured with the knee and ankle joints flexed at 90°, using an anthropometer and calculated according to the formulas reported by Chumlea et al. [21]. Body mass index (BMI) was calculated as body weight (kg) divided by height (m) squared. A low BMI was considered a value  $< 20 \text{ kg/m}^2$  [22].

The skinfold thickness of triceps (TSF, mm) was measured using a skinfold caliper Lange® (Cambridge Scientific Industries, USA). We also assessed arm circumference (AC, cm) and mid-arm circumference (MAC) at the same point of TSF. The mid-upper arm muscle area (MUAMA,  $\text{cm}^2$ ) was calculated used the equation proposed by Heymsfield et al. [23]. Low muscle mass was characterized when MUAMA  $< 32 \text{ cm}^2$  for males and  $< 18 \text{ cm}^2$  for females [22].

### Nutritional risk

NR was evaluated using the Portuguese version of the Patient-Generated Subjective Global Assessment short form (PG-SGA SF©), available at [Pt.Goblal.org](http://Pt.Goblal.org), after acquiring permission (©FD Oterry). This tool consists of four boxes in the first part of the PG-SGA, which was self-reported by the patients. Box 1 focuses on weight history (maximum score of 5), box 2 on food intake (maximum score of 4), box 3 on symptoms of nutritional impact (maximum score of 24), and box 4 on functional status (maximum score of 3). The higher the overall score, the worse the nutritional status. Those patients with a PG-SGA SF score of  $\geq 9$  were classified as being at NR [24].

### Cancer cachexia

Patients were classified as cachectic according to the international consensus [22]. One of three criteria had to be met: weight loss (WL)  $\geq 5\%$  in the past 6 months, or BMI  $< 20 \text{ kg/m}^2$ , and WL  $\geq 2\%$  in the past 6 months, or low muscle mass and WL  $\geq 2\%$  in the past 6 months.

### Quality of life

QoL was assessed using the Portuguese version of the Quality of Life Questionnaire Core 15 Palliative (QLQ-C15-PAL) [25,

26]. This tool consists of 15 questions: two multi-item functional scales (physical and emotional functioning), two multi-item symptom scales (fatigue and pain), plus five single-item symptom scales (nausea/vomiting, dyspnea, insomnia, appetite loss, constipation), and one final question referring to overall QoL. Patients self-reported rated each question/item on a numerical scale from 1 (not at all) to 4 (very much), with the exception of global QoL which was rated from 1 (very poor) to 7 (excellent). Each scale was transformed into a score ranging from 0 to 100, according to the respective scoring manual [27]. We considered QLQ-C15-PAL domain scores as continuous variables. The higher the score for the symptom scales, the higher the level of symptomatology, and therefore the lower the QoL. However, conversely, the higher the score for the functional scale and global health status, the higher the level of health and QoL.

### Statistical analysis

A Kolmogorov–Smirnov test was performed to assess distribution symmetry. Descriptive statistics (count/frequency [%], means/ $\pm$  standard deviation, or median/interquartile ranges, as appropriate) were used to describe patient characteristics. Differences in QoL scores by clinical and nutritional variables were evaluated using independent *t* test.

In order to test independent relationships between nutritional status (independent variables) and QLQ-C15-PAL domain scores (dependent variables), several multivariate linear regression models were performed, controlling for gender (female vs. male), age (years), KPS (%), type of tumor (diagnosis of gastrointestinal cancers vs. others), and current location of care (inpatient vs. outpatient). It was created 10 multivariate regression models one for each dependent variable analyzed (physical functioning, emotional functioning, fatigue, nausea/vomiting, pain, dyspnea, insomnia, appetite loss, constipation, and overall QoL). Statistical analysis was performed using Stata® version 12.0 (Stata Corp., College Station, Texas, USA). Statistical significance was set at  $p < 0.05$ .

### Results

A total of 1039 consecutive patients (74.6% outpatients) were included in the study. The mean age was 61.7 ( $\pm$  13.5) years and the majority of the patients were female. The most common type of cancer was that of the gastrointestinal tract, followed by gynecological cancer. The majority of the patients had metastatic disease and received radiotherapy as previous treatment. The median KPS was 50% (Table 1).

Although the mean of BMI is considered proper/suitable, a high mean of WL was verified (13.3%). According to MUAMA, a low average was found in male, but not in female.

**Table 1** Baseline characteristics of patients with incurable cancer ( $N = 1039$ )

Variables	<i>n</i> (%)
Age (years) <sup>a</sup>	61.7 ( $\pm$ 13.5)
Female	579 (55.7)
Ethnicity	
White	466 (45.0)
Black	176 (17.0)
Mixed-race	391 (37.7)
Other	6 (0.3)
Tumor type	
GI tract <sup>c</sup>	335 (32.2)
Gynecology	168 (16.2)
Head and neck <sup>d</sup>	140 (13.5)
Breast	103 (9.9)
Lung	111 (10.7)
Others <sup>e</sup>	182 (17.5)
Metastatic cancer (y/n)	816 (78.5)
Previous treatment (y/n)	
Surgery	422 (40.6)
Chemotherapy	442 (42.5%)
Radiotherapy	634 (61.0%)
Comorbidities (y/n)	
SAH	300 (28.9)
DM	117 (11.3)
CKD	94 (9.1)
Current patient situation	
Inpatient	264 (25.4)
Outpatient	775 (74.6)
KPS (%) <sup>b</sup>	50 (40; 60)
BMI (kg/m <sup>2</sup> ) <sup>af</sup>	22.6 ( $\pm$ 5.5)
WL in 6 months (%) <sup>ag</sup>	13.1 ( $\pm$ 11.1)
MUAMA (cm <sup>2</sup> ) <sup>ah</sup>	365 (37.5)
Male	30.2 ( $\pm$ 11.2)
Female	28.6 ( $\pm$ 11.5)
CRP (mg/L) <sup>b</sup>	5.5 (1.8; 11.8)
Albumin (g/dL) <sup>b</sup>	3.3 (2.7; 3.8)

*N*, number of observations; %, frequency; *GI*, gastrointestinal; *SAH*, systemic arterial hypertension; *DM*, diabetes mellitus; *CKD*, chronic kidney disease; *KPS*, Karnofsky Performance Status; *BMI*, body mass index; *WL*, weight loss; *MUAMA*, mid-upper arm muscle area; *CRP*, C-reactive protein

<sup>a</sup> Mean/standard deviation

<sup>b</sup> Median/interquartile ranges (p25–p75)

<sup>c</sup> Upper and lower gastrointestinal tract

<sup>d</sup> Head and neck = oral and nasal cavity, pharynx, larynx, salivary glands, paranasal sinuses, and eyes

<sup>e</sup> Central nervous system, kidneys, and urinary tract, male reproductive system, hematologic, skin, bones and soft tissues, and unrecognized site  
<sup>f</sup>  $n = 796$

<sup>g</sup>  $n = 998$

<sup>h</sup>  $n = 973$

In addition, low serum albumin and elevated CRP level were verified (Table 1). A total of 79 (9.92%) patients had a BMI  $\geq$

30 kg/m<sup>2</sup>, of which, concomitantly, 52 were cachectic and 56 presented NR (data not shown).

A high prevalence of NR (85.4%) and CC (78.7%) was observed. There was no statistically significant difference in mean overall QoL scores for age and gender, but patients with poor performance status had significantly lower overall QoL. Nutritional impairment was significantly associated with reduced QoL according QLQ-C15-PAL domain scales (physical, emotional, symptoms, and overall QoL). Worst averages of overall QoL domains covered in QLQ-C15-PAL reflect NR ( $p < 0.001$ ) and CC ( $p < 0.05$ ) (Table 2).

Approximately 40% of the patients considered non-cachectic reported a good overall QoL (score  $\geq 6$ ), in contrast with 20% of the CC patients ( $p < 0.001$ ). In relation to the classification of nutritional risk, approximately 60% of the patients not at NR considered their overall QoL to be good (score  $\geq 6$ ), compared to approximately 20% of those at NR ( $p < 0.001$ ) (Fig. 1).

Multiple linear regression analysis demonstrates that all the domains related to QoL were associated with NR determined by PG-SGA SF (Table 3). However, only dyspnea ( $p = 0.013$ ), insomnia ( $p = 0.046$ ), and appetite loss ( $p = 0.015$ ) showed a statistically significant association with CC (Table 4).

## Discussion

The present study reports on unprecedented data from a large sample of incurable cancer patients in palliative care followed at a national reference cancer care center in Brazil [28]. Our results showed that NR as well as CC were significantly related to a worse QoL. Additionally, provides data on the nutritional profile of this population that previously scarce in the country. To our knowledge, this is the first study that investigates the relationship of nutritional impairment determined by two different diagnostic measures with QoL specific in incurable

**Table 2** Mean QoL scores by clinical and nutritional characteristics in patients with incurable cancer

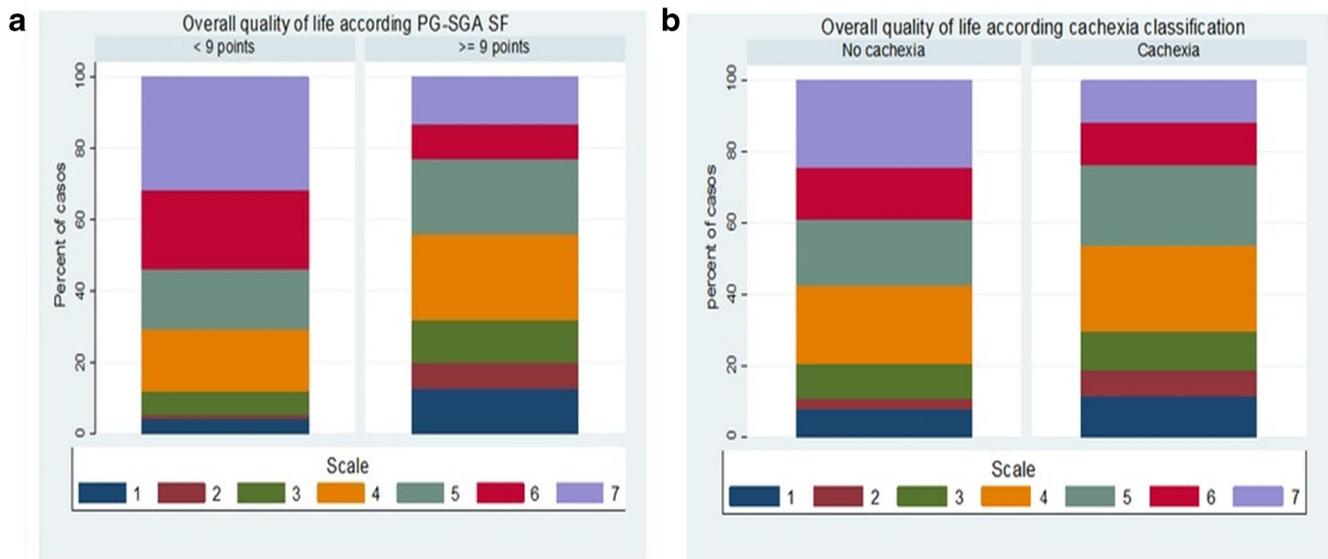
Variables	n (%)	Physical functioning	Emotional functioning	Fatigue	Nausea/vomiting	Pain	Dyspnea	Insomnia	Appetite loss	Constipation	Overall QoL
Age (years)											
< 60	410 (39.5)	62.1	47.1	48.4*	44.6*	56.3*	42.1	42.6	43.6	47.0*	50.7
$\geq 60$	629 (60.5)	62.5	45.7	44.8	38.1	50.1	40.5	42.7	41.5	41.4	48.4
Gender											
Male	460 (44.3)	59.2*	43.6*	42.9*	38.6	51.6	39.9	38.6*	37.4*	40.2*	49.2
Female	579 (55.7)	64.9	48.4	48.9	42.3	53.4	42.1	45.9	46.3	46.3	49.5
KPS (%)											
$\leq 40$	443 (42.6)	43.7**	60.5**	59.7**	46.0**	59.7**	49.5**	51.4**	48.8**	49.6**	47.1*
> 40	596 (57.4)	86.5	36.0	36.3	36.7	47.3	34.9	36.1	37.6	39.2	52.4
WL in 6 months (%)											
$\geq 5$	711 (71.2)	53.7**	41.3**	49.5**	40.9	54.7**	44.0**	46.7**	46.8**	46.7**	50.9*
< 5	287 (28.8)	66.3	48.5	39.0	40.7	47.2	35.3	33.6	32.4	37.6	45.5
BMI (kg/m <sup>2</sup> )											
< 20	280 (35.2)	52.4*	39.3	45.4*	39.1	52.1*	41.4*	44.3*	42.5	44.8	47.5
$\geq 20$	526 (64.8)	59.8	42.1	40.3	37.9	47.3	35.1	36.9	39.3	39.9	47.7
Low MUAMA (cm <sup>2</sup> )											
Yes	365 (37.5)	59.2**	42.1*	47.0	42.4*	56.5	43.6	45.4*	42.6	42.7	48.8
No	608 (62.5)	66.4	48.2	45.5	38.3	50.6	39.3	40.8	41.8	44.1	49.0
Nutritional risk <sup>a</sup>											
Yes	887 (85.4)	36.0**	26.2**	50.2**	44.9**	56.8**	45.9**	47.2**	48.0**	47.8**	51.2**
No	152 (14.6)	66.9	49.7	23.0	16.2	28.3	13.7	16.3	9.2	19.3	38.3
Cachexia <sup>b</sup>											
Yes	818 (78.7)	53.4**	40.5*	48.2**	40.7	54.3*	43.7**	45.2**	44.8**	45.5**	50.5*
No	221 (21.3)	64.8	47.8	38.9	40.7	46.4	31.7	33.3	33.2	36.7	45.2
Total	1039 (100)	62.6	46.3	46.2	40.7	52.6	41.1	42.7	42.4	43.6	49.3

KPS, Karnofsky performance status; WL, weight loss; BMI, body mass index; QoL, quality of life; MUAMA, mid-upper arm muscle area

Mean/standard deviation/*t* test. \* $p < 0.05$ ; \*\* $p < 0.001$

<sup>a</sup> According to PG-SGA SF, Patient-Generated Subjective Global Assessment short form

<sup>b</sup> According International consensus by Fearon et al. [22]



**Fig. 1** Patient response to QLQ-C15-PAL question 15 (1 to 7) according to the classification of (a) nutritional risk and (b) cancer cachexia in advanced cancer patients. QoL, quality of life; PG-SGA SF, Patient-Generated Subjective Global Assessment short form. The difference of

the mean score of question 15 was statistically significant ( $P < 0.001$ ) between **a** subjects not at nutritional risk [ $5.3 (\pm 1.6)$ ] and subjects at nutritional risk [ $4.1 (\pm 1.8)$ ] and **b** non-cachectic [ $4.8 (\pm 1.7)$ ] and cachectic [ $4.1 (\pm 1.8)$ ] subjects

cancer patients. In addition, our results demonstrated that the NR assessed by PG-SGA SF significantly correlated to overall QoL score, physical, emotional, and symptom scales, while CC significantly correlated to some symptom scales.

The relationship between nutrition impaired and QoL in advanced cancer patients have been reported by other previous studies [4, 10, 18, 29, 30]. However, studies with the same scope in incurable cancer patients are limited. Shahmoradi et al. [18] investigated the association between NR and QoL in cancer patients receiving hospice home care with the Hospice Quality of Life Index (HQLI) questionnaire and found that those with

poorer nutritional status exhibited a lower QoL. According to these authors, PG-SGA scores significantly correlated with overall QoL scores, as well as psychophysiological, functional, and social/spiritual well-being [18]. Likewise, in a study conducted with advanced colorectal cancer patients, the QoL score evaluated by the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) was worse among the cachectic and/or malnourished patients when different criteria for nutritional evaluation were used [29]. Daly et al. [30] assessed the relationship between nutritional status evaluated by the BMI adjusted WL grading

**Table 3** Multivariate linear regressions models of nutritional risk as predictive factor of quality of life domain scores in advanced cancer patients ( $N = 1039$ )

Variables	$\beta$ (95% CI) <sup>a</sup>	$p$ value
Physical functioning	-2.754 (-5.455; -0.963)	0.049
Emotional functioning	-4.782 (-9.301; -0.866)	0.050
Fatigue	10.226 (5.225; 15.227)	< 0.001
Nausea/vomiting	22.334 (15.345; 29.324)	< 0.001
Pain	18.325 (12.669; 23.981)	< 0.001
Dyspnea	21.690 (15.589; 27.791)	< 0.001
Insomnia	16.399 (10.016; 22.783)	< 0.001
Appetite loss	29.139 (22.958; 35.320)	< 0.001
Constipation	17.944 (11.794; 24.094)	< 0.001
Overall QoL	8.345 (2.618; 14.072)	0.004

$\beta$ , regression coefficient; CI, confidential interval; QoL, quality of life

<sup>a</sup> Adjusted for age (years), sex, Karnofsky Performance Status (%), type of tumor, and current location of care (inpatient or outpatient)

$p$  value < 0.05

**Table 4** Multivariate linear regressions models of cancer cachexia as predictive factor of quality of life domain scores in advanced cancer patients ( $N = 1039$ )

Variables	$\beta$ (95% CI) <sup>a</sup>	$p$ value
Physical functioning	1.019 (-2.331; 4.370)	0.551
Emotional functioning	0.287 (-3.764; 4.338)	0.889
Fatigue	2.171 (-1.845; 6.188)	0.289
Nausea/vomiting	-4.760 (-10.418; 0.897)	0.099
Pain	2.152 (-2.433; 6.378)	0.357
Dyspnea	6.294 (1.343; 11.247)	0.013
Insomnia	5.233 (0.103; 10.363)	0.046
Appetite loss	6.352 (1.250; 11.454)	0.015
Constipation	3.578 (-1.385; 8.541)	0.157
Overall QoL	3.038 (-1.532; 7.608)	0.192

$\beta$ , regression coefficient; CI, confidential interval; QoL, quality of life

<sup>a</sup> Adjusted for age (years), sex, Karnofsky Performance Status (%), type of tumor, and current location of care (inpatient or outpatient)

$p$  value < 0.05

system (WLGS) and QoL (EORTC QLQ-C30) in patients with advanced cancer. In line with our findings, the author reported that nutritional impaired assessed by WLGS was useful in identifying patients at risk of poor QoL [30].

According to our results, in general, younger patients reported worse QoL. About gender, physical and emotional functional were worse in male, while symptom scales were worse in female. Previous reports by Daly et al. [30] show inconsistent results. These authors categorized their sample as < 65, 66–73, and > 74 year and did not find difference in overall QoL score between these groups. In addition, these authors reported a poorer overall QoL score in women [30].

Notably, a high prevalence of nutritional disorders was verified in our sample. In study by Wallengren et al. [4], it was demonstrated that the prevalence of CC in palliative patients varies (12% to 85%) according to the definition used for its diagnosis [27]. Kwang and Kandiah [5] and Cunha et al. [8] reported the prevalence of NR evaluated by PG-SGA at 70.7% and 83.6%, respectively, in patients receiving palliative care, which is consistent with our findings. The mode by which nutritional status influence on QoL seems to be related to the complex interplay between inflammation and metabolic disorders related to malnutrition, which often leads to physical, biochemical deterioration and disease symptom burden beside that to other multidimensional factors associated with declining nutritional status such as the psychological, and social which affects QoL [17, 31, 32].

Of note, PG-SGA SF seems to be a more sensitive nutritional assessment method than the CC criteria for detecting changes in QoL domains. This was evidenced in this study, since NR determined by PG-SGA SF was associated with all the domains concerning of QLQ-C15-PAL, while the only associations with CC were found with the score symptoms of dyspnea, insomnia, and appetite loss. A possible explanation for this is that PG-SGA SF involves WL, the patient's dietary intake, symptoms, and functional capacities, resulting in a multidimensional assessment, unlike the diagnosis of CC, which is centered on their consequences (e.g., WL, skeletal muscle depletion) rather than their causes [33–35]. Box 2 of the PG-SGA reflecting the presence of anorexia that is known to contributes to WL [36, 37]. Box 4 assesses the subjective report of performance status. Reduced physical performance is associated with poorer nutritional and functional outcomes, decreased QoL and survival [37]. Furthermore, the domain referring to symptom evaluation (Box 3) can increase the total score significantly, and this domain is one of the most common factors that can affect multiple QoL domains. Thus, our hypothesis is that PG-SGA's multidimensional feature makes it a more sensitive tool to detect changes in QoL.

All aforementioned studies [4, 10, 18, 29, 30] with advance cancer demonstrate significant impact of nutritional status on cancer patients' QoL. A systematic review including a total of 67 studies cancer patients reported a negative association

between WL and QoL regardless of the tumor site [17]. Information about period of WL, the stage of CC and changes in QoL was not available in most included studies, but an inverse relationship between QoL and WL was found in 23 of the 27 studies which directly examined this [17]. Another recent systematic review examining nutrition support interventions in patients with incurable cancer [38]. Ten studies included examined QoL, with six studies reporting improvements following intervention. The most common nutritional interventions examined were nutrition counseling and dietary supplementation. These findings underline the importance of considering nutritional status when attempting to improve QoL.

Various issues may be associated with poorer patient's QoL, and identification of those most related to QoL would permit health care professionals to management strategies most helpful to the patient. Management strategies may thus be optimized if the most significant predictors of QoL are considered in the course of palliative patient care [4, 30, 38].

In our study, malnutrition prevalence was explored in a consecutive cohort of patients with cancer at the palliative care unit of a reference tertiary care center. Validate instruments were used to assess nutritional status and QoL. However, it is important to note that the currently available QoL instruments does not address the issues which are most relevant for patients with malnutrition or CC, so the really impact of nutritional status on patients' QoL cannot be completely explored. This study has some limitations: it was conducted at just one center and has a cross-sectional design, making it impossible to assess temporal variations in the variables under study. In addition, only a quarter of the sample consisted of inpatients, so that our findings apply better to outpatients, i.e., patients with better performance status.

In conclusion, the present study shows that poor QoL was associated with impaired nutritional status in a large sample of incurable cancer population in palliative care in Brazil. NR assessed by PG-SGA SF better reflects physical, emotional, symptom burden, and overall QoL scores and can contribute in identifying patients at risk of deterioration QoL. It is imperative that nutritional assessments be carried out on cancer patients in palliative care throughout the clinical process to plan targeted interventions with a focus on improving QoL.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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