A Poorer Nutritional Status Impacts Quality of Life in a Sample Population of Elderly Cancer Patients

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Research

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Abstract

Rationale: Quality of Life (QoL) is impaired in cancer, and the elderly are particularly vulnerable to malnutrition. A diagnosis of cancer in elderly patients further exacerbate risks of negative health outcomes. Here we investigated associations between QoL and nutritional status in a sample population of mostly socially deprived elderly cancer patients.

Method: 432 patients with diagnosed cancer were recruited for this cross-sectional study at point of admission to a tertiary referral charitable hospital for cancer treatment. Patient-Generated Subjective Global Assessment (PG-SGA) assessed nutritional status. Functional Assessment of Cancer Therapy-General (FACT-G) quantified QoL. PG-SGA outcomes were compared against FACT-G scores employing Mann-Whitney test. Relationship between PG-SGA and QoL scores was assessed by Spearman correlation. Bivariate Linear Regression Model was employed to investigate the influence of sociodemographic, clinical and nutritional status upon QoL.

Results: 37.5% of participants were malnourished or at risk. 39% were illiterate and 54.6% had a family income lower than minimum wage. Malnourished patients showed lower FACT-G scores (78.0 vs. 86.0; p=0.000). Poor nutritional diagnosis was inversely correlated with all QoL domains. Bivariate regression analysis showed that worsened PG-SGA scores (βo = -1.00; p = 0.000) contributed to FACT-G score deterioration; the male gender showed less pronounced effects in QoL, whereas literacy and family income did not show relationship.

Conclusion: We found that poorer nutritional status was significantly associated with worsened physical, social, emotional and functional well-being domains of QoL in elderly cancer patients. Future policies aimed at this particularly vulnerable population may improve QoL and health outcomes.

Introduction

Increased life expectancy is positively associated with increased incidence of cancer. Approximately 60% of new cancer cases are diagnosed in the population group aged 65 years or older, and approximately 70% of the mortality attributed to cancer occurs in that group [1]. Ageing is positively associated with physiological and functional deterioration, which are important risk factors for the exacerbation of chronic conditions [2]. Decline of functionality is also associated with increased morbidity, higher hospitalization rates and increased costs of healthcare provision [3].

The provision of nutritional advice for patients with cancer must be tailored to the patient’s specific needs. Particular attention is required for elderly cancer patients when considering their naturally expected physiological and functional decline. Weakening attributed to loss of muscle mass and reduced movement is expected in ageing; however, when associated with a diagnosis of cancer, the sufferer’s quality of life (QoL) and life expectancy become dramatically compromised [4].
The impact of cancer and chronic conditions in the social and emotional aspects of the sufferer's life is significant, particularly in the elderly. The need for lifestyle restructuring, and the sometimes-dramatic changes in lifelong-acquired habits, may negatively influence their mental health and personal values, as well as their social structure [5]. By identifying deficits in QoL in cancer sufferers, adjustments can be made to promote humanization of the care provided to those patients [6].

A more thorough understanding of the associations between nutritional status and QoL in elderly cancer patients may contribute to the further development of strategies that support better health outcomes for sufferers. The aim of the present study was to investigate potential associations between nutrition status and parameters of QoL in a sample population of mostly socially deprived elderly patients with a diagnosis of cancer. We have correlated the nutritional assessment outcomes, generated by the Patient-Generated Subjective Global Assessment (PG-SGA), with the QoL scores, as measured with the Functional Assessment of Cancer Therapy: General (FACT-G) instrument.

**Methods**

This cross-sectional study received ethical approval by the Research Ethics Committee of the School of Nutrition, Federal University of Bahia (187441/12) and by the Research Ethics Committee of the Hospital Aristides Maltez (00913/12), Salvador, Brazil. The Hospital Aristides Maltez is a charitable institution, reference centre for tertiary medicine in the state of Bahia, Brazil. All procedures were conducted in full compliance with the ethical standards of both Research Committees, and with the 1964 Helsinki Declaration and its subsequent amendments.

All patients were explained the aims and objectives of the study, and those who agreed to participate signed the ‘Free and Informed Consent Form’, which included a clause on ‘Consent to Publish’. No participant can be identified in this study. Patients with an associated psychiatric diagnosis, as well as patients admitted to hospital for the sole purpose of diagnostic investigations, were not included. Inclusion criteria included individuals aged 60 years or older, admitted to medical and surgical wards of the Hospital Aristides Maltez for cancer treatment. All patients had their cancer diagnosis confirmed prior to participation in this study.

Between June 2013 and January 2014, 461 consenting patients were recruited, however 29 participants did not complete the assessment. The research staff in charge of data collection were Registered Dietitians with full training on the usage of the questionnaires adopted in this study, therefore minimizing the likelihood of errors in data collection. A standardized form collected demographic data (age, gender, place of residence, literacy, family income and occupation) and clinical data including type of diagnosed cancer, current treatment plan (surgery, chemotherapy, venous catheter blockage management), and comorbidities.

The Patient-Generated Subjective Global Assessment (PG-SGA) was employed as previously established [7,8] for the assessment of nutritional status. The PG-SGA categorises patients into three possible categories: ‘A’ for well-nourished, ‘B’ for suspected or moderate malnutrition, and ‘C’ for severely
malnourished patients. The questionnaire scoring system ranges from 0 to 55, with higher scores reflecting greater risk of malnutrition, as described previously [8].

QoL was assessed with the Functional Assessment of Cancer Therapy: General (FACT-G) version 4 instrument, as previously described [9] and validated for the Portuguese language [10]. FACT-G is divided into four domains: Physical Well-Being (score 0-28), Social and Family Well-Being (score 0-28), Emotional Well-Being (score 0-24) and Functional Well-Being (score 0-28). Each item of this Likert-type questionnaire is answered based on five possible options, ranging from 'not even a little' (score 0) to 'very much' (score 4). Higher scores indicate better quality of life.

Statistical Assessment

Measures of central tendency and dispersion were calculated and presented as mean and standard deviation. Descriptive analysis calculated absolute and relative frequencies to characterize the study population, also identifying the nutritional status at the time of investigation. The Mann-Whitney test was used to compare the medians of FACT-G domains with the nutritional status of the PG-SGA categories A and B+C (combined suspected malnutrition and malnourished).

Spearman’s correlation was used to identify the relationship between PG-SGA scores with FACT-G scores. For the interpretation of the magnitude of the correlations, the following classification of the correlation coefficients was adopted: 0.00-0.19 = absent or very weak correlation; 0.20-0.39 = weak correlation; 0.40-0.59 = moderate correlation; 0.60-0.79 = strong correlation; 0.80-1.0 = very strong correlation, as previously described [11].

The influence of sociodemographic, clinical and nutritional status variables upon QoL was investigated with the application of a bivariate linear regression model. $P < 0.05$ was considered statistically significant for all tests. Statistical analysis was performed using the SPSS statistical package (version 20.0, IBM).

Results

Four hundred thirty-two patients completed the study, and 45% of participants were males. The average age for men was 69.9 ± 7.59 years, and the average age for women was 68.2 ± 6.88. Sixty-six % of patients lived in rural areas, countryside and other urban areas away from the capital city. Self-declared illiteracy was identified in 39% of participants. The total family income of 54.6% of participants was lower than minimum wage. The most frequent occupation was farming and agriculture, in 42.2% of cases. The most prevalent type of diagnosed cancer was prostate, in 19.9% of cases, followed by skin (17.1%), cancers of the gastrointestinal tract (16%), breast (15.7%) and gynaecological tract (7.7%). Hypertension was a comorbidity in 60.2% of cases, followed by diabetes mellitus (17.1%) and other types of cardiovascular disease (10.9%). The vast majority of patients were admitted to hospital for cancer surgery (98.6%), whilst 0.9% were admitted for chemotherapy and 0.5% were admitted to manage venous catheter blockage. The PG-SGA showed that 62.5% of patients were well nourished at hospital admission,
whilst 29.9% were either at risk of malnutrition or moderately malnourished, and 7.6% were severely malnourished (Table 1).

We have found significantly higher QoL scores in the FACT-G Physical, Emotional and Functional Well-Being domains in well-nourished patients, as compared to those at risk of malnutrition or malnourished (Table 2). Only the Social and Family Well-Being QoL domain was similar between both groups.

The Spearman's correlation analysis revealed a significantly negative correlation between the four FACT-G domains (A: Physical $\rho = -0.415$, $p = 0.000$; B: Social $\rho = -0.114$, $p = 0.018$; C: Emotional $\rho = -0.191$, $p = 0.000$; D: Functional $\rho = -0.34$, $p = 0.000$) and the PG-SGA scores (Figure 1). Figure 2 shows the significantly negative correlation between the FACT-G final score and the PG-SGA scores ($\rho = -0.376$, $p = 0.000$). Inverse correlations can be expected as low PG-SGA scores indicate better nutritional status whilst high FACT-G scores indicate better QoL.

The bivariate linear regression analysis amongst the sociodemographic, clinical and nutritional variables showed a statistically significant association between the QoL FACT-G scores with the nutritional status, as assessed by the PG-SGA-scores, and with the male gender. Increasing PG-SGA by 1 point decreased the QoL FACT-G by 1 point, whereas the male gender added 2.88 points to the FACT-G score (Table 3).

**Discussion**

In the present study, 432 elderly patients with a diagnosis of cancer admitted to a tertiary referral charitable hospital for cancer treatment completed the PG-SGA and the FACT-G assessment tools, as previously established [7-9]. We have found a high percentage of individuals at risk of malnutrition or malnourished at point of admission. Furthermore, the malnourished and at risk of malnutrition patients showed significantly worsened FACT-G scores in relation to the well-nourished patients. Our findings further evidence the need for early nutritional intervention to preserve QoL and to improve health outcomes. It has been previously demonstrated that nutritional interventions in adult cancer patients has improved QoL [12].

A cohort study of elderly cancer patients undergoing chemotherapy identified low QoL scores at baseline, and a further deterioration after chemotherapy [13]. That study also showed that as treatment progressed, other undesired effects also occurred, including deteriorated nutritional status, as identified by the Mini Nutritional Assessment tool [13]. A study recruiting 60 cancer patients aged in average 61.9 years receiving radiation therapy showed that there was a significant correlation between changes in PG-SGA scores ($p<0.001$) and changes in QoL scores ($p=0.003$) amongst the patients that either improved (5% of participants), maintained (56.7%) or deteriorated (33.3%) their nutritional status after 4 weeks of treatment [14]. The researchers’ regression analysis revealed that 26% of the QoL change variation was attributed to changes in the PG-SGA scores [14].

Previous cancer studies have shown that not only malnutrition, but also nutritional risk, are associated with poorer QoL and prolonged hospital stay, irrespective of age at diagnosis and type of surgical
procedure performed [15, 16]. A small sample population study of malnourished elderly patients submitted to gastrointestinal cancer surgery showed a mortality rate of 1/3 of the cohort 8 months after the surgery [17]. That study showed higher surgery-related complication rate in comparison to non-malnourished patients. The study also found that early nutritional monitoring could assist in better recovery during the postoperative period and improve QoL one year after surgery [17].

In our study, the FACT-G Physical Well-Being and Functional Well-Being domains were inversely correlated with PG-SGA scores. In the context of our sample population, specifically, we found these results extremely relevant; it is likely that the manifestations of cancer-related symptoms could be a catalyst for the lack of motivation to perform daily activities. Depending on family and social circumstances, this could be as difficult as the inability to successfully care for oneself. Our findings further corroborate the need for nutritional intervention as early as possible in the course of the disease.

Capuano and colleagues [18] assessed nutritional status using PG-SGA and performance status using the Eastern Cooperative Oncology Group PS tool in a sample population of 61 patients with head and neck cancer. The authors found that malnourished patients presented more frequent complaints of fatigue, weight loss, nausea and vomiting, as well as lower QoL scores, as compared to the non-malnourished group. It has been demonstrated that weight loss, reduced functional capacity, pain and fatigue are associated with shorter survival in patients with inoperable non-small cell lung cancer [19]. In a cohort study of 53 elderly cancer patient in catabolic state conducted in Sweden, a significant correlation was found between spontaneous physical activity and nutritional status, in which less spontaneous physical activity was directly correlated with greater weight loss [20].

Significant functional limitations have been reported in older breast cancer women survivors, as compared to older women without cancer [21]. Sarcopenia is a highly prevalent condition in ageing, and further exacerbated with a diagnosis of cancer, dramatically deteriorating QoL and survival rate [22 - 24]. The carcinogenic biochemical environment is known to induce the systemic release of pro-inflammatory cytokines and hormones associated with anorexigenic effects, including interleukin-6, interferon-y, ghrelin and leptin, as well as mediators with proteolytic actions, including Proteolysis Inducing Factor and interleukin-1 (IL-1). The effects of said molecules in tandem include decrease appetite and motivation to eat, further accentuating sarcopenia [25].

In our study, the FACT-G Emotional Well-Being domain showed a significant correlation with PG-SGA scores. Literature is still somewhat scarce in studies that have explored the relationship between the emotional life aspects of elderly cancer sufferers with their nutritional status. However, available evidence suggests that malnutrition increases by five-fold the risk of depression in elderly patients undergoing chemotherapy [26]. The occurrence of gastrointestinal symptoms and the side-effects associated with cancer treatment reduce food intake and induce weight loss, impacting mobility and the capacity to perform daily-life activities. It is also known that reduced performance and mobility have a negative impact on social interactions and emotional health of the sufferers [27]. Therefore, even though social and emotional QoL and nutritional status were found to be correlated with each other in our study, we
suggest that one effect may not necessarily be a direct consequence of the other, but possibly an indirect relationship, in which one exacerbates the other via the consequences of impacted social and emotional life.

The FACT-G Social Well-Being in our study did not reach significance in the Mann-Whitney test comparing the medians of well-nourished (A) versus at risk + malnourished (B+C) groups. However, the Spearman correlation coefficient obtained from the total score showed a weak but statistically significant association. The lack of a very strong relationship between social well-being and nutritional status could be explained by the existence of family support in most of the cases.

In our study, the male sex appeared to be less negatively influenced in QoL. The bivariate linear regression analysis showed that nutritional status directly affected QoL in elderly cancer patients, but also that men were much less susceptible than women. We have not found reports in the literature that have associated nutritional status and QoL in elderly cancer male sufferers, specifically. Whilst our study included all types of cancers, the studies we have found were specific to prostate cancer, and compared different types of treatment [28, 29].

A particular aspect of our study worth of further consideration is the socioeconomical reality of our participants. In our study, nearly 40% of the participants were illiterate and over 50% had a total family income below minimum wage. Most of the studies referred to in our discussion were conducted in economically developed countries. On the other hand, most of the participants in our sample population were extremely poor and socially deprived. Even though our bivariate linear regression analysis has not revealed a significant association between literacy and family income with QoL, we believe the formers could be contributing factors for the exacerbation of the latter. The ill-fated relationship between poverty and negative health outcomes has been documented several decades ago [30], and this could be one of the factors that explain why a high proportion of our participants were malnourished or at risk of malnutrition at the point of admission for cancer treatment.

Effective nutritional assessment in elderly cancer patients is known to improve survival, functional status and body weight gain [31]. In our study, we have found that patients with better nutritional status have better functional, emotional, social and physical scores of QoL. We have also found that men were at lower risk as compared to women. Our study adds to the body of evidence that confirms the relationship between nutritional status and QoL in cancer patients. Further studies are still needed, and it is hoped that their outcomes may pave the way for betterment of health policies aimed at highly vulnerable populations.

**Declarations**

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**Conflict of interest**

The authors declare no conflict of interest.

**Authors’ contributions:**

LPMO conceptualized and designed the study. TCR, MLVC and LPMO collected data. All authors contributed to data analysis and interpretation, literature appraisal and manuscript write-up. All authors have read and approved the final manuscript.

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**Tables**

**Table 1**: Demographic and clinical characteristics of the sample population of elderly cancer patients investigated.
|                                      | Mean (SD) | N (%) |
|--------------------------------------|-----------|-------|
| **Age (years)**                      |           |       |
| Male                                 | 69.9 (7.59) | 196 (45.0) |
| Female                               | 68.2 (6.88) | 236 (55.0) |
| **Place of residence**               |           |       |
| Capital city                         |           |       |
| Rural areas and other urban areas    |           |       |
| **Literacy**                         |           |       |
| Illiterate                           |           |       |
| Literate                             |           |       |
| **Family income**                    |           |       |
| ≤MW                                  |           |       |
| >MW                                  |           |       |
| **Occupation**                       |           |       |
| Farmer                               |           |       |
| Housewife                            |           |       |
| Housekeeper                          |           |       |
| Others                               |           |       |
| **Diagnosed Cancer**                 |           |       |
| Prostate                             |           |       |
| Skin                                 |           |       |
| GIT                                  |           |       |
| Breast                               |           |       |
| Gynecological                        |           |       |
| Urological                           |           |       |
| Head and Neck                        |           |       |
| Bone                                 |           |       |
| Pulmonary                            |           |       |
| Others                               |           |       |
### Comorbidities

| Comorbidities | 260 | 60.2 |
|---------------|-----|------|
| SAH           | 74  | 17.1 |
| DM            | 47  | 10.9 |
| Cardiopathy   | 23  | 5.3  |
| Hepatopathy   | 21  | 4.9  |
| CKD           |     |      |

### Current Treatment

| Current Treatment | 426 | 98.6 |
|-------------------|-----|------|
| Surgery           | 4   | 0.9  |
| Chemotherapy      | 2   | 0.5  |
| Venous catheter blockage management | | |

### PG-SGA

| PG-SGA          | 270 | 62.5 |
|-----------------|-----|------|
| Well Nourished (A) | 129 | 29.9 |
| Risk or moderate malnourishment (B) | 33  | 7.6  |
| Severely malnourished (C) | | |

SD: Standard Deviation; MW: Minimum wage; GIT: gastrointestinal tract; SAH: systemic arterial hypertension; DM: diabetes mellitus; CKD: chronic renal disease; PG-SGA: Patient-Generated Subjective Global Assessment.

**Table 2**: FACT-G domains median scores in relation to nutritional status, as defined by the PG-SGA, in the sample population of elderly cancer patients investigated.

| FACT-G domains | Well-nourished (n=270) | Risk + Malnourished (n=162) | p-value* |
|----------------|------------------------|-----------------------------|----------|
|                | Median (P25-P75)a       | Median (P25-P75)a            |          |
| PG-SGA         |                        |                             |          |
| PWB            | 26.0 (23.0-27.0)        | 23.0 (18.0-26.0)             | 0.000*   |
| SWB            | 21.0 (19.4-23.0)        | 21.0 (18.0-23.0)             | 0.081    |
| EMB            | 20.0 (17.0-22.0)        | 19.0 (15.0-21.0)             | 0.006*   |
| FWB            | 20.0 (17.0-21.0)        | 18.0 (14.0-21.0)             | 0.000*   |
| Final Score    | 86.0 (78.0-91.0)        | 78.0 (67.1-86.0)             | 0.000*   |
\(^{a}\)P25 = 25\(^{th}\) percentile 25, P75 = 75\(^{th}\) percentile. *Mann Whitney \(p\) value <0.05.

PG-SGA: Patient-Generated Subjective Global Assessment; FACT-G: Functional Assessment of Cancer Therapy: General; PWB: Physical Well-Being; SWB: Social and Family Well-Being; EMB: Emotional Well-Being; FWB: Functional Well-Being

**Table 3.** Linear regression analysis between FACT-G QoL scores with the PG-SGA-measured nutritional status and gender, in the sample population of elderly cancer patients investigated.

| Variables  | FACT-G          | Coefficient (\(\beta_0\)) | p-value | IC       |
|------------|-----------------|-----------------------------|---------|----------|
| PG-SGA     | -1.00           | 0.000*                      | -1.25; -0.76 |
| Gender     |                 |                             |         |          |
| Male       | 2.88            | 0.037*                      | 0.17; 5.59 |
| Female     |                 |                             |         |          |

* Bivariate Linear Regression Model, \(p\) <0.05

**Figures**
Figure 1

Spearman correlations between FACT-G domains scores and PG-SGA scores in the sample population of elderly cancer patients investigated.
Figure 2

Scatterplot of the Spearman correlation between FACT-G final score and PG-SGA screening score in the sample population of elderly cancer patients investigated. Spearman correlation= -0.376 p value = 0.000. PG-SGA: Patient-Generated Subjective Global Assessment; FACT-G: Functional Assessment of Cancer Therapy: General