Nutritional Status and Associated Factors in Older Patients with Prostate Cancer: A Cross-Sectional Study in Two Brazilian Cities

Graziele Marques Rodrigues* and Inês Echenique Mattos

Department of Epidemiology and Quantitative Methods in Health, National School of Public Health, Oswaldo Cruz Foundation, Brazil

*Corresponding author: Graziele Marques Rodrigues, National School of Public Health/Oswaldo Cruz Foundation, Rua Leopoldo Bulhões, 1480/room 817b, Manguinhos, Zip Code: 21041-210, Rio de Janeiro, Brazil

Abstract

Background: Given the heterogeneity of the overall health status of older patient with cancer, it is recommended to conduct a multidimensional geriatric assessment (MGA) before the establishment of the treatment protocol. Nutritional status is an important part of this assessment, as it is associated to poor health outcomes in older adults with cancer. This study aims to identify factors associated with nutritional status in older adults with prostate cancer.

Methods: Cross-sectional study of 538 older adults aged 60 or more, with incident prostate cancer before the beginning of the treatment at hospitals of Brazil’s Unified Health System. Nutritional status was evaluated with the Mini-Nutritional Assessment Short-Form version. Socio-demographic and clinical variables, besides some dimensions of the MGA (functionality, comorbidity and emotional condition) were evaluated. We estimated the prevalence of subjects at risk of malnutrition or malnourished and analysed the associations between nutritional status and the independent variables using prevalence ratios and Poisson’s regression with statistical significance for p value ≤ 0.05.

Results: The mean age of the individuals was 69.11 ± 6.43 years and 27.1% were at risk of malnutrition or malnourished. Presence of depressive symptoms (PR 1.78; 95% CI 1.27-2.50), functional dependence in Basic Activities of Daily Living (PR 1.40; 95% CI 1.01-1.94) and age (PR 1.02; 95% CI 1.00-1.04) were independent factors associated with nutritional status.

Conclusion: The high prevalence of patients at risk of malnutrition or malnourished and the association with functional dependence, presence of depressive symptoms and age point the importance to assessment the nutritional status in this population.

Keywords

Nutritional status, Prostate cancer, Aged

Introduction

Older adults currently constitute a major part of the world’s population and it is estimated that in 2050 they will number around two billion [1]. In Brazil, population ageing occurred rapidly [2] and the Brazilian Institute of Geography and Statistics [3] indicated that individuals aged 65 years and more will represent 21.8% of the country population in the year 2050. Age is an important risk factor for cancer [4-6] and high frequencies of new cancer cases in older adults are expected in Brazil in the years to come, due to this age shift.

Prostate neoplasia is the most frequently diagnosed tumor in men in the world excluding non-melanoma skin cancer [7]. For 2018, were estimated more than one million cases of prostate cancer worldwide [8]. In the same year, for Europe, prostate cancers corresponding 21.8% of the total of primary sites [9]. Similar data were reported in the United States in 2019, where 174,650 new cases of this tumor are estimated (20% of all malignancies diagnosed in men) [10]. In Brazil, for the biennium 2018-2019, are expected 68,220 new cases of this tumor, corresponding a risk of 66.12 new cases/100,000 men [11]. It is important to note that incidence and mortality increase markedly after 50 years [12].
Population ageing leads to a high incidence of cancer in older adults, increasing the demand of oncological care for these individuals [13,14]. Older adults constitute a heterogeneous population in relation to overall health, and therefore individuals of the same age may display different health conditions and so, respond differently to cancer treatment [15-17]. For this reason, it is recommended to conduct a multidimensional geriatric assessment (MGA) before the establishment of the treatment protocol. The evaluation of nutritional status is an important part of this assessment [15,18,19] because it allows early intervention in patients at risk of malnutrition or malnourished, reducing days of hospitalization, the development of infections, toxicity during chemotherapy and increased survival [20-23].

Paillaud, et al. [22] studied patients 70 or more years old, before starting treatment for different types of solid tumours, including prostate cancer and reported that 41.0% were at risk of malnutrition and 13.2% malnourished. Already, Aaldriks, et al. [14] observed that 33.0% of the older adults were considered at risk of malnutrition or malnourished.

Despite the above findings, there are still few international studies evaluating the nutritional status and its associated factors before the beginning of prostate cancer treatment. As for Brazil, no articles were found on this subject.

Thus, the present study aims to estimate the prevalence of nutritional status and analyse its associated factors in older patients with incident prostate cancer, before the therapeutic decision in Campo Grande and Rio de Janeiro municipalities in Brazil.

Methods

The present study used data from the research project "Multidimensional Geriatric Assessment in the elderly with prostate cancer: feasibility and potential impact on survival" with funding from the National Counsel of Research (Grant PDTSP/FIOCRUZ) and was approved by the Research Ethics Committee of the National School of Public Health of the Oswaldo Cruz Foundation (CAEE04383912.1.3001.5253).

Study design

This is a cross-sectional study developed in two Brazilian municipalities, Campo Grande and Rio de Janeiro. From April 2012 to June 2014, consecutive cases of prostate cancer that met the inclusion criteria were recruited from urology outpatient clinics of eight hospitals of the Brazilian National Health System in the cities of Campo Grande and Rio de Janeiro. Trained research assistants, who were standardized as to data collection procedures, interviewed the patients applying a structured questionnaire, which included sociodemographic and clinical variables, besides some dimensions of the MGA. Complementary data was collected in the patient’s medical records by the researchers.

Study population

Eligibility criteria consisted of individuals aged 60 years and older with a histopathological diagnosis of prostate cancer and not having initiated treatment. Prevalent cases, patients who had started any oncological treatment for prostate cancer or with cancer at other sites, cases not confirmed after immunohistochemical study and patients without conditions to answer the items of the questionnaire were excluded.

Assessment measuring

The outcome variable was the nutritional status, evaluated with the Mini-Nutritional Assessment Short-Form version (MNA-SF), which consists of a subset of six items. The MNA-SF score varies from zero to 14 points [24,25]. This instrument is specific for the evaluation of older adults, allows the detection of individuals at risk of malnutrition and has high sensitivity and specificity [24,25]. The instrument was translated to Portuguese and validated for the Brazilian population [26,27]. Subjects were classified into three categories, based on the score obtained: normal nutritional status (14-12 points), at risk of malnutrition (11-8 points) and malnourished (7-0 points) [25]. For purposes of analysis, this variable was later dichotomized into normal nutritional status and at risk of malnutrition or malnourished.

Like possible exposure variables we analyzed sociodemographic (age, family income, marital status and education level), clinical (Gleason score and Body Mass Index) variables, and other dimensions of elderly health (functionality in Basic Activities of Daily Living, functionality in Instrumental Activities of Daily Living, comorbidity and emotional condition).

Functionality in Basic Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) were assessed, respectively, through the Katz [28] and the Lawton [29] scales, both translated to Portuguese and validated for the Brazilian population [30,31]. For the two scales, we considered as dependence those individuals who were unable to perform unaided one or more of the activities assessed. Comorbidity was assessed with the Cumulative Illness Rating Scale-Geriatric (CIRS-G) [32]. Comorbidity was classified by total score, which is the sum of scores obtained in each system or organ affected, reflecting the severity of the diseases. This variable was categorised into three strata: no/mild comorbidity (0-2 points), moderate comorbidity (3-8 points) and severe comorbidity (> 8 points) [33]. For the multiple analysis, we combined the moderate and severe comorbidity in one stratum, the other being no/mild comorbidity.

We investigated emotional condition with the 15-item Geriatric Depression Scale (GDS-15), translated to Portuguese and validated for Brazilian older adults.
[34,35]. By adding the scores obtained on each item, participants were classified into three strata: No depressive symptoms (0-5 scores), mild depressive symptoms (6-9 scores) and severe depressive symptoms (10-15 scores). For the multiple analysis, we dichotomized this variable in without depressive symptoms and with mild/severe depressive symptoms.

**Statistical analysis**

The characteristics of the study population were described by measures of central tendency and dispersion for continuous variables and by frequency distributions for categorical variables. We estimated prevalence and prevalence ratios (PR) by strata of the independent variables in order to test the presence of associations with nutritional status for individuals classified as at risk of malnutrition or malnourished and tested the statistical significance for a p value ≤ 0.05.

We performed a Poisson regression statistical modeling to control possible confounding variables, using the stepwise method for inclusion of independent variables. The covariates that showed associations with statistical significance for a p value ≤ 0.05 and had theoretical relevance in relation to nutritional status were included in the model. The criterion for retention in the model was statistical significance for a p value ≤ 0.05 and 95% confidence interval (CI).

Statistical data was performed with SPSS 17.0 and STATA, version 10.0 (StataCorp LP) for Windows.

**Results**

We recruited 639 older adults subjects, of which 15.8% (N = 101) were excluded after medical history review, histopathological report and immunohistochemical study. Of these, 66.5% (N = 67) had no malignant neoplasia, 26.7% (N = 27) were prevalent cases and 6.9% (N = 7) had other malignancies.

The study population consisted of 538 older patient, whose mean age was 69.11 ± 6.43 (60-88) years, with a median of 68.00 years, mean weight of 74.64 ± 11.88 kg (42 kg-129 kg) and an average Body Mass Index of 25.99 ± 3.91 kg/m². The MNA-SF identified 72.9% (N = 376) with normal nutritional status, 23.4% (N = 121) at risk of malnutrition and 3.7% (N = 19) malnourished (Table 1).

The majority of the individuals were married or lived with a partner, had a median family income of 3.12 ± 2.77 (0.12-36.87) minimum wages (minimum wage was approximately 332 dollars) and low education level. On the Gleason score, all patients, except one, had a tumour classified as intermediate and high risk (Table 1).

Most participants were independence in Basic Activities of Daily Living and in Instrumental Activities of Daily Living. Mean total comorbidity score was 4.98 ± 3.05 (0-18), with the largest proportion of participants with moderate comorbidity. In relation to emotional condition, the GDS-15 mean score was 2.70 ± 2.18 (0-13) and the majority of older adults showed no depressive symptoms.

Based on the pre-established criteria, only age (continuous), marital status, functionality in ADL or IADL and emotional condition were included in the multiple model (Table 2). After analysis, the independent variables associated with being at risk of malnutrition or malnourished were functionality in Basic Activities of Daily Living (functional dependence), emotional condition (mild/se-
Basic Activities of Daily Living and being at risk of malnutrition or malnourished may be connected with limitations on participants’ ability to prepare meals and feed themselves without depending on others [39]. Amaral, et al. [40] conducted a multicentre study in Portugal to examine the association between functionality and nutritional status, using the Nutritional Risk Screening and the Katz scale. Functional dependence in ADL showed an association with being at risk of malnutrition (OR 2.60; 95% CI 1.95-3.46) among patients completely dependence. Nonetheless, despite the methodological differences, these findings corroborate the association between dependence in ADL and nutritional status.

As regards to the association with emotional condition, it is possible that patients with depressive symptoms tend to reduce their food intake and, as a result, lose weight [41]. In Lithuania, in a study of 40 older adults with advanced prostate cancer, assessed by the Mini-Nutritional Assessment and the 15-item Geriatric Depression Scale, it was observed an inverse correlation between nutritional status and depressive symptoms, i.e., low MNA score/high GDS-15 score (r 0.46; p < 0.01).

Discussion

In this study, functional dependence in Basic Activities of Daily Living, presence of mild/severe depressive symptoms and age were independent risk factors for being at risk of malnutrition or malnourished in older patient with incident prostate cancer before the beginning of the treatment.

The aging process may foster alterations in older adult’s nutritional status by different mechanisms, including loss of muscle mass [36,37]. In France, in a study of individuals of both sexes and mean age 61.90 years with head and neck cancer diagnosis, before the start of oncological treatment, it was observed an association between malnourishment and age 65 years or more (OR 2.60; 95% CI 1.95-3.46) among patients completely dependence. Nonetheless, despite the methodological differences, these findings corroborate the association between dependence in ADL and nutritional status.

### Table 2: Prevalence’s and crude prevalence ratios (PR) for nutritional status (at risk of malnutrition or malnourished) in older adults with incident prostate cancer before the beginning of the treatment, Brazil (N = 538).

<table>
<thead>
<tr>
<th>Variables</th>
<th>At risk of malnutrition or malnourished N (%)</th>
<th>Crude PR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (continuous)</td>
<td></td>
<td>1.04 (1.01-1.07)</td>
<td>0.003</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/Living with partner</td>
<td>95 (67.9)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Divorced or separated/single/widowed</td>
<td>45 (32.1)</td>
<td>1.42 (1.06-1.90)</td>
<td>0.023</td>
</tr>
<tr>
<td>Education Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illiterate/Incomplete elementary school</td>
<td>85 (61.2)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>54 (38.8)</td>
<td>1.00 (0.74-1.33)</td>
<td>0.986</td>
</tr>
<tr>
<td>Functionality in ADL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional independence</td>
<td>108 (77.1)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Functional dependence</td>
<td>32 (22.9)</td>
<td>1.59 (1.16-2.18)</td>
<td>0.006</td>
</tr>
<tr>
<td>Functionality in IADL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional independence</td>
<td>81 (57.9)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Functional dependence</td>
<td>59 (42.1)</td>
<td>1.94 (1.48-2.55)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Emotional condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No depressive symptoms</td>
<td>113 (82.5)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Mild/Severe depressive symptoms</td>
<td>24 (17.5)</td>
<td>1.91 (1.37-2.67)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Comorbidity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No/Mild comorbidity</td>
<td>23 (16.4)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Moderate/Severe comorbidity</td>
<td>117 (83.6)</td>
<td>1.44 (0.97-2.14)</td>
<td>0.058</td>
</tr>
</tbody>
</table>

### Table 3: Poisson multiple regression model for nutritional status (at risk of malnutrition or malnourished) in older adults with incident prostate cancer before the beginning of the treatment, Brazil (N = 538).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Adjusted Prevalence Ratios (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional condition (mild/severe depressive symptoms)</td>
<td>1.78 (1.27-2.50)</td>
</tr>
<tr>
<td>Functionality in ADL (functional dependence)</td>
<td>1.40 (1.01-1.94)</td>
</tr>
<tr>
<td>Age (continuous)</td>
<td>1.02 (1.00-1.04)</td>
</tr>
</tbody>
</table>

vere depressive symptoms) and age (continuous) (Table 3).

Table 2: Prevalence’s and crude prevalence ratios (PR) for nutritional status (at risk of malnutrition or malnourished) in older adults with incident prostate cancer before the beginning of the treatment, Brazil (N = 538).

Table 3: Poisson multiple regression model for nutritional status (at risk of malnutrition or malnourished) in older adults with incident prostate cancer before the beginning of the treatment, Brazil (N = 538).
In France, Paillaud, et al. [22] studied patients 70 or more years old, before starting treatment for different types of solid tumours, including prostate cancer. Nutritional status was assessed by the MNA and emotional condition, by the GDS-15. In multiple analysis, having depressive symptoms was associated with being at risk of malnutrition or being malnourished. Although using different methodologies, these results reinforce the findings of the present study.

In the present study, 23.4% (N = 121) patients were at risk of malnutrition and 3.7% (N = 19) were malnourished. We recruited individuals with a recent diagnosis of prostate cancer and were evaluated before the beginning of cancer treatment. Even so, more than a quarter of the population already presented alterations in their nutritional status.

Decoster, et al. [43] studied patients of 70 or more years, with different types of cancer, at two hospitals in Belgium, and found that 63.7% were at risk of malnutrition or malnourished at time of diagnosis. Terret, et al. [44] studied individuals of 65 or more years with a diagnosis of advanced-stage prostate cancer at oncological centres in France. Nutritional status was assessed with the MNA, 45.0% of the patients were at risk of malnutrition, and 20% were malnourished. Toliusiene & Lesauskaite [42] recruited individuals with 65 or more years old, hospitalised with stage-III prostate cancer and in treatment with radiotherapy at a cancer hospital in Lithuania, and nutritional status was assessed with the MNA. Fifty percent of the patients were at risk of malnutrition and 10.0% were considered malnourished. These studies examined the nutritional status of patients with cancer using the MNA or MNA-SF and their samples comprised only patients with advanced-stage disease or already in treatment, which explains the higher prevalence of nutritional problems.

In Brazil, the most relevant study of nutrition in older patients with cancer is the Luso-Brazilian Survey of Oncologic Nutrition of the Elderly [45]. This study evaluated the nutritional status in the first 48 hours of hospitalization using MNA-SF in patients with 65 and more years of both sexes. It was shown that 39.8% of the older adults were at risk of malnutrition and 33.2% were malnourished. However, the high prevalence of malnourished individuals could be explained by the inclusion of patients with different cancer stages.

Nutritional status is associated with increased toxicity during treatment, longer hospitalizations, presence of fatigue and lower survival rates [20,23,46]. In addition, nutritional deficits can trigger cancer cachexia, an abnormality associated with anorexia, skeletal muscle atrophy, loss of adipose tissue and anemia [47,48].

In Italy, Basso, et al. [49] studied patients with 70 or more years, with different types of cancer, before starting chemotherapy. They assessed the same dimensions and the same instruments we used in the present study and reported 27.4% of participants with functional dependence, 16.2% with depressive symptoms and a mean comorbidity score of 4 (0-8). Except for comorbidity, which returned a mean similar to that found in the present study, they found high percentages of alterations in the other dimensions, which could be explained, in part, by the high mean age (75 years) of participants and by the inclusion of patients with metastatic cancer.

This study has limitations, particularly because of its cross-sectional design. In this type of study, exposure and outcome are ascertained at the same time, making it difficult to assess for potential causal associations. Other limitations include the low prevalence of participants over 70 years of age, which hinders comparisons with the international literature, and the use of self-reported instruments to measure health dimensions. Although research assistants were trained in order to standardize application of the instruments, the possibility of information bias cannot be disregarded.

On the other hand, this study has strengths, among them, a subject that was little explored in studies in the area of geriatric oncology, the adequate sample size for the conducted analyzes and its originality. Up to the present moment, we could not identify a study that evaluated the nutritional status of older adults with cancer before the beginning of cancer treatment in Brazil.

The findings point to older adults with a good overall health, considering the low percentage of deficits in the domains of the multidimensional geriatric assessment. However, we pointed out a relevant percentage of individuals at risk of malnutrition or malnourished. This percentage could be high among those with functional dependence and/or depressive symptoms and increases with each year of increase in age. These findings reinforce the relevance of an early nutritional assessment of older adults with prostate cancer, especially those with advanced age, presenting depressive symptoms or functional dependence.

**Conclusion**

This study is the first to analyze factors associated with nutritional status in older patients with cancer in Brazil. During data collection, it was observed that few hospitals conduct a multidisciplinary assessment before the beginning of cancer treatment.

Due to the aging of the Brazilian population, an increment in the number of new cancer cases in older adults is expected. Health services will need to be prepared to provide quality and individualized care with a multidisciplinary team, thus avoiding adverse outcomes such as hospitalizations, toxicity and death during treatment.

For future studies to bring more contributions on this topic, the development of longitudinal studies that evaluate nutritional status is needed in order to...
estimate its association with unfavorable events during oncological treatment and to evaluate the role other dimensions of health on them.

Acknowledgements

We would like to thank all the staff, research assistants and urology outpatient clinics of eight hospitals of the Brazilian National Health System in the cities of Campo Grande and Rio de Janeiro, for their help in completing this study. This work was supported by Clinical Research Network in Public Health/Oswaldo Cruz Foundation and National Research Council (CNPq/PDTSP-FIOCRUZ).

Disclosure and Conflicts of Interest

The authors have no conflicts of interest to disclose.

Sources of Support

This work was supported by Clinical Research Network in Public Health/Oswaldo Cruz Foundation and National Research Council (CNPq/PDTSP-FIOCRUZ).

Statement of Equal Authors’ Contribution

Study concept and design: IE Mattos.
Data acquisition: GM Rodrigues.
Quality control of data and algorithms: GM Rodrigues and IE Mattos.
Data analysis and interpretation: GM Rodrigues and IE Mattos.
Statistical analysis: GM Rodrigues and IE Mattos.
Manuscript editing, review and final approval: IE Mattos and GM Rodrigues.

References


