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Nutritional parameters as predictors of mortality in home care patients: a cohort study

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ABSTRACT

Background: Home care services help the people to cope at home and support individual life. The nutritional assistance is part of routine. A poor nutritional risk status is associated with negative clinical outcomes as death.

Aims: To identify the prediction of mortality of nutritional parameters and; to analyze the mortality risk through the significant parameter, and to demonstrate survival rate of home care patients.

Methods: A retrospective cohort study was performed with a sample of home care patients implanted to the Hospitalar ATS® Company, RS, Brazil. Univariate analysis was done according survivors and non-survivors patients. Multiple logistic regression analysis was used to calculate risk relative adjusted for age and sex. The survival curve was generated by Kaplan-meier analysis.

Results: 58 patients were included. Patient's age, elderly age and length of home care were significant differences between survivors and non-survivors ($p<0.05$). In addition, there were also significant difference between groups in relation to BMI ($p=0.023$) and BMI <18.5 kg/m² ($p=0.002$). The patients classified at low weight assessed by BMI presented almost 3 times of risk to mortality ($p=0.014$). The 50% probability of death in low weight patients occurs within 500 days of follow-up. Patients with BMI ≥18.5 kg/m² had 90% survival was after 300 days of follow-up.

Conclusions: Nutritional assessment and screening is essential for patients with home care services. In addition, low weight can provides a higher risk of mortality in this population.

KEYWORDS

Home care; nutritional screening; nutritional assessment.

INTRODUCTION

The increased elderly population, the changed life-style trends and women increase in the labor market have reduced the possibilities of providing care informally[1]. On this way, many persons are dependent on formal home care services for continued living at home[2].

Home care services help the people to cope at home and support individual life[3]. The care develop a multi-professional working culture, adopting evidence based clinical pathways and protocols[3]. In addition, working methods include effectively managing resources, continuously monitoring and improving performance of patient[3].

The nutritional assistance is part of the home care routine[4]. The nutritional care should be provided in a systematic sequence that involves distinct interrelated steps called a nutrition care process[4]. The risk screening procedure is the first mandatory step in any diagnostic process[4]. Risk screening is a fast process performed to identify subjects at nutritional risk, and should be performed using an appropriate validated tool in all subjects[4]. The nutritional assessment will provide the basis for the diagnosis of malnutrition according to the nutrition diagnostic procedure[4]. A poor nutritional risk status is associated with increased financial to health organizations and negative clinical outcomes as death[4].

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Thus, the present study aimed: (1) to identify the prediction of mortality of nutritional parameters, (2) to analyze the mortality risk through the significant parameter and (3) to demonstrate survival rate of home care patients.

METHODS

Patients

A retrospective cohort study was performed with a sample of home care patients implanted to the Hospitalar ATS® Company, RS, Brazil. The cohort comprised adult patients (age ≥18 years) of both genders, admitted from January 2014 to April 2019 to home care Company, and with domiciliary nutritional monitoring. The follow-up time was until 18 October 2019. Patients were excluded when length of home care less than 6 months or there was not the first assessment report.

Patients were followed since implantation until discharge, death, or change of home care Company. All data used in this study were collected from patient electronic records. The study was conducted according to the Declaration of Helsinki guidelines.

General evaluation

Clinical and demographic characteristics such as age, sex, and type of admission were collected from electronic records and reports.

Nutritional Screening and Evaluation

A trained nutritionist conducted nutritional screening and assessment. The screening was performed using one tool - Nutritional Risk Screening-2002 (NRS-2002), within first week of admission to the home care[5]. The NRS-2002 rates patients' nutritional risk according to five variables: (I) unexplained weight loss in the last 3 months, (II) appetite, (III) Body Mass Index (BMI), and (IV) disease stress factor. Age (V) over 70 years[5]. The patients were identified at high nutritional risk when ≥3 score[5].

The patients were weighed at the beginning of the implantation through scale or estimative anthropometric by Chumlea[6]. Patient height was generated by the Chumlea equation[7]. From the weight and height was calculated the patient's BMI, classifying as low weight those with BMI <18.5 kg/m² [8].

The anthropometric measurements analyzed were arm circumference, calf circumference and triceps skinfold thickness. A cut-off point of <31 cm has been set to classify calf circumference below appropriate[9]. The arm muscle perimeter[10] and the corrected arm muscle area[10] were calculated from the triceps skinfold and arm circumference value.

Statistical Analyses

Data are presented as mean and standard deviation (SD), median (25th – 75th), or absolute values (%), and compared using Student's *t*, Mann-Whitney U, or χ^2 tests, respectively. Univariate analysis was done according survivors and non-survivors patients. Multiple logistic regression analysis was used to calculate risk relative (RR) and their respective 95% CIs for clinical outcomes. All models were adjusted for age and sex. The survival curve was generated by Kaplan-meier analysis, taking into account the preliminary time to death.

Calculations were performed with the Statistical Package for The Social Sciences (SPSS) 23.0 (Chicago, IL) and R project. P values <0.05 were considered statistically significant.

RESULTS

A total of 58 patients were included (68.3 ±19.2 years old, 39% female). **Figure 1** shows the patient's selection flowchart.

The comparison of characteristics between survivors (n=43; 74.1%) and non-survivors (n=15; 25.9%) of patients admitted to the home care are listed in **Table 1**. The follow-up patient's time were 567 (303 – 907) days. The majority patients were admitted to home care with neuro diagnoses (50%). Patient's age, elderly age and length of home care were significant differences between groups (p<0.05). In relation to admission type and sex, no significant differences were observed between patients.

Table 2 describes the sample according nutritional characteristics. The mean BMI was 21.9 (4.1) and BMI <18.5 kg/m² frequency was 7 (22.6%). In addition, there were significant difference between groups (p=0.023 and 0.002 respectively). There were no difference between nutritional parameters as nutritional care frequency, feeding via, nutritional risk, arm circumference, calf circumference, triceps skin fold, arm muscle circumference and corrected arm muscle area. There was no significant difference between patients followed weekly and quarterly for death outcome (p=0.248) (data not shown).

Table 3 shows the relative risk for mortality according to BMI <18.5 kg/m². The patients classified at low weight assessed by BMI presented almost 3 times of risk to mortality (RR=2.7; 95%CI: 0.560 – 4.867; p=0.014).

Figure 2 demonstrate the Survival Curve. The Curve shows that the 50% probability of death in low weight patients occurs within 500 days of follow-up. Patients with BMI ≥18.5 kg/m² had 90% survival after 300 days of follow-up.

DISCUSSION

This study demonstrated that BMI acted as mortality predictor for adult patients with home care assessment. Both the total BMI value, and the dichotomized group by the cutoff point <18.5 kg/m², showed significant association with death

Figure 1. Home care patients selection flowchart.

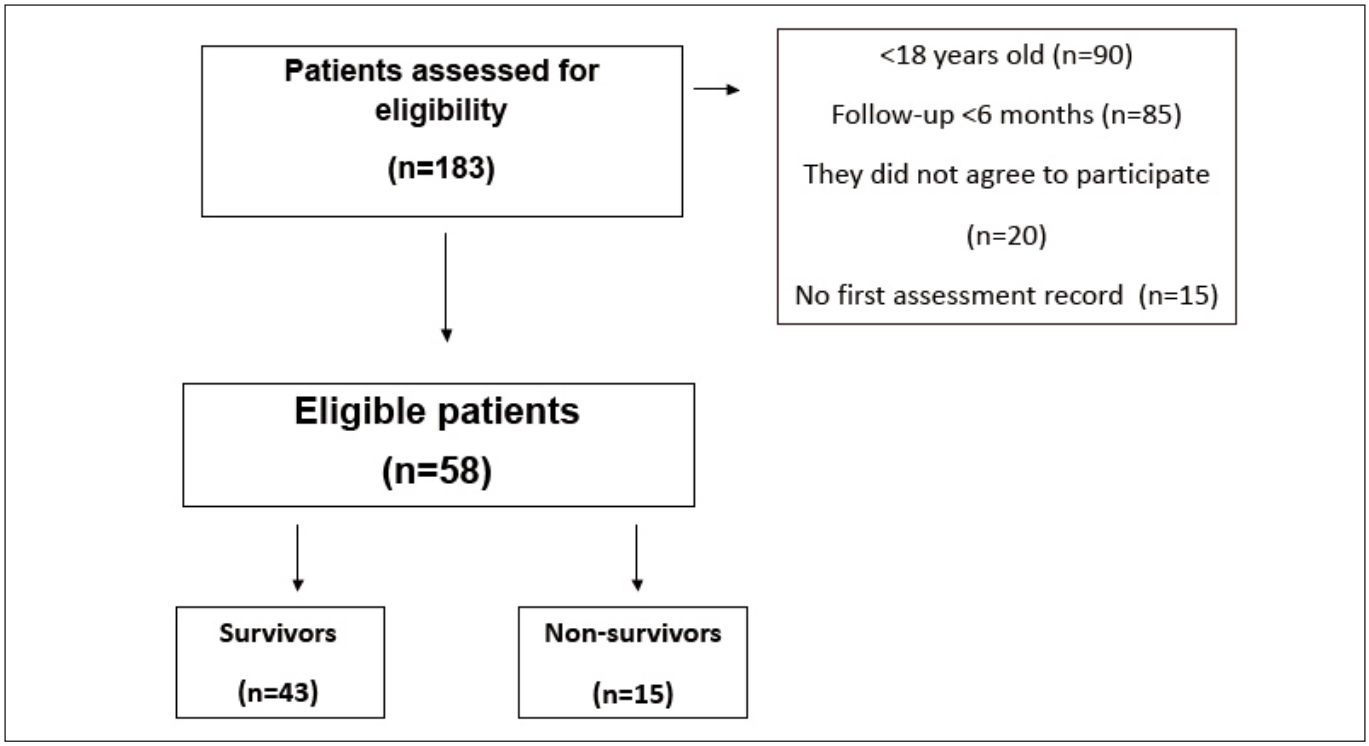


Table 1. Comparison of characteristics between survivors and non-survivors of patients admitted to Home Care (n=58).

Variables	All(n=58)	Survivors (n=43, 74.1%)	Non-survivors (n=15, 25.9%)	p
Type of admission				
Cancer (yes)	4 (6.9%)	2 (4.6%)	2 (13.3%)	0.628
Cardio (yes)	1 (1.7%)	2 (4.6%)	0 (0%)	
Neuro (yes)	50 (86.2%)	38 (88.4%)	12 (80%)	
Trauma (yes)	3 (5.2%)	2 (4.6%)	1 (6.7%)	
Age (years)	68.3 (19.2)	64.7 (20.3)	78.3 (11.3)	**0.033**
Elderly (yes)	48 (82.7%)	33 (76.7%)	15 (100%)	**0.040**
Sex (female)	23 (39%)	19 (44.1%)	4 (26.7%)	0.232
Length of Home Care	567 (303 – 907)	310.9 (413 – 942)	306 (196 – 572)	**0.002**

Data are presented as media (SD), n (%), or median (P25 - P75).

in this population. Gender and age-adjusted multivariate logistic regression showed that patients with low weight were almost 3 times more risk of death. The 50% survival rate for low weight patients occurred at 500 days of follow-up. Patients with BMI ≥18.5 kg/m² had a 90% survival rate during our follow-up.

A nutritional screening process is recommended to detect people with protein-energy malnutrition or at malnutrition risk. BMI is a useful tool in clinical practice for assessing nutritional status, and individuals with BMI ≤18.5 kg/m² are defined as underweight by the World Health Organization[8]. Within the framework of the European Society for Clinical Nutrition and Metabolism, BMI ≤18.5 kg/m² also indicates

Table 2. Comparison of nutritional characteristics between survivors and non-survivors of patients admitted to Home Care (n = 58).

Variables	All(n=58)	Survivors(n=43, 74.1%)	Non-survivors(n=15, 25.9%)	p
Nutritional care frequency				
Quarterly	2 (3.4%)	1 (2.3%)	1 (6.7%)	0.782
Bimonthly	9 (15.5%)	6 (13.4%)	3 (20%)	
Monthly	42 (72.4%)	32 (74.4%)	10 (66.7%)	
Biweekly	3 (5.2%)	2 (4.6%)	1 (6.7%)	
Weekly	2 (3.5%)	2 (4.6%)	0 (0%)	
Feeding via				
Enteral tube	34 (58.6%)	23 (53.5%)	11 (73.3%)	0.198
Enteral tube and orally	7 (12%)	7 (16.3%)	0 (0%)	
Orally	17 (29.3%)	13 (30.2%)	4 (26.7%)	
BMI (kg/m²)	21.9 (4.1)	22.0 (3.6)	21.8 (6.0)	**0.023**
BMI <18.5 kg/m² (yes)	7 (22.6%)	2 (4.2%)	4 (26.7%)	**0.004**
Nutritional Risk (yes)*	22 (12%)	14 (32.5%)	8 (53.3%)	0.153
Arm Circumference (cm)	27.7 (3.9)	31.3 (29.2)	27.5 (8.5)	0.746
Calf Circumference (cm)	30.2 (6.6)	27.9 (3.8)	27 (3.8)	0.353
Calf Circumference < 31 cm (yes)	28 (48.3%)	19 (44.2%)	9 (60.0%)	0.907
Triceps Skin Fold (mm)	15 (10-23)	15 (11-26)	13 (7-20)	0.318
Arm Muscle Circumference	22.2 (3.4)	22.1 (3.2)	22.5 (1.2)	0.182
Corrected Arm Muscle Area	31.5 (11.6)	31.2 (11.2)	32.5 (13.3)	0.299

BMI, Body Mass Index.
Nutritional Risk Screening – 2002 ≥ 3 score.
Data are presented as media (SD), n (%), or median (P25 - P75).

Table 3. Relative risk of mortality according to BMI (n = 58).

Classification	RR[a]	CI 95%	p
BMI <18.5	2.714	(0.560– 4.867)	**0.014**

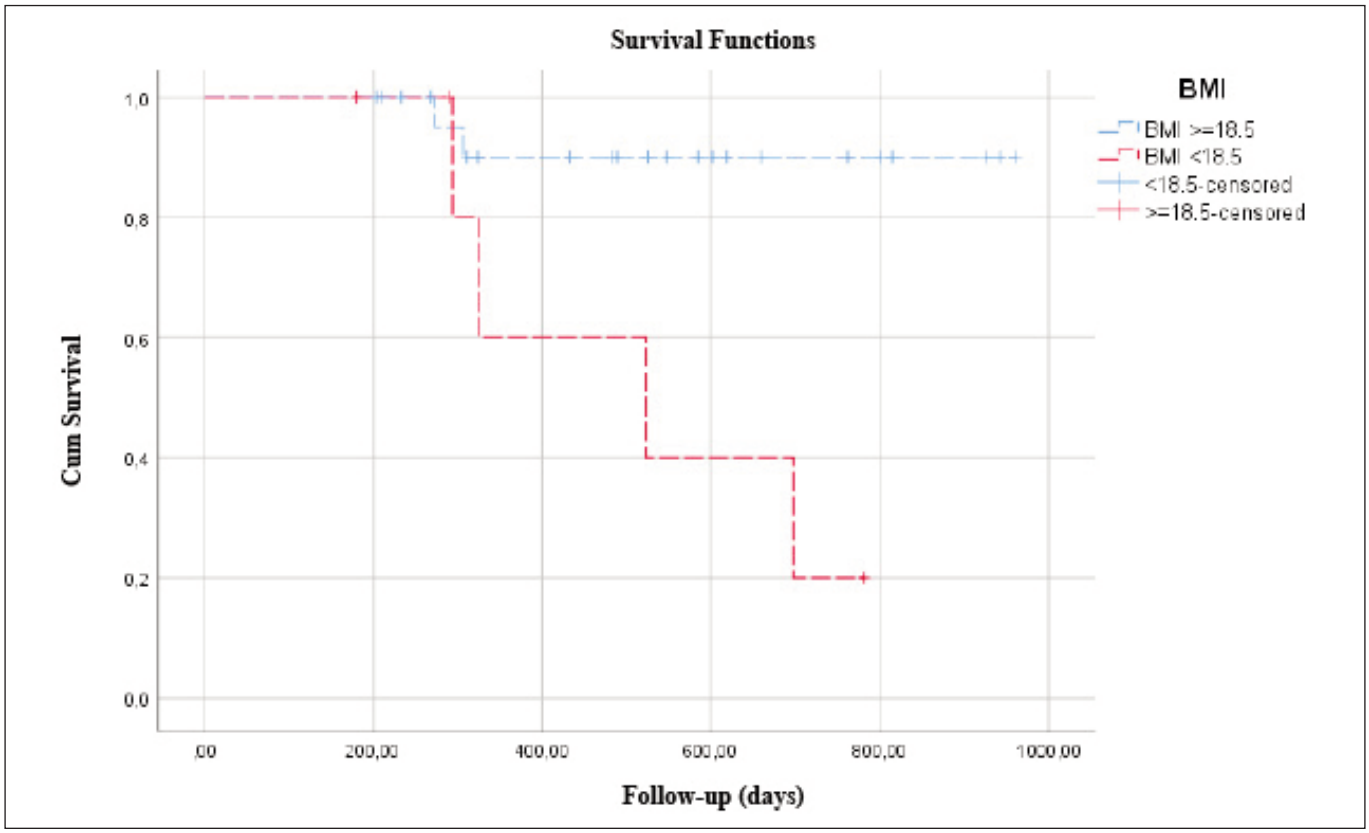
RR: Relative Risk; CI: Confidence Interval; BMI – Body Mass Index.
[a] Obtained by multiple logistic regression analysis. Models adjusted by sex and age of years.

malnutrition and should be considered as serious sign of malnutrition warranting clarification of the underlying causes[4].

A prospective study corroborated with our findings[11]. The follow-up of 84 subjects with dementia aged ≥80 years identified variables associated with mortality risk[11]. After controlling for age, gender, and years of education, Mini Nutritional Assessment ≤11 (RR=3.85; 95%CI: 1.07–14.29; p=0.038), and BMI ≤18.5 kg/m2 (RR=2.91; 95%CI: 1.16–7.32; p=0.023) were statistically significant predictors for death[11]. Similar results was found in a cohort study with 146 patients with liver disease who BMI <18.5 kg/m² presented increased risk for mortality in 3 years follow up (RR=2.43, 95%CI: 1.07–5.50; p<0.005; adjusted for age, gender and disease cause)[12]. A prospective study with 7529 participants showed that overweight and obesity were associated with 61% and 65% lower risk of mortality for patients without cardiovascular disease (RR=0.39; 95%CI: 0.20–0.77 and RR=0.35; 95%CI: 0.14–0.85)[13].

In relation to nutritional screening, there is no specific tool for population with formal home care service. The NRS-2002

Figure 2. Survive curve of home care patients.



BMI – Body Mass Index.

tool was developed to be applied in hospitalized patients[5]. Moreover, your score is associated to negative clinical outcomes, included death, in this specific population[5]. In our population, we did not find this relation, demonstrating the need to develop a tool with specific variables for home care individuals. On the other hand, Orrevall et al. applied NRS-2002 in cancer patients in palliative treatment with home care service. They found that those who survived less than 1 month scored significantly worse compared to 4–12 months (p=0.033) and more than 12 months (p=0.005)[14].

Regarding the periodicity of nutritional assistance, there was no significant association with death, even when comparing patients with weekly and quarterly follow-up. In the scientific literature, there is no specific tool for appropriate frequency for home nutritional care. Often, the nutritionist decides the frequency of patient care subjectively, or the decision is up to the health insurance that hires home care companies.

This study has some limitations. The limited number of patients included demonstrates that the continuity of this analysis is necessary. The lack of adequate nutritional assessment and screening tools for this population may compromise our findings. Analysis of other outcomes such as hospitalization and infections is required in further studies.

CONCLUSION

We conclude that nutritional assessment and screening is essential for patients with formal home care services. In addition, low weight can provides a higher risk of mortality in this population. Further analysis of this population and association between nutrition parameters and mortality or clinical outcomes are needed.

STATEMENT OF AUTHORSHIP

All the authors are responsible for the reported research and have made substantial contributions to the conception and design of the study, acquisition and analysis of data.

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