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IDENTIFICATION OF ELDERLY PEOPLE WITH SARCOPENIA AT HOSPITAL ADMISSION: AN ANALYSIS OF THE RELATIONSHIP BETWEEN SARCOPENIA, INDICATORS OF NUTRITIONAL STATUS AND LENGTH OF HOSPITAL STAY

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ABSTRACT

Objective: To identify, at hospital admission, elderly people at risk of sarcopenia or sarcopenics and their relationship with body mass index (BMI), calf circumference (NC), adductor pollicis muscle thickness (EMAP), length of hospital stay, and readmissions. Material and Methods: The study included elderly people of both sexes, hospitalized at the Hospital Beneficente Unimar, in Marília-SP. Initially, the patients answered a questionnaire to characterize the sample. For the screening and diagnosis of sarcopenia, the European Consensus on the Diagnosis and Definition of Sarcopenia algorithm was adopted. Anthropometric data were collected using techniques standardized in the literature. Results: The study included 98 elderly people, with a mean age of 70 ± 7.9 years, most of whom were women (53%). It was observed that 48% of the patients had sarcopenia or risk of developing it. The variables BMI ($p = 0.0140$), NC ($p = 0.0007$), and EMAP ($p = 0.0013$) were significantly lower in the group of sarcopenic or at-risk older adults compared to the non-sarcopenic group. In addition, the length of hospital stay was significantly longer ($p = 0.0001$) among patients with sarcopenia or risk of developing it. Conclusion: Sarcopenia is associated with a reduction in BMI, NC and EMAP, impacting a longer hospital stay. Early detection of sarcopenia through these nutritional indicators in hospitalized older adults is essential for identifying cases and targeting interventions that improve the health and well-being of patients, reducing the costs associated with hospitalization.

Keywords: Hospitalization. Elderly. Sarcopenia. Length of Hospitalization.

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INTRODUCTION

Sarcopenia is conceptualized as the irreversible and progressive loss of muscle mass, of its strength and its function, with a greater incidence on the elderly population, so that aging as a factor of aggravation has become a consensus, for which there is a loss of muscle strength of 3% each year after the age of 60 (DOHERTY, 2003; MONTERO-ERRASQUÍN; CRUZ-JENTOFT, 2023). Epidemiologically, sarcopenia affects 6 to 22% of the elderly worldwide, still taking into account the different diagnostic instruments used in each region of the planet around the world (TAGLIAFICO; BIGNOTTI; TORRI; ROSSI, 2022). Given its high prevalence in the populationis essential the recognition of risk factors and the early identification of sarcopenia in the individual, once this condition decreases significantly quality of life in various everyday aspects, as seen in functional decline, frailty and in the falls. (KIRK; CAWTHON; CRUZ-JENTOFT, 2024; MONTERO-ERRASQUÍN; CRUZ-JENTOFT, 2023; NUNES; ZACARIN; PAVARINI; ZAZZETTA *et al.*, 2021).

Loss of muscle mass is also associated with several serious complications, such as breathing difficulties, increased risk of infections, and even the worsening of preexisting chronic diseases, as well as an increase in the mortality rates of sarcopenic individuals. In addition, the presence of sarcopenia can be correlated with a longer hospital stay, a fact that is associated with increased costs to health systems (DEANDRADE; PEDERSEN; GARCIA; NAU, 2018). It is known that elderly people with sarcopenia, due to greater dependence on care and long hospitalization, generate high costs for health systems, which suffer from bed occupancy and high demand for health professionals to manage bedridden individuals (ANTUNES; ARAÚJO; VERÍSSIMO; ADAM *et al.*, 2017; CAWTHON; LUI; TAYLOR; MCCULLOCH *et al.*, 2017; TAN; LIM; CHOE; SEETHARAMAN *et al.*, 2017). In view of this situation, there are reports that elderly people who are admitted to hospitals with sarcopenia are five times more likely to have higher hospital costs than those without sarcopenia (ANTUNES; ARAÚJO; VERÍSSIMO; ADAM *et al.*, 2017).

In view of this, the Identification of patients at risk of sarcopenia may allow targeted interventions at the beginning of the hospital course, in which the expansion of multidisciplinary actions is essential, and must occur The integration of physiotherapists, nutritionists, physicians and nurses in the approach to sarcopenia has shown positive results in improving the functionality and quality of life of elderly patients (DEANDRADE; PEDERSEN; GARCIA; NAU, 2018; FILIPPIN; TEIXEIRA; DA SILVA; MIRAGLIA *et al.*, 2015; LIU; HAO; HAI; WANG *et al.*, 2017). Therefore, the Well-performed nutritional

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assessment is important in the hospital area, as it is capable of previously identifying malnutrition and/or sarcopenia in patients, or identifying the risk of developing them during hospitalization (DA COSTA; CHRISTIAN; MARIN; SPEXOTO, 2023).

Therefore, actions that can prevent the development and aggravation of sarcopenia are essential by reducing its risk factors. In view of the above, the objective of the study was to identify, at the time of hospital admission, elderly people at risk of sarcopenia or sarcopenic disease and their relationship with body mass index (BMI), calf circumference (NC), thickness of the adductor pollicis muscle (EMAP), length of hospitalization and readmissions.

METHODOLOGY

The sample consisted of elderly people aged 60 years or older, of both sexes, hospitalized in the medical clinic wards of the Hospital Beneficente Unimar de Marília-SP. Patients who agreed to participate in the study by signing the "Informed Consent Form - ICF" were included, with data collection within the first 48 hours of hospitalization. The exclusion criteria were patients on dietary restriction for weight loss during the study period, with chronic renal failure on dialysis, with paresis or hemiparesis due to stroke, with changes in body fluids, and patients on chronic use of oral corticosteroids. The present study was approved by the Research Ethics Committee of the University of Marília under protocol No. 5,489,649.

Initially, the volunteers answered the sample characterization questionnaire. For the diagnosis of sarcopenia, the European Consensus on the Diagnosis and Definition of Sarcopenia algorithm was used (CRUZ-JENTOFT; BAHAT; BAUER; BOIRIE *et al.*, 2019). In the first stage of the algorithm, the volunteers were screened for risk of sarcopenia using the SARC-F questionnaire (Simple questionnaire to rapidly diagnose sarcopenia) in order to detect if there is a risk of sarcopenia. This The questionnaire consists of five questions pertaining to: strength, walking assistance, getting up from a chair, climbing stairs and falls on a scale of 0 to 2. A greater result or equal to 4 of the questions are considered patients at risk of sarcopenia (CRUZ-JENTOFT; BAHAT; BAUER; BOIRIE *et al.*, 2019; MALMSTROM; MILLER; SIMONSICK; FERRUCCI *et al.*, 2016; MALMSTROM; MORLEY, 2013).

In the second stage, to assess muscle strength, the handgrip strength test was performed, using a SAEHAN® SH 5001 hand-held hydraulic dynamometer. A strength < 16

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kg for women and < 27 kg for men are considered cut-off points for diagnosing probable sarcopenia or risk of sarcopenia (BEAUDART; BIVER; REGINSTER; RIZZOLI *et al.*, 2017; CRUZ-JENTOFT; BAHAT; BAUER; BOIRIE *et al.*, 2019). To perform this measurement, standardized protocols were followed, with three maximal grip maneuvers being performed, alternating between the two arms, with at least one minute of rest in order to control muscle fatigue. The results were expressed in kilogram-force (Kg/f) as the means of the three measurements for each hand (HAMILTON; MCDONALD; CHENIER; THERAPY, 1992; LIU; MARIE; FREDRICK; BERTRAM *et al.*, 2017; MOREIRA, 2001; ROBERTS; DENISON; MARTIN; PATEL *et al.*, 2011).

In the third stage, to confirm sarcopenia through the detection of low muscle quantity/quality, the Biodynamics bioelectrical impedance device (model 450), of the tetrapolar type, was used, and the reduction in muscle mass was identified when the appendicular skeletal muscle mass was < 20Kg for men and < 15 Kg for women (CRUZ-JENTOFT; BAHAT; BAUER; BOIRIE *et al.*, 2019). To estimate appendicular skeletal muscle mass, the formula of JANSSEN; HEYMSFIELD; BAUMGARTNER and ROSS (2000).

The anthropometric data collected were body weight and height for subsequent BMI calculation, plus NC and EMAP. Since it was not possible to measure weight and height, they were estimated using the Chumlea formulas (CHUMLEA; GUO; ROCHE; STEINBAUGH, 1988; CHUMLEA; ROCHE; STEINBAUGH, 1985). For the collection of all anthropometric data, recommended techniques were used (GIBSON, 2005).

The statistical treatment of the quantitative data was carried out with the support of a statistical program. The data were presented in tables of frequency, mean, standard deviation and median, according to the profile of the analysis. To evaluate the association of the variables, the t-test was used for parametric data and the Mann Whitney test for non-parametric data. The significance was 5% ($p \leq 0.05$) for all the operations performed.

RESULTS

The results of this study on sarcopenia and its relationship with anthropometric data and length of hospital stay reveal a comprehensive analysis of the characteristics and implications of this condition in our sample that included 98 hospitalized older adults. Among the participants, the mean age was 70 ± 7.9 years, with a minimum of 60 years and a maximum of 95 years, most of whom were women (53%). Table 1 shows the

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characteristics of the participants in terms of gender, socioeconomic factors and social habits.

Table 1. Data from hospitalized participants regarding gender, socioeconomic factors and social habits.

Variables		Absolute Frequency (n)	Relative frequency (%)	Total
Sex	Female	52	53%	100%
	Male	46	47%	
Household income	Up to 1 salary	38	39%	100%
	1 salary - 3 salaries	41	42%	
	3 salaries - 5 salaries	19	19%	
Schooling	Illiterate	20	20%	100%
	Elementary 1	30	31%	
	Elementary 2	11	11%	
	Middle school	24	24%	
	Superior	12	13%	
Alcohol consumption	Yes	35	36%	100%
	No	63	64%	
Smoking	Yes	13	13%	100%
	No	41	42%	
	Former smoker	44	45%	

Table Source: authorship.

Table 2 describes the prevalence of sarcopenia and the clinical data of the volunteers. The overall prevalence of sarcopenia and risk of sarcopenia was 48%. 11 elderly people with confirmed sarcopenia (11%) and 36 elderly people at risk of developing it (37%) through the reduction of muscle strength by dynamometry.

Regarding the classification of nutritional status according to BMI, half of the sample (n=49) is overweight, 16 of whom were overweight and 33 were obese. The mean number of comorbidities per patient was 2.2 ± 0.19, indicating the occurrence of more than one comorbidity per elderly person, among which the highest prevalence was hypertension (n=66), followed by cardiovascular diseases (n=46), type 2 diabetes mellitus (n=41) and dyslipidemia (n=40). Of the total number of hospitalized patients, 41% were admitted due to falls, and most remained hospitalized for 1 to 5 days (63%).

Table 2. Prevalence of Sarcopenia and clinical data of hospitalized elderly (n=98).

Variables		Absolute Frequency (n)	Relative frequency (%)	Total
Classification of sarcopenia	Non-sarcopenic	51	52%	100%
	Sarcopeni or at risk of sarcopenia	47	48%	
BMI Rating	Low weight	25	26%	100%
	Suitable Weight	24	24%	
	Overweight	16	16%	
	Obesity	33	34%	

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Hospitalization for falls	Yes	40	41%	100%
	No	58	59%	
Length of stay (days)	1 to 5	62	63%	100%
	6 to 10	21	21%	
	11 to 15	5	5%	
	16 to 20	8	8%	
	more than 21	2	2%	
Readmission	Yes	21	21%	100%
	No	77	79%	

Table Source: authorship.

Table 3 shows that the patients were divided into non-sarcopenic, sarcopenic, or at risk of sarcopenia for association with the study variables.

The variables BMI (p=0.0140), PC (p = 0.0007) and EMAP (p = 0.0013) were significantly lower in the group of sarcopenic or at-risk older adults, compared to the group of non-sarcopenic older adults. On the other hand, the length of hospital stay was significantly longer (p = 0.0001) in patients with sarcopenia or at risk, compared to non-sarcopenic patients, which shows that sarcopenic patients are hospitalized for longer.

Table 3. Data on the diagnosis of sarcopenia associated with nutritional indicators and length of hospitalization and rehospitalization (n=98).

	Non-sarcopenic (n=51)	**Sarcopeni or at risk of sarcopenia (n=47)**	
Variables	**Mean±standard deviation**		**p-value**
	(median)		
Body mass index (kg/m2)	28.43 ± 5.33	25.72 ± 6.49	0.0140
	(29)	(26)	
Calf circumference (cm)	34.29 ± 6.00	30.59 ± 4.82	0.0007*
	(35)	(31)	
Adductor pollicis muscle thickness (mm)	15.98 ± 6.08	12.48 ± 4.74	0.0013*
	(16)	(11)	
Length of hospital stay	1.27 ± 0.78	2.04 ± 1.14	0.0001**
	(1.00)	(2)	
Readmissions	1.78 ± 0.415 (2)	1.79 ± 0.413 (2)	0.486*

*T test; **Mann-Whitney test. **Table Source:** authorship.

DISCUSSION

The present study aimed to address an increasingly relevant issue in public health: sarcopenia in hospitalized elderly. With the increase in life expectancy and of the proportional increase of elderly people in the population, it is imperative to understand and

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deal with The specific challenges related to aging (DOGRA; DUNSTAN; SUGIYAMA; STATHI *et al.*, 2022; MARQUES; SIMÕES; SANTA ROSA; SILVESTRE, 2021). This study sought to fill a gap by investigating the prevalence of sarcopenia in hospitalized older adults, as well as its association with anthropometric indicators and clinical outcomes, providing important insights for clinical practice and management of health services.

The results revealed a high prevalence of sarcopenia and risk of developing this condition in hospitalized older adults, with 48% of participants being affected. This finding is consistent with previous studies, which have also reported a high prevalence of sarcopenia in hospitalized populations (ÁLVAREZ-BUSTOS; RODRÍGUEZ-SÁNCHEZ; CARNICERO-CARREÑO; SEPÚLVEDA-LOYOLA *et al.*, 2022; NUNES; ZACARIN; PAVARINI; ZAZZETTA *et al.*, 2021; YUAN; LARSSON, 2023). The association between sarcopenia and anthropometric indicators, such as BMI, calf circumference, and adductor pollicis muscle thickness, reinforces the usefulness of these parameters in the early identification of older adults at risk of sarcopenia (ALVES; CARREGOSA; DE SOUZA OLIVEIRA; DE OLIVEIRA, 2023; BARBOSA; NOVAES; SILVA, 2021). In addition, the relationship between sarcopenia and prolonged hospital stay suggests direct implications for the management of hospitalized patients and the costs associated with hospitalization (SHIBASAKI; OUCHI; FUKUDA; TSUCHIYA *et al.*, 2022).

However, it is important to recognize the limitations of this study when interpreting the results. The cross-sectional nature of the study design limits our ability to establish causal relationships between sarcopenia and clinical outcomes (CRUZ-JENTOFT; BAHAT; BAUER; BOIRIE *et al.*, 2019). In addition, the sample size, while sufficient to detect significant associations, may influence the generalizability of the results to broader populations (PAGOTTO; SAINTS; MALACHI; BACHION *et al.*, 2018). Selecting a larger, more diverse sample in future studies will help confirm and expand these findings. In addition, the inclusion of longitudinal measures could provide a clearer picture on the causality and effects of specific interventions.

The findings of this study pave the way for a number of future perspectives. Implementing systematic screening strategies for sarcopenia in hospital facilities can improve early detection and management of this condition, enabling improvements in the health of their sufferers and reduction of costs associated with hospitalization (CAWTHON; LUI; TAYLOR; MCCULLOCH *et al.*, 2017). In addition, further research is needed to explore the mechanisms underlying the association between sarcopenia and clinical

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outcomes, as well as to develop and evaluate effective interventions to prevent and treat this condition in hospitalized older adults.

In summary, the results of this study contribute significantly to the understanding of sarcopenia in hospitalized older adults. By emphasizing the importance of early detection and proper management of this condition, the study offers a solid basis for clinical interventions and health policies aimed at this vulnerable population. The strong association of sarcopenia with a higher risk of falls, fractures, and functional impairment underscores the urgent need for effective prevention and treatment strategies.

CONCLUSION

The prevalence of sarcopenia and the risk of developing it occurred in 48% of this sample, being confirmed in 11% of the cases. Sarcopenia was associated with a decrease in BMI, NC, and EMAP, impacting a longer hospital stay. Early detection of sarcopenia with the use of these indicators of nutritional status in hospitalized elderly patients is essential to identify cases and to direct interventions that can improve their health and well-being, reducing costs associated with hospitalization.

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