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Original Article

Factors related to sarcopenia and functional capacity in institutionalized elderly

Fatores relacionados à sarcopenia e à capacidade funcional em idosos institucionalizados

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ABSTRACT

Objective: to analyze factors related to sarcopenia and functional capacity of institutionalized elderly. **Methods:** descriptive, correlational, cross-sectional study, with 92 elderly people, in four long-term institutions. For data collection, a socioeconomic and clinical form, Mini Mental State Examination, Barthel Index and *Timed Up and Go test* were applied. In the analysis, the chi-square and Fisher's exact tests were adopted. **Results:** it was identified that 68 (73.9%) had probable sarcopenia, 7 (7.6%) sarcopenia and 11 (12.0%) severe sarcopenia. The factors associated with sarcopenia were education (p=0.017), risk of falls (p=0.000) and chronic kidney disease (p=0.040). As for functional capacity, 49 (53.3%) had mild dependence, 40 (43.5%) moderate and 3 (3.3%) severe. The factors associated with functional capacity were risk of falls (p=0.010), polypharmacy (p=0.017) and education (p=0.019). **Conclusion:** it was found that education, polypharmacy, chronic kidney disease, risk of falls, falls and sarcopenia can influence the functional capacity of institutionalized elderly.

Descriptors: Sarcopenia; Frail Elderly; Homes for the Aged.

RESUMO

Objetivo: analisar fatores relacionados à sarcopenia e à capacidade funcional de idosos institucionalizados. **Métodos:** estudo descritivo, correlacional, transversal, com 92 idosos, em quatro instituições de longa permanência. Para coleta de dados, aplicou-se formulário socioeconômico e clínico, Miniexame do Estado Mental, Índice de Barthel e *Timed Up and Go test*. Na análise, adotaram-se os testes qui-quadrado e exato de Fisher. **Resultados:** identificou-se que 68 (73,9%) possuíam provável sarcopenia, 7(7,6%) sarcopenia e 11 (12,0%) sarcopenia severa. Os fatores associados à sarcopenia foram escolaridade (p=0,017), risco de quedas (p=0,000) e doença renal crônica (p=0,040). Quanto à capacidade funcional, 49(53,3%) possuíam dependência leve, 40(43,5%) moderada e 3(3,3%) grave. Os fatores associados à capacidade funcional foram risco de quedas (p=0,010), polifarmácia (p=0,017) e escolaridade (p=0,019). **Conclusão:** verificou-se que a escolaridade, a polifarmácia, a doença renal crônica, o risco de quedas, as quedas e a sarcopenia podem influenciar a capacidade funcional de idosos institucionalizados.

Descritores: Sarcopenia; Idoso Fragilizado; Instituição de Longa Permanência para Idosos.

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Introduction

Population aging has been increasing exponentially in recent decades, both in developed and developing countries. According to the World Health Organization, in the year 2050, the elderly population will increase from 841 million to two billion, with Japan being the country with the oldest (33.0%), followed by Italy (29.0%), Germany (28.0%), Portugal (27.0%) and Finland (28.0%)[1]. In this way, the health surveillance of these new elderly people becomes increasingly relevant, encouraging the development of effective and resolving actions that promote the health of this population.

In Brazil, an expressive speed of growth of the elderly population is observed, represented by 10.5% of the total population[2]. Due to demographic requirements, public policies were implemented for this population, such as the Statute for the Elderly and the National Health Policy for the Elderly. Currently, Brazil has a significant number of elderly people living in long-term institutions, with a prevalence of 1.0% of the general elderly population[3]. Despite advances in health care for the elderly, there are still challenges, such as the care of the elderly who live in long-term institutions[4].

Institutionalized elderly people, in most cases, in addition to being excluded from social life, have disorders that cause functional impairments and dependence[5]. Therefore, the assessment of functional capacity and the recognition of their functionality become essential to define actions that promote healthy aging.

Among the disorders that lead to a decrease in functional capacity, sarcopenia has been identified as one of the main associates[6], which is defined as a complex geriatric syndrome, characterized by progressive and generalized loss of muscle mass and function. The causes of sarcopenia are multifactorial, involving the aging process itself, the sedentary lifestyle, an inadequate diet and multiple chronic diseases[7]. It is a syndrome with a high prevalence in the population over 60 years of age. In Brazil, the total prevalence was found to be 15.4%, with 14.4% in men and 16.1% in women[8].

The importance of assessing sarcopenia is because it is a health problem associated with adverse events, such as an increased chance of falls and fractures, impairment of the ability to develop daily activities of daily living and increased morbidities. As a consequence, it affects the elderly person, not only functionality, but also physical immobility and dependence, in addition to quality of life and health costs[9].

In this sense, sarcopenia and functional capacity can influence the quality of life of institutionalized elderly people, however, there are still gaps related to the theme in question, aimed at this specific audience, which can lead to unpreparedness and difficulty in early detection of changes, making it difficult to carry out interventions aimed at health care practice for the elderly.

Given the context, the objective was to analyze factors related to sarcopenia and the functional capacity of institutionalized elderly.

Methods

Descriptive, correlational, cross-sectional study carried out with elderly residents in four long-term care facilities for the elderly, located in the city of Fortaleza, Ceará, Brazil. These institutions have 395 elderly people: Institution 1 has 223 elderly people; Institution 2 with 42 elderly people; Institution 3 with 35 elderly people; and Institution 4 with 95 elderly people. These were chosen because they are older and have a greater number of institutionalized elderly people, in addition, they are fields of internships in undergraduate nursing courses at public and private universities.

The study population consisted of 395 elderly people living in long-term care facilities for the elderly. To calculate the estimated sample, the cross-sectional study formula with a finite population was applied, using the 95% confidence coefficient (Z=1.96); prevalence rate of sarcopenia in the elderly equal to 15.4% (P=0.15)[10], (Q=0.75); and sampling error of 0.05 (E=0.05), totaling 133 elderly. However, after applying

the inclusion criteria, the available census sample was 92 elderly. Individuals aged ≥60 years that lived in one of the four institutions were included. The exclusion criteria used were elderly people with disabilities or pathology that could interfere with the application of the instruments and tests used, diagnosis of dementia or severe cognitive impairment and some type of limitation that prevented communication.

Data collection took place from March to June 2017, by researchers and scholarship holders from the Teaching, Research and Extension Group in Elderly Health, linked to the Nursing course at the Federal University of Ceará. It was used to collect data from a form divided into two sections, section I - sociodemographic data (age, sex, education level, previous occupation, institutionalization time, reason for institutionalization) and section II - clinical aspects of the patient: comorbidities, time of diagnosis of comorbidities; medications in use, Mini Mental State Examination score (MMSE), Survey on falls and anthropometric assessment (weight, height, Body Mass Index, abdominal and arm circumference); Barthel index for assessing functional capacity; assessment of handgrip strength, calf circumference; and Time Get Up And Go Test (TUG) to assess sarcopenia.

The Barthel Index was developed and validated for Brazil in elderly patients treated at an outpatient clinic[11]. This instrument assesses the level of dependence to perform ten Activities of Daily Living and, in each answer, scores 15, 10, 5 and 0 can be assigned. The result of the assessment is obtained by adding the scores, which can vary from zero to 100, at five-point intervals. The higher the score is, the greater the degree of functional independence. The cut-off scores for the Barthel Index used in this study were: total dependency: 0 to 20 points; severe dependency: 21 to 60 points; moderate dependency: 61 to 90 points; mild dependency: 91 to 99; independence: 100 points.

To evaluate sarcopenia, the *European Working Group on Sarcopenia in Older People* was used as a theoretical framework, in which the investigation of sarcopenia is based on the assessment of muscle mass, muscle strength and physical performance. Sarcopenia is likely when low muscle strength is detected; the diagnosis is confirmed by the additional presence of low muscle quality or quantity. When low muscle strength, low muscle quantity and/or quality and low physical performance are proven, sarcopenia is considered severe[7].

In order to assess muscle strength, the measurement of handgrip strength was used with the Jamar® hydraulic hand dynamometer, validated and widely used equipment to measure grip strength. The test was performed according to the standards of the American Manual Therapy Association[12]. As cut-off points that determine that there is a decrease in muscle strength, the results are <27kgf for men and <16kgf for women[7].

Muscle mass was assessed by measuring the circumference of the left calf with a tape measure. It is considered altered, when the circumference is less than 31 cm for men and women[13].

As for the verification of physical performance, we used the TUG, which consists of measuring the time spent for the participant to get up from a chair, walk three meters, return and sit down again, at the usual speed. An elderly person with low performance is considered one who performs the TUG in more than 20 seconds. In addition, the TUG also assesses the risk of falls in the elderly. Independent individuals, without changes in balance and risk of falls, perform the test in 10 seconds or less; disabled or frail patients, with partial independence and low risk of falling, perform the test in up to 20 seconds or less, and those who need more than 20 seconds to perform the test are dependent on many activities of daily living, suggesting a significant deficit physical performance and high risk of falls[7].

For data analysis, a spreadsheet was created using the *Microsoft Excel*® computer program, whose statistical analysis was performed using the *Statistical Package for Social Sciences*, version 22.0. In descriptive statistics, after verifying the normality of the data, frequencies, means and standard deviations were calculated for numerical and categorical variables. Chi-square and Fisher's exact tests were applied to verify

associations between the outcome variables (sarcopenia and functional capacity) and the independent variables (sociodemographic and clinical data and anthropometric assessment), with adoption of p<0.05. The study was approved by the Ethics Committee of the Federal University of Ceará, according to opinion No. 1,784,344/2016.

Results

The sample consisted of 92 elderly people, the average age was 76.69 years, in which 43 (46.7%) were between 71 and 80 years old. Most were female (64.1%), with an average schooling of 5.64 years, 48 considered themselves to be single (52.2%), while 21 (22.8%) were widowed. Most of them claimed to receive less than or equal to a minimum wage, 76 (82.6%), and 88 (95.7%) declared that they were retired or received some benefit.

Regarding the MMSE score, the average score was 22.7 points (± 23). Among the illiterate, 19 (20.5%) scored ≥13, showing good cognitive status, while only one (1.1%) had a deficit. Among the literate, 67 elderly (73.0%) scored equal or higher than 17 points, showing good cognition and five (5.4%) presented cognitive deficit.

Among the comorbidities presented, 59 (64.1%) had cardiovascular problems, 25 (27.2%) diabetes and 22 (23.9%) osteoarticular diseases (arthritis, arthrosis, osteoporosis). Of the medications used, 20 (21.7%) used five or more medications, with emphasis on antihypertensive drugs, followed by oral antidiabetic drug, antidepressants, among others.

Regarding the anthropometric assessment, the average weight was 62.30 kg (± 14.64); the average height was 1.54 m (± 8.98); the mean body mass index was 26.09 (± 5.17); 26 elderly (28.3%) were underweight, 24(26.1%) eutrophic, 42(45.7%) were overweight; the mean waist circumference was 101.14 cm (± 12.73). Ninety (97.4%) had an arm circumference greater than or equal to 22 cm.

Regarding falls, 37 (40.2%) fell in the last 12 months, 27 (29.3%) fell within the institution itself and 20 (21.73%) had physical limitations as a consequence. By assessing the risk of falls, with the TUG, 61 (66.3%) were at low risk for falls, 14 (15.2%) at moderate risk and 17 (18.5%) at high risk for falls.

Regarding the assessment of sarcopenia, 86 (93.4%) showed decreased muscle strength, 18 (19.6%) reduced muscle mass and 32 (34.8%) decreased performance and risk for falls. Thus, according to the criteria used, it was identified that 68 (73.9%) had probable sarcopenia, 7 (7.6%) sarcopenia and 11 (12%) severe sarcopenia.

The factors associated with sarcopenia were identified, with educational values (p=0.017), the risk of falls (p=0.000) and chronic kidney disease (p=0.040) standing out (Table 1).

Table 1 – Analysis of the relationships between sociodemographic and clinical variables with the outcome variables of sarcopenia. Fortaleza, CE, Brazil, 2017 (n=92)

Variables	Not sarcopenic	Probable sarcopenia	Sarcopenia	Severe sarcopenia	*p-value
	n (%)	n (%)	n (%)	n (%)	
Age (years)					0.146
≤ 79	5 (8.6)	35 (60.3)	13 (22.4)	5 (8.6)	
≥80	0 (0.0)	17 (50.0)	12 (35.3)	5 (14.7)	
Gender					0.076
Female	2 (6.1)	24 (72.7)	4 (12.1)	3 (9.1)	
Male	3 (5.1)	28 (47.5)	21(35.6)	7 (11.9)	
Education (years)					0.017*
≤5	1 (1.8)	29 (51.8)	21(37.5)	5 (8.9)	
>5	4 (11.1)	23 (63.9)	4 (11.1)	5 (13.9)	
Income (salary)					0.445
≤1	5 (6.4)	45 (57.7)	21(26.9)	7 (9.0)	
>2	0 (0.0)	7 (50.0)	4 (28.6)	3 (21.4)	
Polypharmacy					0.851
≤ 5	4 (5.6)	42 (58.3)	18(25.0)	8 (11.1)	
>5	1 (5.0)	10 (50.0)	7 (35.0)	2 (10.0)	
Risk of falls					0.000*
Low	5 (8.2)	47 (77.0)	9 (14.8)	0 (0.0)	
Moderate	0 (0.0)	3 (21.4)	7 (50.0)	4 (28.6)	
High	0 (0.0)	2 (11.8)	9 (52.9)	6 (35.3)	
Hypertension					0.662
No	1 (3.0)	19 (57.6)	8 (24.2)	5 (15.2)	
Yes	4 (6.8)	33 (55.9)	17(28.8)	5 (8.5)	
Diabetes					0.925
No	4 (6.0)	37 (55.2)	18(26.9)	8 (11.9)	
Yes	1 (4.0)	15 (60.0)	7 (28.0)	2 (8.0)	
Chronic kidney disease					0.040*
No	4 (4.4)	51 (56.7)	25(27.8)	10 (11.1)	
Yes	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	

*Chi-square and Fisher's exact tests

Regarding functional capacity, the maximum score was 95 and the minimum was 35 points, with an average of 88.53 (SD ± 10.2). All the elderly had some degree of dependence, 49 (53.3%) had mild dependence; 40 (43.5%), moderate dependence; and three (3.3%), severe addiction. The factors associated with functional capacity that showed statistical significance are described in Table 2.

Table 2 – Analysis of the relationship between sociodemographic and clinical variables with the functional capacity outcome variables. Fortaleza, CE, Brazil, 2017 (n=92)

Variables	Barthel Index/Dependence			*p–value
	Light	Moderate	Serious	
	n (%)	n (%)	n (%)	
Age (years)				0.155
≤ 79	35 (60.3)	22 (37.9)	1 (1.7)	
≥80	14 (41.2)	18 (52.9)	2 (5.9)	
Gender				0.302
Female	20 (60.6)	13 (39.4)	0 (0.0)	
Male	29 (49.2)	27 (45.8)	3 (5.1)	
Education (years)				0.019*
≤ 5	11 (55.0)	9 (45.0)	0 (0.0)	
>5	38 (52.8)	31 (43.1)	3 (4.2)	
Income (salary)				0.671
≤ 1	42 (53.8)	34 (43.6)	2 (2.6)	
>2	7 (50.0)	6 (42.9)	1 (7.1)	
Polypharmacy				0.017*
≤ 5	44 (61.1)	26 (36.1)	2 (2.8)	
>5	5 (25.0)	14 (70.0)	1 (5.0)	
Risk of falls				0.010*
Low	38 (62.3)	22 (36.1)	1 (1.6)	
Moderate	8 (57.1)	6 (42.9)	0 (0.0)	
High	3 (17.6)	12 (70.6)	2 (11.8)	
Falls in the last 12 months				0.012*
No	35 (63.6)	20 (36.4)	0 (0.0)	
Yes	14 (37.8)	20 (54.1)	3 (8.1)	
Hypertension				0.981
No	18 (54.5)	14 (42.4)	1 (3.0)	
Yes	31 (52.5)	26 (44.1)	2 (3.4)	
Diabetes				0.297
No	39 (58.2)	26 (38.8)	2 (3.0)	
Yes	10 (40.0)	14 (56.0)	1 (4.0)	
Chronic kidney disease				0.265
No	49 (54.4)	38 (42.2)	3 (3.3)	
Yes	0 (0.0)	2 (100.0)	0 (0.0)	

*Chi-square and Fisher's exact tests

When associated with sarcopenia and functional capacity, there was a significant statistical relationship between the two variables (p=0.045) (Table 3).

Table 3 – Analysis of the association between sarcopenia and functional capacity. Fortaleza, CE, Brazil, 2017 (n=92)

Barthel Index	Not sarcopenic	Probable sarcopenia	Sarcopenia	Severe sarcopenia	*p-value
	n (%)	n (%)	n (%)	n (%)	
Dependency					
Light	4 (8.2)	34 (69.4)	7 (14.3)	4 (8.2)	
Moderate	1 (2.5)	17 (42.5)	17(42.5)	5 (12.5)	0.045
Serious	0 (0.0)	1 (33.3)	1 (33.3)	1 (33.3)	

*Chi-square and Fisher's exact tests

Discussion

Regarding the limitations of the study, it is pointed out, first, the cross-sectional design that makes the cause and effect relationship between the investigated variables impossible. Subsequently, the method for assessing muscle mass used is mentioned, although it is accessible and suitable for the population studied, it is not the gold standard.

In addition, it is known that the method used to measure muscle mass is not considered the gold standard, but it is the most accessible and easy to use in the context of the study participants. Another limitation of this study is that most institutionalized elderly people had a high degree of dementia and were bedridden, which makes it impossible for these elderly people to participate in the research, thus influencing the number of participants in the sample to establish associations between variables, which may result in a risk of association bias.

However, the present study has the potential to support the planning of preventive and educational practices to be carried out by health professionals, in particular nurses who work with institutionalized elderly people, helping in the early detection and pre-

vention of sarcopenia, in maintaining functional capacity and fall prevention, favoring the improvement of the quality of life and health promotion of this public.

When considering the assessed aspects of sarcopenia, the high prevalence of elderly people with a probable decrease in muscle mass can be attributed to the fact that institutionalized elderly people have an increased dependence on performing activities of daily living, since many of them, when they will live in institutions of long stay, can already be fragile and are affected by comorbidities that generate dependency. The less frequent frequency of carrying out activities in the institutional environment is also noteworthy, which can compromise physical conditioning and the maintenance of muscle mass[14]. A study carried out in the city of São João Del Rei, in Minas Gerais, Brazil, highlighted the need to promote activities that favor more dynamism, integration, autonomy and quality of life aimed at this audience[15].

As for the assessment of functional capacity, a survey conducted in the city of Ribeirão Preto, São Paulo, Brazil, found an average of 68.3 points among the elderly, showing divergence with the average score found in the study participants, which was 88.53 points[16]. Regarding the degree of dependence, a study developed in Maceió, a Brazilian municipality, showed a higher percentage, in which 38.1% of institutionalized elderly people were independent[14].

Schooling was seen as a factor that can indirectly influence sarcopenia and functional capacity in the elderly, since those with low schooling may present behaviors and lifestyle habits that are harmful to health, due to the lack of access to qualified information, as well as due to the lack of its understanding, which can interfere with important factors directly linked to sarcopenia and functional capacity, such as physical inactivity, low intake of nutrients and proteins, vitamin deficiencies and lack of adequate monitoring. A study developed in the city of São Paulo found that the reduction of access to information and health services can cause a decrease in income and an increase in the risk of malnutrition, also highlighted that there may be deficiency of energy and proteins, capable of causing adverse effects on body composition[17].

Kidney disease is seen as an important and influential clinical condition for the manifestation of sarcopenia, reinforcing data found in a study conducted at the University Hospital of Grande Vitória, in Espírito Santo, Brazil, in which it was found that 100.0% of male patients were classified as sarcopenic[18].

In addition, there was a correlation between polypharmacy and functional dependence, regarding the taking of various medications, as pointed out in a study carried out among elderly people in rural China,, also emphasizing that the increased number of medications used simultaneously was significantly associated with increased likelihood of dependence to perform basic activities of daily living[19].

Falls in the elderly are seen as an important and prevalent problem in elderly people with sarcopenia and with a deficit in functional capacity, since elderly people who fall are more predisposed to develop sarcopenia, due to reduced muscle mass, because of the restriction to bed or of some movement limitation, as they may also suffer declines in functional capacity, thus, they need the use of devices, environmental adaptation and/or caregivers available, most of the time, for performance and supervision, during the performance of activities of daily living . Thus, in a cohort study carried out in Japan, it was observed that sarcopenia is an important risk factor in elderly individuals, even in cases whose protective measures are adopted to prevent falls, in addition to being an important component in physical frailty[20].

Sarcopenia and functional capacity have a considerable relationship, because when an individual is affected by one of these, two clinical problems directly affect physical performance and, consequently, functional dependence. In this sense, in a recent study carried out in Granada, Spain, a high prevalence of sarcopenia was observed in institutionalized individuals, with a high level of dependence, with 31.0% of individuals being totally dependent and 35.0% with severe dependency[6].

Conclusion

The prevalence of probable sarcopenia and significant reduction in muscle strength were high among the institutionalized elderly surveyed. In addition, it was found that most of the elderly participants had some degree of dependence, with mild and moderate dependence being the most common. It was found that education, polypharmacy, chronic kidney disease, risk of falls, falls and sarcopenia can influence the functional capacity of institutionalized elderly.

Collaborations

Marques MB and Coutinho JFV contributed to the conception and design, analysis and interpretation of data, writing of the article, relevant critical review of the intellectual content and final approval of the version to be published. Sousa CR and Sales JMR collaborated with data analysis and interpretation and relevant critical review of intellectual content. Brito MLC and Souza RLP participated in the writing of the article, critical review of the intellectual content and final approval of the version to be published.

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