

Physical frailty, cognitive and functional status in institutionalized older adults

Fragilidade física, estado cognitivo e funcional em idosos institucionalizados

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Abstract

Objective: To investigate the prevalence of frailty and its association with cognitive state and functional capacity in Brazilians institutionalized older adults. **Methods:** Cross-sectional study, conducted with institutionalized older adults from two Brazilian cities. Cognitive status, functional capacity and frailty were evaluated through the Mini-Mental State Examination (MMSE), KATZ index, and frailty phenotype, respectively, besides anthropometry and physical activity. **Results:** This study included 73 older adults with a mean age of 78.6 ± 10.44 years. 63% were female, 47.9% were the very old (> 80 years) and 32.1% were underweight. The prevalence of frailty was 57.5%. It was observed that the older adults with frailty mostly had functional dependence (68.3%; $p < 0.01$); cognitive deficit (69.0%; $p < 0.01$); and were inactive (97.3%; $p = 0.01$). There was an association of frailty with cognitive status (PR=1.90; CI: 1.17 - 3.06) and functional capacity (PR=2.97; CI: 1.18 - 3.11). **Conclusion:** The results showed high prevalence of frailty among institutionalized older adults and its association with functional incapacity and cognitive decline.

Keywords: Frailty; Older adults; Cognitive status; Functional capacity; Institutionalization.

Resumo

Objetivo: Investigar a prevalência da fragilidade e sua associação com estado cognitivo e capacidade funcional em idosos brasileiros institucionalizados. **Métodos:** Estudo transversal, realizado em idosos institucionalizados de duas cidades brasileiras. Foram avaliados estado cognitivo, capacidade funcional e a fragilidade, através do mini exame do estado mental (MEEM), índice de KATZ, e fenótipo de fragilidade, respectivamente, além de antropometria e atividade física. **Resultados:** Participaram 73 idosos sendo maioria do sexo feminino (63%), 47,9% dos idosos eram longevos e 32,1% dos idosos apresentaram baixo peso. A prevalência de fragilidade foi de 57,5%. Observou-se que os idosos com fragilidade apresentavam, em sua maioria, dependência funcional (68,3%; $p < 0,01$); déficit cognitivo (69,0%; $p < 0,01$); e eram inativos (97,3%; $p = 0,01$). Houve associação da fragilidade com o estado cognitivo

(RP=1,90; IC: 1,17 - 3,06) e a capacidade funcional (RP=2,97; IC: 1,18 - 3,11). *Conclusão:* Os resultados mostraram alta prevalência de fragilidade e sua associação com incapacidade funcional e declínio cognitivo em idosos residentes de instituições.

Palavras-chave: Fragilidade; Idosos; Estado cognitivo; Capacidade funcional; Institucionalização.

Resumen

Objetivo: investigar la prevalencia de la fragilidad y su asociación con el estado cognitivo y la capacidad funcional en ancianos brasileños institucionalizados. *Métodos:* Estudio transversal realizado con ancianos institucionalizados en dos ciudades brasileñas. Se evaluó el estado cognitivo, la capacidad funcional y la fragilidad a través del Mini Examen del Estado Mental (MMSE), el índice de KATZ y el fenotipo de fragilidad, respectivamente, además de la antropometría y la actividad física. *Resultados:* Participaron 73 ancianos, la mayoría del sexo femenino (63%), 47,9% de los ancianos eran longevos y 32,1% de los ancianos tenían bajo peso. La prevalencia de fragilidad fue del 57,5%. Se observó que los ancianos con fragilidad eran en su mayoría funcionalmente dependientes (68,3%; $p<0,01$); déficit cognitivo (69,0%; $p<0,01$); y estaban inactivos (97,3%; $p=0,01$). La fragilidad se asoció con el estado cognitivo (RP=1,90; IC: 1,17 - 3,06) y la capacidad funcional (RP=2,97; IC: 1,18 - 3,11). *Conclusión:* Los resultados mostraron una alta prevalencia de fragilidad y su asociación con discapacidad funcional y deterioro cognitivo en ancianos residentes de instituciones.

Palabras clave: Fragilidade; Anciano; Estado cognitivo; Capacidad funcional; Institucionalización.

1. Introduction

The frailty syndrome, characterized by reduced energy reserves and resistance to stressors, results from the cumulative decline of physiological systems, rendering old individuals vulnerable to adverse conditions (Fried et al., 2001, 2004). The main consequences related to frailty in older adults is the decline in functional and cognitive status, falls, injuries, decreased autonomy and independence, hospitalization, institutionalization, and death (Duarte et al., 2018; Lacas & Rockwood, 2012). The prevalence of frailty in older adults is high; the reported prevalence can vary depending on the method used for screening, the population, and the region evaluated. The estimated prevalence is 4–59.1% in community-dwelling older adults (Collard et al., 2012) and 19–75.6% in institutionalized older adults (Kojima, 2015).

The institutionalization of older adults can occur for medical, social, or economic reasons and can be both a predisposing factor and a consequence of frailty. There are long-term-care institutions (LTCIs) that have a monotonous routine, inadequate number of specialized professionals, and insufficient physical infrastructure to meet the needs of older adults. These conditions can contribute to physical and psychological impairment and trigger or exacerbate frailty in this population (deAlves-Silva et al., 2013; Borges et al., 2013).

According to Camarano (2010), institutionalized older adults can present both social and health-related vulnerabilities. The assessment of older adults' functional and health condition (upon admission and periodically) is typically not a routine procedure in institutions, despite the wide prevalence of frailty in this population.

The frailty syndrome in older adults and its associated conditions are still poorly studied, particularly in LTCIs. Therefore, there is a need for studies that encourage interventions with public policies aimed at preventing frailty and controlling its adverse effects. The aim of this study was to investigate the prevalence of frailty and its association with cognitive and functional status in institutionalized older adults from two cities in two regions of Brazil.

2. Methodology

Study design and participants

This cross-sectional study was developed by the Center for Study and Intervention in the Area of Aging (CEIAE) of the School of Nutrition of the Federal University of Bahia in partnership with the University of Brasília. The sample was composed of older adults aged 60 years or more, of both genders, residents of three long-term care institutions for the older adults (LTCI) located in two Brazilian cities (two LTCI in Salvador-Bahia, one public and one philanthropic, and a

philanthropic LTCI in Brasília-DF). The present study was reported in accordance with Fontelles et al. (2009) and Pereira et al. (2018).

The study did not include older adults diagnosed with dementia, schizophrenia, and uncorrected hearing loss that would prevent the comprehension of questions, as well as those unable to communicate verbally. A total of 73 older adults were included in the study: 56 from LTCIs in Salvador (35 from a public one and 21 from a philanthropic one) and 17 from a philanthropic LTCI in Brasília.

Procedures

After training the team and standardizing data collection techniques, a pilot project was conducted with older adults from an institution not participating in this study, with the aim of evaluating the study design, testing the collection instruments, and operationalizing the research.

The older adults selected for the study were evaluated for anthropometric data, frailty syndrome criteria, and cognitive and functional status. Data on gender, date of birth, skin color, marital status, education, length of stay at the LTCI, physical activity, comorbidities and use of medications were collected from a questionnaire and consultation of medical records conducted by trained professionals and students from January to March 2020.

The project was approved by the Research Ethics Committee of the School of Nutrition at the Federal University of Bahia (n° 3.793.529). All participants signed an informed consent form.

Variables

Frailty

Frailty was assessed using the frailty phenotype criteria proposed by Fried et al. (Fried et al., 2001) Older adults who met three or more criteria were considered “frail,” and those who met fewer than three criteria were considered “non-frail.” The latter category included vulnerable (pre-frail) individuals.

Unintentional weight loss

For our assessment, we asked the following question: “Have you unintentionally lost weight in the past 12 months (i.e., without changes in diet or exercise)?” For the classification of frailty among older adults, weight loss ≥ 4.5 kg in the last 12 months was considered as one of the criteria (Fried et al., 2001).

Self-reported fatigue (exhaustion)

Fatigue was assessed using the Center for Epidemiological Studies depression (CES-D) scale proposed by Fried et al.¹ and validated in Brazilian older adults by Batistoni et al. (2007). The two investigated criteria were: “I felt I had to make an effort to do usual tasks” and “I could not carry out my things.” The older adults who obtained a score of 2 or 3 in either of the two questions met a frailty criterion.

Decreased handgrip strength

The handgrip strength was assessed using a Sammons Preston Smedley dynamometer, following the recommendations of the American Society of Hand Therapists. The test was performed with an older adult seated, with the elbow flexed at 90°, with the forearm in a supine position, and without accessories such as rings, bracelets, or watches. A verbal command was given by the examiner, in high volume, for the older adults to start the test by pulling the handle of the dynamometer with the dominant hand, using as much force as possible. Three measurements were obtained in kilogram (kg),

with an interval of 1 min between them, and the mean value was corrected for body mass index (BMI) and gender (Fried et al., 2001). The following cutoff points were used: For women: strength < 17 kg for BMI < 23.0 kg/m²; < 17.3 kg for BMI 23.1 to 26.0 kg/m²; < 18.0 kg for BMI 26.1 to 29 kg/m²; < 21.0 kg for BMI >29.0 kg/m². For men: strength < 29.0 kg for BMI < 24 kg/m²; < 30.0 kg for BMI 24.1 to 28.0 kg/m²; < 32.0 kg for BMI > 28.0 kg/m².

Low Physical activity level

Physical activity levels were classified using the short version of the International Physical Activity Questionnaire (IPAQ) (Benedetti et al., 2007; Pardini et al., 2001). Individuals with <150 min of weekly physical activity were classified as sedentary (Pegorari & Tavares, 2014).

Reduced gait speed

The gait speed was measured as the time (in seconds) spent to cover 4 m at a comfortable speed (the acceleration and deceleration stretches were discarded). The following cutoff points for frailty adjusted for sex and height were used: for women, time > 7 s (height ≤ 159 cm) or 6 s (height > 160 cm); for men, time > 7 s (height ≤ 173 cm) or 6 s (height < 173 cm) (da Silva et al., 2016).

Cognitive status

Cognitive function was assessed by the Mini Mental State Examination (MMEM), a domain test of orientation, immediate memory, attention, calculation, recall memory, and language. The cutoff points for cognitive deficit were: < 13 for illiterate people, < 18 for 1 to 8 years of education, and < 26 for 9 years or more of schooling (Bertolucci et al., 1994).

Functional status

The Katz index was used to assess the ability to perform the basic activities of daily living (BADL)(Lino et al., 2008). Functional impairment was identified by the difficulty in performing activities related to self-care: feeding, bathing, dressing, going to the bathroom, transference, and mobility. Older adults with the capacity to carry out all activities without assistance were classified as independent.

Body mass index

Weight and height (knee height estimate) were measured according to the techniques proposed by Lohman et al. (1988) and Chumlea et al. (1985), respectively. The BMI is classified as proposed by PAHO (2001).

Statistical analysis

Descriptive analysis was performed using mean and standard deviation measurements for continuous variables and percentages for categorical variables, according to the frailty status. Data normality was assessed using the Kolmogorov–Smirnov test. To assess the difference between groups, the χ^2 test or Fisher's exact test and Poisson regression with robust variance were used to calculate the prevalence ratios (PRs) and their respective 95% confidence intervals (CI 95%). A significance level of p -value < 0.05 was adopted for all analyses. Data analysis was performed with SPSS 22.

3. Results

The 73 older adults were aged between 61 and 102 years (mean, 78.6 ±10.4) and lived in the institutions for an average of 5.7 years. Most were female (63.0%), and 47.9% were older than 80 years. Among the studied adults, 88.9% did not

live with a partner, and this group was primarily represented by women ($p = 0.04$). Many older adults declared their skin color to be black (28.6%) or brown (28.6%), and 45.8% of the older adults had between one and eight years of schooling (Table 1).

In terms of anthropometric nutritional status, 32.1% of the older adults were underweight and 26.4% were overweight. Comorbidities were present in 84.8% of older adults, with hypertension being the most frequent (64.4%); 46.9% of the older adults used more than five medications per day. Among the evaluated older adults, 57.5% were frail and 42.3% were dependent on others for performing BADL. In the assessment of cognitive status, the majority (54.8%) had cognitive decline (Table 1).

Table 1 shows that older adults with frailty were mostly functionally dependent (68.3%; $p < 0.01$), cognitively deficient (69.0%; $p < 0.01$), and inactive (97.3%; $p = 0.01$).

Table 1. Characteristics of the older adults institutionalized according to the presence of frailty.

Variables	Total n(%)	Frailty		p-value
		No 31(42.5)	Yes 42(57.5)	
Sex				0.45
Female	46(63.0)	18(58.1)	28(66.7)	
Male	27(37.0)	13(41.9)	14(33.3)	
Age (years)				0.37
<80	38(52.1)	18(58.1)	20(47.6)	
≥80	35(47.9)	13(41.9)	22(52.4)	
Marital Status				0.53*
Partner	8(11.0)	3(9.7)	5(11.9)	
No partner	65(89.0)	28(90.3)	37(88.1)	
Schooling (years)				0.27
Illiterate	12(16.7)	3(10.0)	9(21.4)	
1 to 8 years of study	33(45.8)	13(43.3)	20(47.6)	
9 or more years of study	27(37.5)	14(46.7)	13(31.0)	
Self-referred race/skin color				0.23
Black	20(28.6)	10(33.3)	10(25.0)	
Parida (Mixed/ Brown)	20(28.6)	8(26.7)	12(30.0)	
White	16(22.9)	9(30.0)	7(17.5)	
Other	14(20.0)	3(10.0)	11(27.5)	
Time of institutionalization				0.58
<1 year	18(25.0)	8(26.7)	10(23.8)	
1-5 years	25(34.7)	12(40.0)	13(31.0)	
>5 years	29(40.3)	10(33.3)	19(45.2)	
Comorbidities				0.49*
None	7(22.6)	7(22.6)	4(9.5)	
1-2	40(54.8)	16(51.6)	24(57.1)	
3-4	16(21.9)	6(19.4)	10(23.8)	
5 or more	6(8.2)	2(6.5)	4(9.5)	
Number of medicines				0.16
< 5	34(53.1)	16(64.0)	18(46.2)	
≥ 5	30(46.9)	9(36.0)	21(53.8)	

Anthropometric nutritional status				0.36
Low body weight	17(32.1)	7(24.1)	10(41.7)	
Normal body weight	22(41.5)	14(48.3)	8(33.3)	
Excess body weight	14(26.4)	8(27.6)	6(25.0)	
Physical activity				0.01
Yes	8(12.1)	7(24.1)	1(2.7)	
No	58(87.9)	22(75.9)	36(97.3)	
Functional capacity				<0.01
Independent	41(57.7)	28(93.3)	13(31.7)	
Dependent	28(68.3)	2(6.7)	28(68.3)	
Cognitive State				<0.01
No decline	33(45.2)	20(64.5)	13(31.0)	
With decline	40(54.8)	11(35.5)	29(69.0)	

*Fisher's exact test. Source: Authors (2022).

Poisson analysis revealed that functional dependence and cognitive decline were associated and statistically significant, with frailty after adjustment for age and length of institutionalization (Table 2). Those with functional dependence were 2.97 (CI 95% = 1.86–4.72) times more likely to have frailty than independent individuals. Older adults with cognitive decline were 1.90 (95% CI= 1.17–3.06) times more likely to present frailty than those without cognitive decline. After the adjustment, physical activity was not associated with frailty (Table 2).

Table 2. Prevalence and frailty prevalence ratio of the older adults institutionalized according to health conditions.

Variables	% frail	PR (CI95%) ^a	p-value	PR (CI95%) ^b	p-value
Functional Capacity					
Dependent	93,3	1,85(1,56 – 2,19)	<0,01	2,97 (1,86 -4,72)	<0,01
Cognitive state					
Decline	72,5	1,39 (1,12 – 1,73)	<0,01	1,90 (1,17 - 3,06)	<0,01
Physical activity					
Inactive	87,9	1,86(1,64 – 2,10)	<0,01	4,83 (0,77- 30,41)	0,09

Poisson regression. RP=prevalence ratio; CI95%= 95% confidence interval. ^acrude prevalence ratio; ^badjusted prevalence ratio by age and time of institutionalization. Source: Authors (2022).

4. Discussion

The prevalence rate of frailty can vary markedly depending on the screening method used, population, and the place evaluated (Andrade et al., 2018). For example, the reported prevalence rate varied widely in LTCIs (19–85%) (Fluetti et al., 2018; Hasan et al., 2017; Kojima, 2015; Kumar et al., 2019). In institutionalized Brazilian older adults, a higher prevalence rate was observed than that found in our study (González-Vaca et al., 2014; Gutiérrez-Valencia et al., 2018). Mello et al. (2018) and Arantes et al. (2022) identified 70.1% and 81,33% of frail older adults respectively; however, these authors used a different screening method, the Edmonton Frail Scale.

In a meta-analysis conducted by Kojima in older adults living in LTCI, the combined estimate of the prevalence of frailty was 52.3%, similar to that found in our study. Murukesu et al. (2019) and Zhao et al. (2019) found lower values (40.7% and 29.2%, respectively). In surveys with older adults from the community, the prevalence varied significantly (between 8.7%

and 47.2%) (Fariás-Antúnez & Fassa, 2019). For example, the FIBRA study found a prevalence rate of 19.7% for frailty (Neri et al., 2013), and the SABE study observed a prevalence rate of 37% (Nunes et al., 2015).

The difference between the prevalence of frailty in older adults in community and in institutions can be attributed to the tendency of institutionalized older adults to present a different health profile. The latter typically are less active, have a more compromised functional capacity, and have a poorer quality of life, thereby increasing their risk of frailty (Frisoli et al., 2021). Consistent with other studies, a positive association was observed between frailty and functional and cognitive status, exhibiting a higher probability of frailty in older adults with functional dependence and cognitive decline (Brigola et al., 2020; Furtado et al., 2019; Guedes et al., 2020; Rodrigues et al., 2018; Santos et al., 2015; Tornero-Quiñones et al., 2020). The decline in functional status and frailty may be related to a series of multidimensional factors that interact with each other. Al Snih et al. (Al Snih et al., 2009) found that frail, independent older adults had a risk rate for dependence for performing activities of daily living of 2.42, after 10 years of follow-up, when compared to non-frail adults. This finding reinforces the importance of an early assessment of this population due to the greater vulnerability and greater risk of frailty and loss of functional capacity.

A systematic review showed that most studies found a positive association between frailty and physical and cognitive impairment (Miyamura et al., 2019). Reduced gait speed and muscle weakness, domains of the frailty phenotype, are associated with cognitive impairment (Cadore et al., 2015). Murukesu et al (2019) identified cognitive impairment as one of the factors influencing frailty in institutionalized older adults. The relationship between cognitive performance and frailty has been well documented in the literature. In institutionalized older adults, these factors can make the individuals even more vulnerable to adverse outcomes and increase their risk of falls, hospitalization, and death. However, there are few studies that have investigated the relationship between frailty and cognitive status in institutionalized older adults as in the present study, particularly in Brazil.

In this study, an association between frailty and physical inactivity was observed; however, after adjustment for age and length of institutionalization, this association was not present. Physical exercise promotes positive effects and improves the quality of life during long-term care Physical activity and exercise: Strategies to manage frailty (Angulo et al., 2020). However, this practice is rarely performed by older adults in LTCIs.

Cognitive function, functional capability, and physical condition are related to each other, particularly in frail older adults or those at risk for frailty (Faria et al., 2013; Furtado et al., 2019; Murukesu et al., 2019). Other factors can interfere with these conditions and are common in older adults in LTCI, such as malnutrition, a low level of education, advanced age, the length of institutionalization, and an increased risk of frailty (Mello et al., 2014).

It is possible to verify in the literature that age is a determining factor for the frailty syndrome in older adults, particularly those aged ≥ 80 years (Fabrício-Wehbe et al., 2013; Mello et al., 2014). The influence of aging as a predisposing factor for the development of frailty syndrome may be related to changes and decline in multiple systems, resulting from the interaction of physiological mechanisms and pathological conditions¹³. However, although aging may predispose individuals to frailty, not all older adults are frail.

Therefore, it is recommended that institutionalized older adults have a broad assessment of these conditions on admission to the LTCIs and that they be monitored periodically. The findings indicate the need to develop health care plans for older adults aimed at cognitive stimulation, neurocognitive treatment, and reversal of frailty through multimodal interventions (nutrition, physical activity, and clinical management of comorbidities).

The association of frailty with the variables evaluated simultaneously in institutionalized older adults is one of the strengths of this study. In addition, for frailty screening, a validated instrument was used with both measured and non-self-

reported methods. The absence of weight data in the medical records and loss of mobility in some older adults limited the application of some tests.

5. Conclusion

The results exhibited a high prevalence of frailty and its association with functional incapacity and cognitive decline in older adult residents of LTCI. As a suggestion for future work, it would be interesting to carry out a longitudinal study addressing the issue and investigate this syndrome considering the differences by sex, age group, and the diversity of cutoff points recommended for its evaluation.

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