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Original Article

Frailty among institutionalized older people: a cross-sectional study in Natal (Brazil)

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Abstract

Objective: Verify the prevalence of frailty and its associated factors in institutionalized older people. **Methods:** Cross-sectional study carried out in 10 nursing homes in Natal (Brazil), between October/2013 and January/2014. All institutionalized older people 60+ that were not hospitalized, in terminal state, coma or under palliative care were included in the study. The dependent variable of the study was the presence/absence of frailty, classified according to the following criteria: severe cognitive decline and/or impossibility of independent walking or being bedridden. The 5 criteria (muscular weakness, unintentional weight loss, low physical activity level, slowness and exhaustion) of Fried et al. were considered for those with preserved cognitive and walking capacity. The chi-square test or Fisher's test and logistic regression were used for bivariate and multiple analysis, respectively. Sociodemographic, institution-related and health-related variables were also included. **Results:** Of the 321 participating older people, 80.1% were considered frail, 16.8% pre-frail and 3.1% non-frail. The final model demonstrated association of frailty with age (OR=2.67; 95%CI 1.39-5.14; p=0.003), presence of chronic diseases (OR=10.27; 95%CI 3.42-30.90; p<0.001), systemic arterial hypertension (OR=0.11; 95%CI 0.05-0.27; p<0.001) and institutionalization due to lack of caregiver (OR=2.55; 95%CI 1.36-4.76; p=0.003) adjusted by sex and type of institution. **Discussion:** Frailty was highly prevalent in institutionalized older people and its association with multi-factor aspects suggested that action of health services and government representations could aid in the prevention or delay of frailty onset, improving the life quality of older people.

Keywords: Aging, Health of institutionalized elderly, Frail elderly, Long-term institution for elderly, Cross-sectional studies

Introduction

Frailty is a geriatric syndrome that is characterized by the decrease of biological reserves and resistance to endogenous and exogenous stress factors[1,2]. Although it is not a synonymous of such conditions, frailty is associated with higher susceptibility to adverse health events, including functional decline, hospitalization and institutionalization[3-5].

Fried et al. (2001) identified the frailty phenotype based on the longitudinal Cardiovascular Health Study (CHS), constituted by five indicators: unintentional weight loss, exhaustion, decrease in grasp strength and reduction of physical activity. There was posterior consensus on the importance of a wider frailty definition, which included mental health and cognition[2].

From Fried et al.[3] data, it was estimated that within community settings, 6.9% of older people over the age of 65 presented the frailty phenotype[3]. Other authors affirmed that between 4.0 and 59.1% of older people population are frail[6].

The authors have no conflict of interest.

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It is known that institutionalized older people are considered more frail and that, given the absence of family care and caregivers, are sent to nursing homes (NH), which further worsens the frailty condition[7]. However, the prevalence of frailty in NH is a subject that remains underexplored, especially in institutionalized people[8]. Specifically, there is scarce knowledge on the disability and frailty status in NH of developing countries, in which the contextual factors may play an important role[9,10]. Added to this, the diversity of conceptual and operational models for identification of frailty in older adults has still produced doubts and further research is needed[11].

Such information can be useful for researchers, health professionals and managers, in the sense of planning and developing services to fulfill the needs of the institutionalized older population, which is progressively increasing as population ages[8,12]. The objective of this study was to verify the prevalence of frailty and its associated factors in institutionalized older people in the city of Natal (Brazil).

Methodology

Study design

A cross-sectional study is presented herein, carried out between October/2013 and January/2014. The study herein presented is part of a wider project, entitled "Human aging and health - the reality of institutionalized older people in the city of Natal/RN", with approval number 308/2012 awarded by the Research Ethics Committee of the Federal University of Rio Grande do Norte (UFRN). The resident and direct caregivers of the ten NH that accepted to participate in the research project signed free informed consent forms.

Of the 14 NH registered in the Sanitary Vigilance agency (VISA) of the city of Natal (Northeast Brazil), ten (71.4%) accepted to participate in the study. All individuals over the age of 60 that resided in these NH were included in the study. Subjects that were not at the NH at the time of the study due to hospitalization, as well as those in terminal state, coma or under palliative care were excluded from the study.

The research team was constituted by two PhD candidates of the Collective Health Graduate Program of UFRN and undergraduate Physiotherapy students of UFRN, which were trained to utilize the instruments. The physical exams that constituted the classification of the frailty phenotype were applied by a single researcher. The intra-examiner reliability was calculated by the Intra-class Correlation Coefficient (ICC) for palmar grasp strength (CCI=0.993) and gait speed (CCI=0.906).

Variables

The dependent variable of the study was the presence/absence of frailty, classified according to the following criteria: severe cognitive decline and/or impossibility of independent walking or being bedridden were initially assessed[13]. The cognitive state was evaluated by the Pfeiffer test, which evaluates long- and short- term memory, orientation, information on daily activities and math capacity. This instrument enables the classification of older people in intact mental function or slight (3-4 mistakes), moderate (5-7 mistakes) or severe cognitive decline (8-10 mistakes), taking into consideration the education level[14]. Regarding evaluation of mobility, the following states were considered: walks without help, walks with help, wheelchair and bedridden. Older people with severe cognitive decline and/or impossibility of independent walking or being bedridden were already considered frail and did not proceed to the next step.

For those with preserved cognitive capacity (intact mental function, slight or moderate cognitive decline and that walked independently (either with or without help), frailty was categorized considering the evaluation of the five criteria proposed by Fried et al.[3]. Since normative data are not yet available for the Brazilian population, cut-off points of the indicators that make up the frailty scale were adapted to the study population, according to the Brazilian consensus on frailty in older people[11]:

- Unintentional weight loss: identified by the following question: "Within the last year, have you unintentionally lost more than 4.5 kg? (without diet or exercise)". This information was contrasted with the evaluation of the institution's nutritionist, if available in medical records.
- Muscular weakness: evaluated by the decrease in palmar grasp, measured by a Jamar® dynamometer, in kilograms-force (kgf). For such, the study participants were asked to remain seated, with adducted shoulders, elbows bent at 90º, and fist extended between 0º and 30º. The second position of the dynamometer cable was considered for women, and the third position was considered for men, as these levels correspond to maximum grasp force for each sex[15,16]. A loud verbal command was given by the examiner, to indicate that older people should pull the handle of the dynamometer and maintain the position for six seconds[17]. Three measurements were made with the dominant hand of the volunteer and the highest value was considered. Body Mass Index (BMI) quartiles and lowest quintiles stratified by sex frailty were the cutoff points (CP) adopted, shows in Table 1.
- Level of physical activity: evaluated by the short version of the International Physical Activity Questionnaire (IPAQ)[18]. This version includes information that allows for the estimation of the time spent within the last week, with minimum duration of 10 continuous minutes, in three different activities: walking and moderate/vigorous exercise. The procedures described in the guidelines for Data Processing and Analysis for IPAQ were employed to calculate the physical activity scores, yielding results in Metabolic Equivalent of Task (MET)-minutes/week[19]. The lowest quintiles of these results, stratified by sex, were identified and utilized as cutoff points to classify a low level of physical activity. The cut-off point for men was 361.94

Men		Women	
BMI (kg/m²)	Handgrip strength (kgf)	BMI (kg/m²)	Handgrip strength (kgf)
0 - 23,7	≤ 12,0	0 - 23,0	≤ 7,0
23,8 - 27,4	≤ 10,8	23,1 - 26,6	≤ 10,0
27,5 - 29,7	≤ 6,0	26,7 - 30,3	≤ 9,0
≥ 29,8	≤ 24,0	≥ 30,4	≤ 10,0

Table 1. Cutoff points for muscular weakness, according to sex and BMI (Natal-RN, 2016).

kcal/week and 0 kcal/week for women.

- Exhaustion: evaluated by the self-report of fatigue according to questions 7 ("I feel that everything I did was very effortful") and 20 ("I feel discouraged") of the depression scale of the Center for Epidemiological Studies (CES-D)20. The answers considered the frequency of each symptom in the preceding week: rarely or never (less than one day); a few times (1-2 days); sometimes (3-4 days); almost every day or always (5-7 days). Older people that answered "sometimes" or "almost every day or always" at least once fulfilled the frailty criterion for this item.
- Slowness: calculated by the time elapsed to walk a 4.6 meter distance; older people were requested to walk normally (usual gait speed) and wear their habitual shoes. If necessary, a walking aid could be utilized. The results for this item, converted to meters/second (m/s), were adjusted by the median of height for men and women, with the lowest quintiles considered as cutoff points: (men: 0m <height ≤1.59 m to CP ≤0.25 m/s; height >1.59 m to CP ≤0.20 m/s; women: 0m <height ≤1.49 m to CP <0.33 m/s; height >1.49 m to CP ≤0.38 m/s).

In this sense, older people received one point for each positive criterion, resulting in a frailty index that varied between 0 and 5. Older people that presented scores between 3 and 5 were classified as frail, a score of 1 or 2 characterized pre-frail individuals, and zero corresponded to non-frail people3. The frailty variable was then dichotomized in frail and non-frail (pre-frail + non-frail).

Information on the sociodemographic conditions of older people were collected (age, sex, education level, marital status, number of children, type of NH, time and reason for institutionalization, private health plan, number of residents per caregiver) along with health-related information (chronic diseases, history of falls within the last 30 days, functional capacity, daily use of drugs and number of drugs). The drugs studied were antiepileptics, antithrombotics, psycholeptics, diuretics, mineral supplements, antihypertensives and vasoprotectants. Eye drops, inhalators, vitamins and minerals were included, while nutritional support, ointments and systemic antibacterial drugs (type J) used during a period of time inferior to 30 days were excluded. Regarding the documentary analysis of the medical records, the registration of Drugs for Continuous Treatment, meaning those used daily for at least 30 days, was classified according to the ATC Classification (Anatomical Therapeutic Chemical)[21]. Medical prescriptions were checked to confirm whether such medications were in fact being administered, and only those that had actually been administered for at least 30 consecutive days were included, not taking into account their doses.

Regarding the education level, the following categories were considered according to the Brazilian education system: illiterate, literate (but did not complete any stage), fundamental I (first stage of primary education completed), fundamental II (second stage of primary education completed), high school and graduate studies.

Chronic diseases include diagnosed systemic arterial hypertension (SAH), diabetes, dementia, Parkinson's disease, mental disease, osteoporosis, depression, dyslipidemia, stroke, cancer, pulmonary disease, rheumatic disease and kidney failure. Anthropometric evaluation considered the BMI from the relationship between weight (kg) and squared height (meters). An electronic Tanita® scale was utilized for weight measurements, with a 150 kg capacity and 100 g precision. Total height was obtained as the average between two measurements with an exact-type portable stadiometer (precision 1 mm). BMI classification considered the following values: underweight (<22 kg/m²), eutrophic (≥22 and <27 kg/m²) and overweight (≥27 kg/m²)[22]. Functional capacity was evaluated by the Katz Index, which is an instrument that has been validated in Brazil and contains six basic activities of daily life (BADL): feeding, sphincter control, transfer, personal hygiene, and dressing and bathing capacities[23]. All the information related with independent variables was obtained from resident (when cognitive status preserved), medical records or provided by personnel at the institutions (social assistants, nursing technicians or caregivers).

Statistics

Data analysis initially included descriptive analysis, through the presentation of absolute and relative values. The quantitative variables were described by the averages, with standard deviations (±SD) and then categorized in dichotomic variables. Bivariate analysis was then carried

	n	%
Sex		
Male	242	75.4
Female	79	24.6
Age		
60-69 years	37	11.5
70-79 years	93	29.0
80-89 years	134	41.7
Over 90 years	57	17.8
Education level		
Illiterate	73	22.7
Literate	6	1.9
Fundamental I	73	22.7
Fundamental II	24	7.5
High school	45	14.0
University	48	15.0
Could not answer	52	16.2
Marital status		
Single	152	47.4
Married	40	12.5
Divorced	36	11.2
Widow(er)	81	25.2
Could not answer	12	3.7
Retirement pension		
No	14	4.4
Yes	306	95.6
Children		
No	158	50.5
Yes	155	49.5
Type of institution		
For profit	117	36.4
Not-for-profit	204	63.6
Reason for institutionalization		
No caregiver	150	46.7
Lived alone	43	13.4
No home	11	3.5
Disease	36	11.2
By own choice	9	2.8
No work	1	0.3
Other reasons	28	8.7
Several reasons	32	10.0
Could not answer	11	3.4

	n	%
Private health plan		
No	201	62.8
Yes	119	37.2
Body Mass Index		
Underweight	137	49.6
Eutrophy	71	25.8
Overweight	68	24.6
Mobility		
Bedridden	64	19.9
Wheelchair	68	21.2
Walks with help	65	20.3
Walks without help	124	38.6
Cognitive decline		
Intact	26	8.6
Slight	24	7.8
Moderate	64	21.1
Severe	190	62.5
Functional capacity		
Degree A - Independent	87	27.1
Degree B – Dependent in one activity	24	7.5
Degree C – Dependent in bathing and one more activity	7	2.2
Degree D – Dependent in bathing, dressing and one other activity	9	2.8
Degree E – Dependent in bathing, dressing, toileting and one other activity	17	5.3
Degree F – Dependent in bathing, dressing, toileting, transferring and one other activity	72	22.4
Degree G - Dependent	82	25.5
Another - not classifiable	23	7.2
Chronic diseases		
No	38	11.8
Yes	283	88.2
Falls within the last 30 days		
No	300	93.5
Yes	21	6.5
Drugs		
No	17	5.3
Yes	304	94.7
Frailty		
Non-frail	10	3.1
Pre-frail	54	16.8
Frail	257	80.1

Note: Data losses were not included.

Table 2. Characteristics of the participants (n=321).

out through the chi-square test (or Fisher's test when expected values less than 5) for the nominal category variables. The magnitude of the association was verified by the odds ratio for each independent variable in relation to the dependent variable.

Multiple logistic regression analysis was utilized to identify the factors associated with frailty. Variables with p values equal to or under 0.20 (besides sex and age) in the bivariate analysis were selected and tested by decreasing magnitude of association, using the *Stepwise Forward* method. Permanence of the variable in multiple analysis depended on the *Likelihood Ratio Test*, absence of multicolinearity, and capacity of improving the adjustment of the model through the *Hosmer and Lemeshow* test. A significance level of 5% was considered.

Results

Of the total number of residents, six (1.8%) individuals were excluded from the study: four (1.2%) were hospitalized at the time of data collection, one (0.3%) was in terminal stage and one (0.3%) was under the age of 60. The total sample was constituted of 321 individuals, mostly of the female sex (75.4%), with average age 81.5 years (SD: 9.0). The majority of residents belonged to not-for-profit institutions, was retired, single, illiterate or with fundamental I education, and did not count with private health plan. It was verified that 155 (49.5%) of older people had children and the average number of children was 1.4 (SD: 2.1). The average residence time was 63.2 months (SD: 62.0) and there were, on average, 8.1 residents per caregiver at the institutions (SD: 5.2).

Regarding health state, 137 (49.6%) older people were underweight, 124 (38.6%) walked without aid, 190 (62.5%) presented severe cognitive decline and 92 (28.7%) presented functional independency. It was verified that 276 (86.0%) residents presented chronic diseases and 21 (6.5%) suffered falls in the last 30 days. More specifically, 157 (48.9%) suffered from SAH, 79 (24.6%) dementia, 72 (22.4%) mental disease, 81 (25.2%) diabetes, 50 (15.5%) stroke, 55 (17.1%) dyslipidemia, 32 (10.0%) osteoporosis, 10 (3.1%) depression, 17 (5.3%) rheumatic disease, 16 (5.0%) pulmonary disease, 10 (3.1%) kidney failure, and 14 (4.4%) cancer. The use of medication was present for 304 (94.7%) of individuals and the average number of medicines per person was 4.5 (SD: 2.8). Table 2 shows other sociodemographic and health-related characteristics.

Of the 321 older people that constituted the total sample, only 80 (24.9%) had walking and cognitive capacity to be assessed according to Fried criteria. Of these, 20.0% (CI 95%: 12.7-30.0) were considered frail, 67.5% (CI 95%: 56.6-76.8) were pre-frail, and 12.5% (CI 95%: 6.9-21.5) were non-frail. According to Table 3, the most frequent frailty criterion was exhaustion (65.0%), followed by low level of physical activity (41.2%).

	n	%
Unintentional weight loss		
No	61	76.3
Yes	19	23.7
Exhaustion		
No	28	35.0
Yes	52	65.0
Slowness		
No	66	83.5
Yes	**13**	**16.5**
Weakness		
No	59	73.8
Yes	21	26.2
Low level of physical activity		
No	47	58.8
Yes	33	41.2
Frailty		
Non-frail	10	12.5
Pre-frail	54	67.5
Frail	16	20.0

Table 3. Distribution of criteria and categorization of frailty among older people with minimum cognitive and physical capacities to carry out physical tests, according to Fried et al. (2001) (n=80).

In this subsample, it was verified that there was no significant association between frailty and independent variables for this subsample (Table 4).

Considering the categorization of frailty for the entire sample (n=321), it was observed that 80.1% (CI 95%: 75.3-84.1) were considered frail, 16.8% (CI 95%: 13.3-21.3) were pre-frail and 3.1% (CI 95%: 1.7-5.6) were non-frail. Table 5 contains the independent variables with *p* values equal to or lower than 0.20, which were tested in multiple analysis, but not included in the final model.

The final model indicated the association of frailty with age, presence of chronic diseases, SAH and institutionalization due to lack of caregiver (adjusted by sex), and residence in a not-for-profit institution (Table 6). The Hosmer-Lemeshow test value was 0.970.

Discussion

The results obtained herein indicated that approximately 80% of the sample was considered frail. This suggests a higher prevalence of frailty when compared to other studies that used the criteria of Fried et al. (2001) that were conducted on institutionalized older people of Brazil and developed countries, and reported frailty rates between 23

	Frailty				p	PR(CI: 95%)
	Yes		No			
	n	%	n	%		
Age						
81 years and over	10	25.0	30	75.0	0.264	1.89 (0.61-5.82)
60-80 years	6	15.0	34	85.0		1.00
Sex						
Male	2	11.8	15	88.2	0.339	0.47 (0.09-2.29)
Female	14	22.2	49	77.8		1.00
Education level						
Illiterate - Fundamental I	8	16.7	40	83.3	0.423	0.63 (0.20-1.96)
Fundamental II - Undergraduate	7	24.1	22	75.9		1.00
Marital status						
No partner	14	18.9	60	81.1	0.396	0.47 (0.08-2.81)
With partner	2	33.3	4	66.7		1.00
Type of institution						
Not-for-profit	9	15.5	49	84.5	0.104	0.39 (0.12-1.24)
For-profit	7	31.8	15	68.2		1.00
Reason for institutionalization: disease						
Yes	3	50.0	3	50.0	0.056	4.69 (0.85-25.91)
No	13	17.6	61	82.4		1.00
Reason for institutionalization: no caregiver						
Yes	7	24.1	22	75.9	0.374	1.67 (0.53-5.21)
No	8	16.0	42	84.0		1.00
Reason for institutionalization: by own choice						
Yes	2	33.3	4	66.7	0.351	2.31 (0.38-13.96)
No	13	17.8	60	82.2		1.00
Private health plan						
No	7	13.5	45	86.5	0.082	0.37 (0.12-1.16)
Yes	8	29.6	19	70.4		1.00
Number of chronic diseases						
3 or more	8	21.6	29	78.4	0.737	1.21 (0.40-3.61)
0-2	8	18.6	35	81.4		1.00
SAH						
Yes	13	22.0	46	78.0	0.446	1.69 (0.43-6.66)
No	3	14.3	18	85.7		1.00
Cardiovascular disease						
Yes	1	12.5	7	87.5	0.576	0.54 (0.06-4.76)
No	15	20.8	57	79.2		1.00
Osteoporosis						
Yes	1	8.3	11	91.7	0.321	0.04 (0.04-2.69)
No	15	22.1	53	77.9		1.00
Rheumatic disease						
Yes	2	25.0	6	75.0	0.709	1.38 (0.25-7.58)
No	14	19.4	58	80.6		1.00
Urinary Incontinence						
Yes	6	30.0	14	70.0	0.197	2.14 (0.66-6.92)
No	10	16.7	50	83.3		1.00
Fecal Incontinence						
Yes	8	29.6	19	70.4	0.147	2.26 (0.74-6.93)
No	8	15.7	43	84.3		1.00
Number of medicines						
5 or more	11	23.9	35	76.1	0.309	1.82 (0.57-5.85)
0-4	5	14.7	29	85.3		1.00
Diuretics						
Yes	6	21.4	22	78.6	0.815	1.14 (0.37-3.57)
No	10	19.2	42	80.8		1.00
Calcium Channel Blockers						
Yes	2	18.2	9	81.8	0.871	0.87 (0.17-4.50)
No	14	20.3	55	79.7		1.00
Medicine that acts on the renin-angiotensin system						
Yes	9	21.4	33	78.6	0.737	1.21 (0.40-3.64)
No	7	18.4	31	81.6		1.00
Lipid Modifying Agents						
Yes	7	26.9	19	73.1	0.283	1.84 (0.59-5.67)
No	9	16.7	45	83.3		1.00
Thyroid Therapy						
Yes	2	18.2	9	81.8	0.871	0.87 (0.17-4.50)
No	14	20.3	55	79.7		1.00
Drugs for Bone Diseases						
Yes	1	11.1	8	88.9	0.479	0.47 (0.05-4.03)
No	15	21.1	56	78.9		1.00
Anti-Parkinson drugs						
Yes	1	16.7	5	83.3	0.832	0.79 (0.08-7.25)
No	15	20.3	59	79.7		1.00
Psycholeptics						
Yes	11	26.8	30	73.2	0.117	2.49 (0.78-7.99)
No	5	12.8	34	87.2		1.00
Other drugs for the nervous system						
Yes	2	33.3	4	66.7	0.396	2.14 (0.36-12.89)
No	14	18.9	60	81.1		1.00
Mineral suplements						
Yes	13	21.0	49	79.0	0.688	1.33 (0.33-5.28)
No	3	16.7	15	83.3		1.00

Table 4. Bivariate analysis between frailty, according to Fried et al. (2001), and independent variables among older people with preserved walking and cognitive capacity (n=80).

and 69%[24-26]. Other studies that used other instruments of measurement, such as the Canadian Study of Health and Aging-Clinical Frailty Scale, osteoporotic fractures frailty index, the Groningen Frailty Indicator or the Edmonton Frail Scale, have reported that this issue affects between 35 and 77%[27-31]. Although these works used the same similar criteria, none of them analyzed individuals with cognitive impairment or without gait capacity. We decided to also include these subjects people due to the fact that it better reflects the reality of the NHs in Natal (Brazil).

When analyzing people with severe cognitive decline and/or impossibility of independent walking or being bedridden

	Frailty				p	OR (CI: 95%)
	Yes		No			
	n	%	n	%		
Education level						
Illiterate - Fundamental I	112	73.7	40	26.3	0.147	0.65 (0.36-1.17)
Fundamental II - Undergraduate	95	81.2	22	18.8		1.00
Marital status						
No partner	209	77.7	60	22.3	0.073	0.39 (0.13-1.31)
With partner	36	90.0	4	10.0		1.00
Reason for institutionalization: lived alone						
Yes	30	69.8	13	30.2	0.094	0.54 (0.27-1.12)
No	216	80.9	51	19.1		1.00
Reason for institutionalization: disease						
Yes	33	91.7	3	8.3	0.064	2.99 (0.89-10.09)
No	224	78.6	61	21.4		1.00
Reason for institutionalization: by own choice						
Yes	5	55.6	4	44.4	0.073	0.31 (0.08-1.19)
No	241	80.1	60	19.9		1.00
Private health plan						
No	156	77.6	45	22.4	0.165	0.66 (0.36-1.19)
Yes	100	84.0	19	16.0		1.00
Number of chronic diseases						
3 or more	90	75.6	29	24.4	0.127	0.65 (0.37-1.13)
0-2	167	82.7	35	17.3		1.00
Stroke						
Yes	49	98.0	1	2.0	<0.001**	14.84 (2.01-109.64)
No	208	76.8	63	23.2		1.00
Cardiovascular disease						
Yes	13	65.0	7	35.0	0.082	0.43 (0.16-1.14)
No	244	81.1	57	18.9		1.00
Neoplasm						
Yes	8	57.1	6	42.9	0.028*	0.31 (0.10-0.993)
No	249	81.1	58	18.9		1.00
Osteoporosis						
Yes	21	53.6	11	34.4	0.031*	0.43 (0.19-0.94)
No	236	81.7	53	18.3		1.00
Rheumatic disease						
Yes	11	64.7	6	35.3	0.103	0.43 (0.15-1.21)
No	246	80.9	58	19.1		1.00
Urinary incontinence						
Yes	175	92.6	14	7.4	<0.001**	7.91 (4.13-15.15)
No	79	61.2	50	38.8		1.00
Fecal incontinence						
Yes	114	85.7	19	14.3	0.037*	1.87 (1.03-3.39)
No	138	76.2	43	23.8		1.00
Number of drugs						
5 or more	110	75.9	35	24.1	0.087	0.62 (0.36-1.07)
0-4	147	83.5	29	16.5		1.00
Diuretics						
Yes	45	67.2	22	32.8	0.003*	0.41 (0.22-0.75)
No	209	83.3	42	16.7		1.00
Calcium channel blockers						
Yes	19	67.9	9	32.1	0.097	0.49 (0.21-1.15)
No	235	81.0	55	19.0		1.00
Medicine that acts on the renin-angiotensinsystem						
Yes	77	70.0	33	30.0	<0.001**	0.41 (0.23-0.71)
No	177	85.1	31	14.9		1.00
Lipid modifying agents						
Yes	48	71.6	19	28.4	0.059	0.55 (0.29-1.03)
No	206	82.1	45	17.9		1.00
Thyroid therapy						
Yes	20	69.0	9	31.0	0.124	0.52 (0.23-1.21)
No	243	81.0	55	19.0		1.00
Drugs for bone diseases						
Yes	14	63.6	8	36.4	0.049*	0.41 (0.16-1.02)
No	240	81.1	56	18.9		1.00
Anti-Parkinson drugs						
Yes	36	87.8	5	12.2	0.175	1.95 (0.73-5.18)
No	218	78.7	59	21.3		1.00
Psycholeptics						
Yes	160	84.2	30	15.8	0.019*	1.93 (1.11-3.35)
No	94	73.4	34	26.6		1.00
Other drugs for the nervous system						
Yes	4	50.0	4	50.0	0.033*	0.24 (0.06-0.99)
No	250	80.6	60	19.4		1.00
Vitamins						
Yes	29	70.7	12	29.3	0.118	2.23 (1.07-4.65)
No	225	81.2	52	18.8		1.00
Mineral suplements						
Yes	24	61.5	15	38.5	0.028*	0.45 (0.21-0.93)
No	230	82.4	49	17.6		1.00

** p≤ 0.05 ** p≤0.001*

Table 5. Bivariate analysis between frailty and independent variables (n=321).

along with those classified according to the criteria by Fried et al. (2001)[3], it was observed that the prevalence of frailty and pre-frailty was almost 97% overall. Therefore, a minority of older people was considered robust as per the same criteria, indicating that most of them had already progressed to initial or advanced frailty states. Some authors[24-28,31,32] corroborated the findings obtained herein, reporting combined frailty and pre-frailty prevalences between 91.1 and 96.3%. However, El Zoghbi et al.[27] and Khater & Mousa[28], in studies carried out in Lebanon and Egypt, respectively, encountered lower proportions of frail or pre-frail older people, when observing younger individuals.

	Frailty				Bivariate		Multivariate	
	Yes		No					
	n	%	n	%	p	OR (CI: 95%)	p	OR (CI: 95%)
Age								
83 years and over	138	86.8	21	13.2	0.003	2.37 (1.33-4.23)	0.003*	2.67 (1.39-5.14)
60-82 years	119	73.5	43	26.5		1.00		
Chronic diseases								
Yes	230	81.3	53	18.7	0.139	1.77 (0.82-3.79)	<0.001**	10.27 (3.42-30.90)
No	27	71.1	11	28.9		1.00		
SAH								
Yes	111	70.7	46	29.3	<0.001	0.31 (0.18-0.55)	<0.001**	0.11 (0.05-0.27)
No	146	89.0	18	11.0		1.00		
Reason for institutionalization: no caregiver								
Yes	128	85.3	22	14.726	0.012	2.07 (1.17-3.67)	0.003*	2.55 (1.36-4.76)
No	118	73.80	42	.20		1.00		
Sex								
Male	64	81.0	15	19.0	0.808	1.08 (0.57-2.06)	0.122	1.76 (0.86-3.61)
Female	193	79.8	49	20.2		1.00		
Type of institution								
Not-for-profit	155	76.0	49	24.012	0.016	0.46 (0.25-0.87)	0.195	0.63 (0.32-1.26)
For-profit	102	87.20	15	.80		1.00		

Table 6. Final model for the presence of frailty in institutionalized older people of Natal (n=321).

This finding demonstrates that age itself is the main factor for frailty, as affirmed by Veras[33].

Fried et al.[3] verified that that combined prevalence of frailty in community-dwelling older people was 53.5%, much lower that what was observed in institutionalized individuals. The high prevalence of frailty in the studied NHs occurs due to differences between the average ages of the participants included in this study (81 years old) and community-setting studies (75 years of age)[6], as older individuals usually present high levels of physical, mental and functional dysfunctions[26].

Considering the five Fried frailty indicators for older people that walked without aid and presented preserved cognitive capacity (n=80), it was observed that exhaustion and low levels of physical activity were the most frequent criteria. Most older people that practiced physical activity carried out rehabilitation activities, which can lead to a higher sensation of exhaustion. In this sense, Chaves et al.[34] showed that exhaustion can be related to lack of physical activity, sarcopenia, anemia and malnutrition. However, we run a secondary analysis between these two frailty indicators and chi-square test showed non-significant association.

In multiple analysis, the variables included in the final model were: age, presence of chronic diseases, SAH and institutionalization due to lack of caregiver. Several studies also found associations between frailty and age[6,24,25,30-32]. The association between frailty and advanced age is already well-established in the scientific literature and is explained by the characteristics of the aging process, as all body systems suffer structural and functional losses with age[35].

The presence of chronic diseases was also strongly associated with frailty (p<0.001). It is known that although the presence of chronic diseases is not synonymous of frailty, throughout the aging process these sometimes overlap, which can cause increased risk of adverse health events. Therefore, there are higher chances of older people becoming frail due to the clinical events that could arise[31,36].

The presence of SAH has been associated with frailty. Data from the Study Network on Frailty of Brazilian Elderly (SNFBE) corroborated the findings herein presented when observing that diastolic arterial pressure (DAP) (p<0.001) and average arterial pressure (AAP) (p=0.004) were protection factors towards frailty[37]. It has been well-established in literature that structure and operation of the cardio-circulatory system change with age. Generally, the systolic arterial pressure (SAP) increases progressively

with age, while DAP increases only until middle-age, then decreases or remains stable[38-40]. The AAP, result of the interaction between SAP and DAP, tends to decrease in older individuals, as a result of declining DAP values.

Data of the SNFBE revealed that there were significant decreases in DAP for older people in the age group over 80, which was a difference of 5.9 mmHg in comparison with the age group 65-69 years of age[37]. In addition, the average life expectancy in Brazil is approximately 73 years of age, and it is possible that people with higher SAH (and therefore at higher risks of cardiovascular diseases) were not represented herein, due to the influence of early death. Finally, it is also possible that low arterial pressure was developed as a consequence of primary heart disease and decreased heart output[37]. The values of SAP, DAP, and AAP were not considered in the present study, only diagnosis of the pathology, either from medical records or provided by the staff, which limited a deeper investigation on the subject.

Among the reasons of institutionalization, the lack of caregiver (strongly associated with frailty) indicated limited social support of residents, who often have advanced functional limitation, which increases the demand for care[41]. Besides, with the progression of age, there is a higher risk of functional limitations, as well as higher burden of chronic diseases and hospitalizations, which increases the demand for care, sometimes overloading the family[7]. In the study herein presented, only 12% of older people had a partner, 50% did not have children, and only 27% were totally independent. However, due to the study design, it was not possible to identify if the functional limitations were already present or were a consequence of institutionalization.

This study showed that frailty was highly prevalent in institutionalized older people, with high rates of cognitive decline and mobility. Frailty was strongly associated with age, presence of chronic diseases (mainly SAH), and institutionalization due to lack of caregiver. The representativeness of the sample and low percentage of refusals and data losses were the main strengths in this study. Among the limitations, the cross-sectional design limited the possibility of carrying out a temporal study on frailty of the residents. The small sample of older people that was evaluated according to the frailty criteria of Fried et al.[3] could have caused a type II error, i.e., limited the occurrence of significant associations between frailty and other variables studied in this population. Besides, the Pfeiffer's test has not yet been validated in Brazil. The selection was made considering easy and fast application of the test, and also due to the low difficulty and exigency of questions, being therefore an adequate instrument to measure the cognitive capacity of the sample. Finally, some chronic diseases could have been under-diagnosed or under-registered. However, medical records were checked and the professionals at the institutions were interviewed, aiming at collecting the maximum amount possible of information.

Conclusions

The results confirmed -the influence of aging-related factors, such as progression of age and presence of chronic pathologies. However, social factors, such as being institutionalized due to lack of caregiver in community settings, were also associated with frailty, indicating the importance of a consistent social support network as part of providing care to older people. Thus, the early identification of the frailty syndrome is necessary, considering its impact on the quality of life of older people, functional independence and their own autonomy. Frail older people should be considered a priority group in public health policies, focusing on prevention, treatment and rehabilitation.

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