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Frailty syndrome and associated factors in community-dwelling elderly in Northeast Brazil

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ABSTRACT

Introduction: Frailty syndrome in the elderly, characterized by decreased physiological reserves, is associated with increased risk of disability and high vulnerability to morbidity and mortality. This study is part of a multicenter project on Frailty in Elderly Brazilians (REDE FIBRA). *Aims*: To investigate characteristics, prevalence and associated factors related to frailty. *Methodology*: A total of 391 randomly selected elderly patients aged 65 years were interviewed. Data collection was performed using a multidimensional questionnaire containing information about sociodemographic and clinical variables. Fried's phenotype was used to characterize the frail elderly. Data were analyzed using descriptive statistics, bivariate analysis (χ^2) and binary logistic regression. *Results*: The prevalence of frailty was 17.1%. In the final multivariate analysis model, the following factors associated with frailty were obtained: advanced chronological age ($p < 0.001$), presence of comorbidity ($p < 0.035$), dependence in basic ($p < 0.010$) and instrumental ($p < 0.003$) activities of daily living and negative perception of health status ($p < 0030$). *Conclusion*: The factors associated with frailty suggest a predictive model that helps in understanding the syndrome, guiding actions that minimize adverse effects in the aging process.

1. Introduction

Human aging, which is dynamic and progressive depends on interacting hereditary, biological, social, environmental, historical and cultural factors that determine the quality of life of an individual (Maciel and Guerra, 2007). In the last three decades the term "frail elderly" was used to designate elderly individuals who are extremely debilitated and vulnerable to adverse effects, characterizing pathological aging (Walston et al., 2006). Nowadays, frailty is currently considered a geriatric biological syndrome, characterized by weakness, fatigue, weight loss, diminished physiological reserves and extreme vulnerability to stressors. Such aspects may lead to adverse results in the aging process such as functional incapacity, precarious survival conditions, morbidity, hospitalization and death (Fried et al., 2001, 2004; Markle-Reid and Browne, 2003; Bandeen-Roche et al., 2006; Walston et al., 2006; Ahmed et al., 2007; Bergman et al., 2007; Kuh, 2007; Varadhan et al., 2008a,b). Understanding the factors related to the frailty syndrome enables the elaboration of prevention and intervention actions in elderly populations.

Most current data on the frailty profile are based on parameters from population studies conducted using the environmental, social, economic and cultural traits of developed countries. Recent studies consider that factors such as significantly compromised health, precarious social conditions and childhood poverty, as well as adverse working conditions in adulthood, health risk situations and violence in old age, may indirectly interfere in both the development of frailty (Alvarado et al., 2008; Fernandez-Bolaños et al., 2008). Thus, there is a need to investigate the frailty syndrome in developing countries with different social context. Brazil has a multicultural, economic and social diversity with an emergent aging population. The multicenter and multidisciplinary study of REDE FIBRA investigated the elderly population of several Brazilian cities and municipalities, in order to determine the traits, prevalence and associated biological, psychological and environmental factors related to the frailty syndrome.

The present article discusses the results obtained in a study conducted in an underdeveloped area of Northeast Brazil with a lower human development index (HDI) and different lifestyles from that of large cities, enabling a broad characterization of elderly Brazilians. We aimed at estimating the frail profile in community-dwelling elderly and analyzing the factors associated to the frailty syndrome.

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2. Materials and methods

2.1. Study characterization

This is a cross-sectional epidemiological study. It is part of a multicenter and multidisciplinary project denominated REDE FIBRA (Network of Studies on the Frailty of Elderly Brazilians), that uses operational parameters to evaluate the frailty phenotype proposed by Fried et al. (2001) and additional clinics, culture and social aspects to verify its association with this syndrome. REDE FIBRA has a total of 7983 elderly subjects enrolled from 17 distinct cities of Brazil. The selection criteria of subjects were oriented by a stratified and randomized sample based on the Human Development Index (HDI) of the cities assessed (IBGE, 2008).

2.2. Population and sample

The sample study was composed of men and women, aged 65 years or older, residents of the urban zone of Santa Cruz city – Brazil, that is located in interior of Rio Grande do Norte (RN) 120 km from the capital Natal, and has approximately 34,000 inhabitants. It is considered a poor and underdeveloped region, with HDI in 0.655 and life expectancy of 67 years (IBGE, 2008).

The sample size was estimated to have a population proportion of 50% of a certain trait under study – a value in which the sample size obtained is the maximum possible ($p = 0.50$; $q = 0.50$). The significance level was set at 5%. The sample error was fixed at 5%, since the city of Santa Cruz has less than one million inhabitants. The participants were randomly selected, considering the socioeconomic diversity of the municipality to establish representative of the population.

- *Inclusion criteria*:
  1. Elderly individuals 65 years or older.
  2. Residents of randomly selected sectors based on IBGE (Brazilian Institute of Geography and Statistics) data.
  3. Obtain a score $\geq$17 on the Mini-Mental State Examination (MMSE).
  4. Sign the informed consent form.
- *Exclusion criteria*:
  1. Unable to walk, temporarily or permanently.
  2. Presence of severe sensory deficits for locomotion, communication, drawing and writing.
  3. Presence of severe cognitive or motor impairments due to stroke.
  4. Presence of Parkinson's disease severe or unstable.
  5. Presence of terminal illness.

2.3. Instrumentation and data collection procedures

Data collection was performed using a multidimensional questionnaire with valid instruments, cross-culturally adapted for use in the Brazilian elderly population. An interviewer team was selected and trained to conduct the interviews, following instructions contained in the REDE FIBRA manual. A pilot study was carried out to calibrate the instruments and verify internal reliability during the interviews. The multidimensional questionnaire consisted of the specific sessions described below:

- *Sociodemographic charateristics*:The following demographic data were collected: sex, age, color, marital state, family arrangement and situation of the home in which they reside. Social data collected were: schooling level, monthly income and occupation.
- *Cognitive state*:Cognitive level was assessed using the MMSE. MMSE score varies between 0 and 30 points (Folstein et al., 1975; Brucki et al., 2003), with a cutoff point $\geq$17 established by REDE FIBRA.
- *Physical health status*:Assessment of physical health was based on self reports, investigating the presence or absence of chronic diseases diagnosed within the last year. These include: cardiac disease, hypertension, diabetes mellitus, malignant tumor, arthritis or rheumatism, pulmonary diseases, osteoporosis, stroke and falls (Brucki et al., 2003; Lima-Costa et al., 2004). We considered presence of two or more chronic diseases as comorbidity.
- *Perceived health*:A subjective evaluation of elderly health was made, based on the following question: "*In general, would you say your health is very good, good, fair, poor or very poor?*" Those who considered their health very good, good or fair had a positive self-perception of health. On the other hand, those who considered their health poor or very poor had a negative self-perception.
- *Functional capacity*:Functional capacity for the instrumental activities of daily living (IADL) was assessed using the Lawton Scale (Lawton and Brody, 1969) and basic activities of daily living (BADL) using the Katz Scale (Lino, 2008). For BADL, individuals who reported total dependence in at least 1 Katz activity were considered dependent. For IADL, individuals classified with some degree of dependence were considered dependent, according to the Lawton–Brody score (Lawton and Brody, 1969).
- *Mental health*:Depressive symptoms were assessed based on application of the short version of the Geriatric Depression Scale – GDS-15. The short GDS contains fifteen questions and is validated in Brazil (Almeida and Almeida, 1999). Each patient response coinciding with a depressive symptom is awarded 1 point, and the total score is the sum of all of these responses. A total score $\leq$5 is considered a "non case" for depressive symptoms, while a score $>$5 is considered a "case" for depressive symptoms (Almeida and Almeida, 1999).
- *Assessment of the frailty syndrome*:Data collection in relation to frailty phenotype was based on an assessment of the five criteria proposed by Fried et al., as follows: non-intentional weight loss, muscle weakness, self-report of exhaustion, slow gait and low level of physical activity (Fried et al., 2001; Bandeen-Roche et al., 2006).

Non-intentional weight loss was determined by the following question: "*Have you lost weight involuntarily in the last 12 months?*" If the answer was affirmative, the subject was asked to state the approximate amount of kilograms lost. Non-intentional loss $\geq$4.5 kg or $\geq$5% of body weight in a one-year period was indicative of frailty (Fried et al., 2001).

To assess muscle strength, we tested hand grip strength using a JAMAR dynamometer, a standard instrument in both clinical practice and research (Figueiredo et al., 2007).

The dynamometer was preferentially placed in the dominant hand. The handle was adjusted to position 2 for women and to position 3 for men. Three measures were obtained in kilograms-force (kgf), with a 1-min interval between them, to obtain a mean value of the three measures. Furthermore, to indicate the frail elderly, the cutoff points proposed by Fried et al. (2001), adjusted for sex and BMI, were adopted.

The self-report of exhaustion was verified by applying two questions from the Center for Epidemiological Studies Depression Scale (CES-D): "*Did you feel that you had to exert yourself to perform your daily tasks?*" and "*Were you not able to carry out your activities?*" (Bastitoni et al., 2007). A score of 2 or 3 on one of the above questions evidenced frailty (Fried et al., 2001).

Gait speed was based on the time required to walk 8.6 meters, excluding 2 meters for acceleration and 2 meters for deceleration, resulting in a final time measured for the remaining 4.6 meters. A Kadio KD 1069 Professional Quartz Timer was used for the

measurements. As a further indication of frailty, the cutoff points proposed by Fried et al. (2001), adjusted for sex and height, were adopted.

Finally, physical activity level was investigated using the Minnesota Questionnaire of Physical Activities and Leisure, which encompasses a number of activities performed by the individuals, such as engaging in sports, leisure, walking and daily activities (Taylor et al., 1978; Fried et al., 2001). The translated and adapted version was used for the REDE FIBRA study.

Based on this information, we calculated kilocalories (kcal) spent during activities over the previous two weeks. Cutoff points were based on the 20th percentile of the results found in the present study. Individuals with scores below the 20th percentile were considered frail (Fried et al., 2001).

2.4. Statistical analysis

The data were processed, stored and analyzed using SPSS (Statistical Package for the Social Sciences) 15.0. Statistics consisted of descriptive, bivariate and multivariate analysis.

Descriptive analysis was conducted using distribution measures (mean, standard deviation, absolute frequency and relative frequency), considering the variables of interest, in order to characterize the sample.

Bivariate analysis was performed by applying Pearson's chi-square (χ^2) test to identify a possible association between independent variables (sociodemographic conditions, self-reported health and functional capacity) and the dependent variable (frailty).

Seeking the best way of conducting the analysis, we regrouped a number of variables, considering frequency distribution and the models found in a literature review. Thus, classification of frailty was divided into frail (exhibiting at least 3 suggestive criteria), and we considered non-frail who exhibiting at most 2 suggestive or less.

The variable marital status was dichotomized as follows: individuals in a stable union (married or living with a companion) and not in a stable union (single, widowed, separated or divorced). Monthly income was stratified into values below 1 minimum monthly wage (MMW), between 1 and 2 MMWs and above 2 MMWs (the MMW in 2009 was R$465.00 or ≈US$250.00).

Based on previous results, we proceeded with multivariate analysis using binary logistic regression, to identify the factors associated to frailty. To that end, hierarchical blocks were created, including variables with a potential association factor with frailty. $p \leq 0.05$ and CI = 95% were adopted for all the analyses.

3. Results

A total of 391 elderly (61.4% females) were assessed. The minimum and maximum ages were 65 and 96 years, respectively, with mean age of 74.0 ± 6.5 years. The sample, stratified by age group, showed that 60.4% of the elderly were between 65 and 74 years old.

With respect to self-reported physical health, most reported suffering from hypertension (58.1%), the most prevalent pathology. However, 74.2% of the elderly had two or more infirmities, characterizing comorbidity. Moreover, 13.3% reported diagnosis of depression; however, when the GDS-15 was applied, the index was 29.4% for depressive symptoms. In relation to the occurrence of falls, 31.5% had fallen at least once in the previous year. With respect to functional capacity, it was observed that 16.4% were dependent in BADL and 64.5% in IADL.

In terms of frailty in the municipality of Santa Cruz, Brazil, it was found that 17.1% of the elderly were frail, 60.1% pre-frail and 22.8% non-frail. Of frail, 65.7% were females and 64.2% were 75 years of age or older.

Bivariate analysis between sociodemographic variables and frailty revealed that the presence of frailty is significantly associated with age ($p < 0.001$). This suggests that the higher the chronological age, the greater the likelihood of frailty (Table 1).

Bivariate analysis also showed a significant association between frailty and osteoporosis ($p < 0.018$), stroke ($p < 0.001$), medical diagnosis of depression ($p < 0.017$), at least one fall ($p < 0.005$) and the presence of comorbidities ($p < 0.013$) (Table 2).

Additional factors associated to frailty were dependence in BADL ($p < 0.001$) and IADL ($p < 0.001$), as well as negative self-perception of health (0.001) (Table 3).

Table 1
Prevalence and association of frailty in the elderly according to sociodemographic variables, Santa Cruz, Brazil, 2009.

Variables		Groups						*p*-Value
		Frail		Pre-frail		Non-frail		
		%	*N*	%	*N*	%	*N*	
Age group [min. 65; max. 96; mean 74.05; ±6.57]	65–74 years	6.1	24	36.3	142	17.9	70	0.001
	75–84 years	9.0	35	18.9	74	4.6	18	
	85 years or older	2.0	8	4.9	19	0.3	1	
Gender	Male	5.9	23	24.6	96	8.2	32	0.527
	Female	11.2	44	35.5	139	14.6	57	
Marital status	In a stable union	9.0	35	36.6	143	13.8	54	0.430
	Not in a stable union	8.1	32	23.5	92	9.0	35	
Color\race	White	6.4	25	16.9	66	6.4	25	0.475
	Black	1.7	07	5.9	23	1.6	06	
	Mulatto\Brown-skinned\Indian or mixed Indian and White	9.0	35	37.7	146	14.8	58	
Currently employed	Yes	1.0	04	9.5	37	3.8	15	0.097
	No	16.1	63	50.6	198	19.0	74	
Literate	Yes	5.4	21	24.8	97	11.5	45	0.054
	No	11.7	46	35.3	138	11.3	44	
Monthly income (MMW)[a]	Less than 1 MMW	1.3	05	6.1	24	1.5	06	0.702
	1–2 MMW	13.8	54	47.8	187	17.9	70	
	More than 2 MMW	2.0	08	6.1	24	3.3	13	

[a] MMW in 2009 was R$465.00 (≈US$250.00).

Table 2
Prevalence and association of frailty in the elderly according to self-perceived physical health variables, Santa Cruz, Brazil, 2009.

Variables		Groups						*p*-Value
		Frail		Pre-frail		Non-frail		
		%	*N*	%	*N*	%	*N*	
Hypertension	Yes	11.5	45	34.5	135	12.0	47	0.409
	No	5.6	22	25.6	100	10.8	42	
Cardiopathy	Yes	3.5	14	8.2	32	2.8	11	0.510
	No	13.6	53	51.9	202	20.0	78	
Diabetes	Yes	4.9	19	12.3	48	4.3	17	0.460
	No	12.2	48	47.8	187	18.5	72	
Arthritis\rheumatism	Yes	5.8	22	12.5	47	3.4	13	0.051
	No	11.3	45	47.6	188	19.4	76	
Osteoporosis	Yes	4.1	16	5.6	22	3.6	14	0.018
	No	13.0	51	54.5	213	19.2	75	
Stroke\ischemia	Yes	1.3	05	0.3	01	0.3	01	0.001
	No	15.8	62	59.8	234	22.5	88	
Cancer	Yes	0.8	03	1.5	06	0.8	03	0.710
	No	16.3	64	58.6	229	22.0	86	
Bronchitis\emphysema	Yes	1.8	07	3.1	12	0.8	03	0.337
	No	15.3	60	57.0	222	22.8	86	
Presence of comorbidity	Yes	2.0	08	17.9	70	5.9	23	0.013
	No	15.1	59	42.2	165	16.9	66	
Medical diagnosis of depression	Yes	3.8	15	7.9	31	1.5	06	0.017
	No	13.3	52	52.2	204	21.3	83	
Depressive symptoms (GDS-15)	Case	7.4	29	18.2	71	3.9	15	0.001
	Non case	9.7	38	41.9	164	18.9	74	
Occurrence of falls	Yes	7.5	29	19.6	76	4.4	17	0.005
	No	9.6	38	40.5	156	18.4	71	

Source: Research data.

Table 3
Prevalence and association of frailty in the elderly according to functional capacity and self-perceived health variables, Santa Cruz, Brazil, 2009.

Variables		Groups						*p*-Value
		Frail		Pre-frail		Non-frail		
		%	*N*	%	*N*	%	*N*	
BADL	Dependent	5.4	21	8.2	32	2.9	11	0.001
	Independent	11.7	46	51.9	203	19.9	78	
IADL	Dependent	14.3	56	38.6	151	11.5	45	0.001
	Independent	2.8	11	21.5	84	11.3	44	
Perceived health	Very good	0.5	2	4.1	16	1.3	05	0.001
	Good	3.6	14	18.2	71	8.4	33	
	Fair	8.2	32	32.0	125	12.0	47	
	Poor	3.6	14	4.3	17	0.5	02	
	Very poor	1.3	05	1.5	16	0.5	02	

Source: Research data.

In multivariate analysis, shown in Table 4, values were adjusted according to the sociodemographic block, self-reported physical health, functional capacity and subjective perception of health. The factors associated to frailty were advanced age ($p = 0.001$), presence of comorbidity ($p = 0.035$), dependence in BADL ($p = 0.010$) and IADL ($p = 0.003$) and poor/very poor self perceived health (0.030).

4. Discussion

The article presents the first results of most import Brazilian study (REDE FIBRA study) from an undeveloped region of Brazil. Data of frailty populations from Brazilian and Latin American are still scarce, but it is very necessary to plan public health policies to these countries that have a rapidly growing aging population.

In terms of frailty assessment parameters, the construct validity of this syndrome is supported in the operationalization of the frailty concept (Walston et al., 2006), which is being widely used in epidemiological studies. This concept, in turn, is supported in the dichotomized response of five items that mainly reflect functional deficiency in the elderly, emphasizing aspects related to strength and muscle fatigue. However, it is believed that age-related sarcopenia, strongly represented in the frailty phenotype, seems to be one of the points of clinical interest, for both assessment and clinical intervention.

Even considering recent studies showing strong applicability of the criteria proposed by Fried et al. for assessing frailty (Rothman

Table 4
Binary logistic regression model for assessment of factors associated with frailty in the elderly, Santa Cruz, Brazil, 2009.

Variables		Odds ratio [CI 95%]	*p*-Value
Model 1: sociodemographic block			
Age group	65–74	1.00	0.001
	75+	3.461 [1.993–6.010]	
Gender	Male	1.00	0.287
	Female	1.361 [0.771–2.401]	
Model 2: self-reported physical health block[a]			
Age group	65–74	1.00	0.001
	75+	3.484 [1.983–5.811]	
Comorbidity	Absent	1.00	0.028
	Present	2.459 [1.101–5.492]	
Depression	Yes	1.00	0.036
	No	2.142 [1.051–4.366]	
Model 3: functional capacity block[b]			
Age group	65–74	1.00	0.001
	75+	2.789 [1.557–4.995]	
Comorbidity	Absent	1.00	0.016
	Present	2.734 [1.202–6.216]	
Depression	No	1.00	0.044
	Yes	2.156 [1.022–4.547]	
BADL	Independent	1.00	0.004
	Dependent	2.629 [1.364–5.068]	
IADL	Independent	1.00	0.001
	Dependent	3.256 [1.585–6.692]	
Model 4: perceived health block[c]			
Age group	65–74	1.00	0.001
	75+	2.637 [1.461–4.760]	
Comorbidity	Absent	1.00	0.035
	Present	2.437 [1.065–5.579]	
Depression	No	1.00	0.144
	Yes	1.782 [0.820–3.870]	
BADL	Independent	1.00	0.010
	Dependent	2.422 [1.241–4.726]	
IADL	Independent	1.00	0.003
	Dependent	2.958 [1.433–6.108]	
Perceived health	Very good/good/fair/poor/very poor	1.00	0.030
	Poor/very poor	2.290 [1.083–4.841]	

Source: Research data.

[a] Adjusted by the sociodemographic block.
[b] Adjusted by the sociodemographic and perceived health blocks.
[c] Adjusted by sociodemographic, perceived health and functional capacity blocks.

et al., 2008; Kiely et al., 2009; Drey et al., 2011), our results suggest caution when considering their applicability in the Brazilian elderly population, mainly when it comes to evaluating physical activity levels.Data from the Cardiovascular Health Study (Fried et al., 2001) were originally used in the development and operationalization of the frailty phenotype in elderly individuals. Assessment of the item related to physical activity level was obtained using the Minnesota Questionnaire (Taylor et al., 1978; Fried et al., 2001) which determines low physical activity level by estimating calorie expenditure according to sex. Because of the obvious difficulties in applying this instrument to the Brazilian cultural context, the questionnaire applied to the REDE FIBRA study was adapted. The present study discusses the main validation parameters of the Brazilian version and their repercussions in estimating the prevalence of frailty in elderly Brazilians. Our preliminary conclusion was that the cutoff point adopted (20th percentile) may be underestimating physical activity levels.

The results revealed that 21.2% of the elderly exhibited low physical activity, which, along with the score on the remaining items, showed an estimated prevalence of 17.1% of frail elderly in the study population. Although this value is comparable to that reported by other American studies (Fried et al., 2001; Walston et al., 2002; Fried et al., 2004; Ahmed et al., 2007), it is much below the values obtained in the city of São Paulo, where Alvarado et al. (2008) analyzed data from the SABE study and found a prevalence of 40.6%. It should be pointed out, however, that the assessment methods used in the Latin American population studied differed from the methods used in our study, as well as in the other American studies.

Despite inconsistencies in the assessment methods used in frailty studies, it was found that frailty prevalence rates in the elderly populations of developing countries are indeed higher than in developed countries (Alvarado et al., 2008). The reasons for this possible increase, in addition to the possibility of measurement biases and deficiency in validating the construct of the instruments used, lie in the investigative approach of the life trajectory of these elderly individuals, which analyzes their exposure to different adverse factors and stressors in childhood, adulthood and those currently present in old age (Lipsitz, 2004; Kuh, 2007; Alvarado et al., 2008). We consider that factors such as significantly compromised health, precarious social conditions and childhood poverty, as well as adverse working conditions in adulthood, health risk situations and violence in old age, may indirectly interfere in both the development of subclinical inflammatory processes and immune response to stress. These processes are intimately linked to the genesis of frailty, given that they are related to the emergence of sarcopenia and to the deterioration of adaptive processes within the organism related to homeostasis and allostasis (Gruenewald et al., 2009).

The potential factors associated to frailty in this study were advanced age, presence of comorbidity, dependence in some BADL or IADL and negative self-perception of health status. These results are corroborated in the literature (Fried et al., 2001;

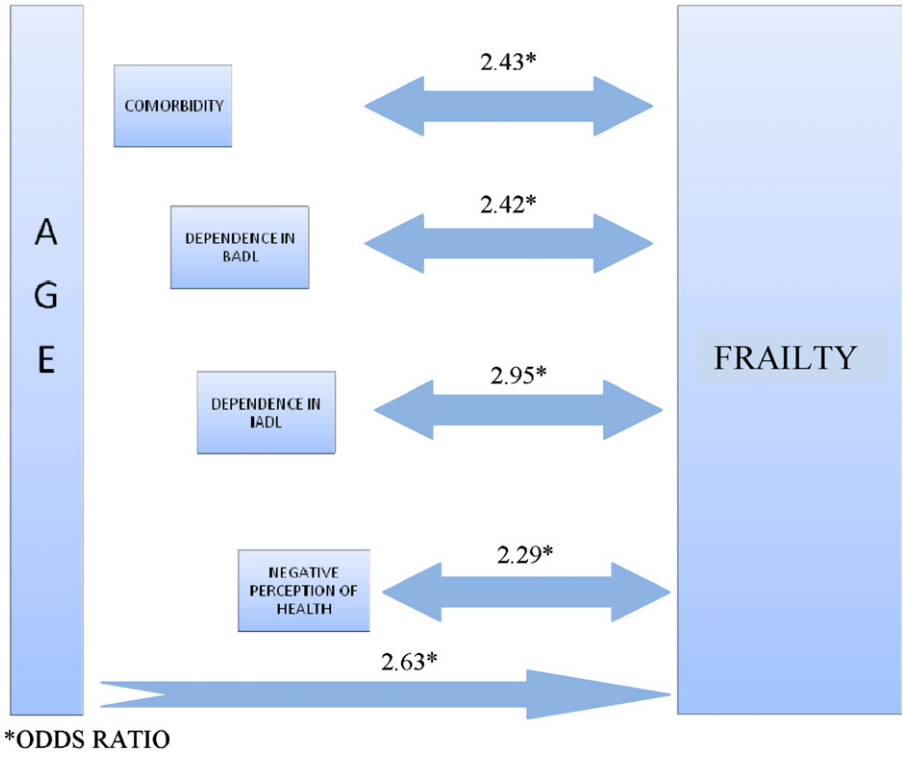

Fig. 1. Theoretical model of factors associated to the frailty syndrome in the elderly of Santa Cruz, Brazil. *Odds ratio.

Walston et al., 2002; Fried et al., 2004; Bergman et al., 2007; Carey et al., 2009; Ensrud et al., 2009; Vila-Funes et al., 2009). Based on the final explicative model observed using binary logistic regression, the findings suggest the possibility of elaborating a predictive theoretical model (Fig. 1) with the respective odds ratios found. This model could help in understanding the factors associated with the frailty syndrome in the study population.

Of the sociodemographic variables included in the model, only age was significantly correlated even when adjusted for the other variables, demonstrating, as in other studies, the influence of the aging process on the emergence of frailty (Fried et al., 2001; Markle-Reid and Browne, 2003; Ahmed et al., 2007; Carey et al., 2009; Ensrud et al., 2009; Vila-Funes et al., 2009). In contrast to other studies (Fried et al., 2001; Markle-Reid and Browne, 2003; Bandeen-Roche et al., 2006; Alvarado et al., 2007, 2008), the female sex showed no association with frailty, despite the greater prevalence of women among individuals considered frail. Other studies also found no association between gender and frailty; nor did they consider gender a risk factor for adverse outcomes in old age (Sarkisian et al., 2008; Rodrigues et al., 2009; Vila-Funes et al., 2009).

Our results revealed that comorbidity is associated to frailty, corroborating the literature, even though the frailty syndrome may exist without the presence of comorbidity (Fried et al., 2004). However, studies have shown that elderly individuals who experience associated comorbidities seem to be more predisposed to frailty and that the prognosis for such a condition depends on the clinical manifestations exhibited (Sarkisian et al., 2008; Hackstaff, 2009). A similar finding was found in relation to the association observed between functional incapacity in the activities of basic living and frailty. Despite being considered distinct theoretical concepts, it is important to know the trajectory of functional incapacity and its interrelationships with frailty phenotype. Factors intrinsically linked to frailty, such as fatigue, low physical activity level, gait speed and diminished muscle strength, have been suggested as predictors of functional incapacity (Avlund, 2010; Simões et al., 2010; Wennie Huang et al., 2010).

Finally, the association between negative health perception and outcomes of interest linked to human aging are well known (Gutman et al., 2001; Hackstaff, 2009; Hybels et al., 2010). Thus, we believe that the perception of the elderly regarding adverse experiences during their lifetime may predispose them to frailty. This hypothesis is supported by the theory proposing a relationship between human resilience and frailty (Varadhan et al., 2008a,b).

Since the present study is cross-sectional, it cannot determine a causal network for frailty. However, from the findings and associations observed, we can hypothesize that the frailty syndrome would be a natural outcome of the aging process, that is, a consequence of reduced biological resistance over the course of a lifetime. Thus, a better understanding of the factors involved with frailty in the elderly requires a lifelong investigation. This could be achieved by longitudinal studies using life course epidemiology, and from the perspective of studies investigating the concept of allostatic load (Gruenewald et al., 2009), it would be possible to identify the main pathway to frailty in the elderly.

In conclusion, we consider that epidemiological studies in the elderly Brazilian population will enable the planning of concrete actions directed at the physical dimensions of the human body as well as the creation of social and medical support networks capable of meeting material, instrumental, informative and affective needs. This set of actions would likely help the elderly to face daily adversity, allowing them to adapt more readily to stressor events, keeping them free from incapacities and functional limitations for a longer period of time.

Conflict of interest

Authors declare no conflict of interest.

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