Frailty syndrome in elderly patients with type 2 diabetes *mellitus*

Síndrome da fragilidade em idosos com diabetes *mellitus* tipo 2

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Abstract

Objective: To determine the prevalence of frailty syndrome in elderly patients with type 2 diabetes *mellitus*.
Methods: Cross-sectional study including 30 elderly of both genders, aged 60-79 years, and diagnosed with type 2 diabetes *mellitus*. The research instruments were validated for Portuguese, included sociodemographic and clinical variables, and criteria for frailty syndrome. The elderly were divided into frail, pre-frail and non-frail. Data were analyzed using descriptive statistics.
Results: The prevalence of frailty was 56.7%. The associated factors were the following: female gender (70.6%); widowed (69.2%); white color (58.8%); not working (69.2%); and time since diagnosis of 25-48 months (47.1%).
Conclusion: The associated factors such as sociodemographic, economic and time since diagnosis did not affect the prevalence of frailty syndrome in elderly patients with type 2 diabetes *mellitus*.

Resumo

Objetivo: Conhecer a prevalência da síndrome da fragilidade e fatores associados em idosos com diabetes *mellitus* tipo 2.
Métodos: Estudo transversal que incluiu 30 idosos, de ambos os sexos, com idades entre 60 a 79 anos e diagnóstico de diabetes *mellitus* tipo 2. Os instrumentos de pesquisa foram validados para língua portuguesa e incluíram variáveis sociodemográficas, clínicas e critérios para síndrome da fragilidade. Os idosos foram divididos em frágil, pré-frágil e não frágil. Os dados foram analisados por estatística descritiva.
Resultados: A prevalência da fragilidade foi de 56,7%. Os fatores associados foram: sexo feminino (70,6%); viúvos (69,2%); cor branca (58,8%); não trabalhar (69,2%); e tempo de diagnóstico de 25 a 48 meses (47,1%).
Conclusão: Os fatores associados, tais como, sociodemográficos, econômicos e tempo de diagnóstico não interferiram na prevalência da síndrome da fragilidade em idosos com diabetes *mellitus* tipo 2.

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Conflicts of interest: no conflicts of interest to declare.

Introduction

The growing life expectancy of the population has shown significant increase in the number of elderly. This process is confirmed by the analysis of demographic data, according to which the elderly population worldwide was 600 million in 2000. By 2050, it is estimated that the world population of this age group will exceed 2 billion.[1]

An increase of chronic diseases associated with aging is expected in this scenario, contributing to high rates of mortality, disability, increased dependency, immobility, falls, fractures and hence, the institutionalization, resulting in frail elderly.[2]

The literature describes frailty as loss of capacity, which makes the individual more vulnerable to environmental challenges. Some research groups in geriatrics and gerontology began to suggest a syndromic picture of frailty with multisystemic character, loss of physiological reserve, and reduced resistance to stressors. However, it may not be directly associated with weight loss, and observed in obese people.[3]

Some scholars have reported that frailty syndrome and the chronic and disabling diseases generated by aging must be properly treated and monitored over the years.[4,5] Among the pathological conditions that have received more attention in recent years, type 2 diabetes *mellitus* stands out because it is a complex disorder of potential deleterious effects that favors morbidity and mortality.

Most studies on frailty syndrome and type 2 diabetes *mellitus* including the elderly are justified by the fact that this condition makes this population more likely to progressive reduction of functional capacity, repeated hospitalizations and consequently, increased demand for health services at various levels.[4]

The choice of type 2 diabetes *mellitus* for analysis in this study was due to the high prevalence of the condition among the elderly over 60 years; for its relation to an increased risk of premature death; for its greater association with comorbidities, and especially with major geriatric syndromes, such as the frailty syndrome.

The information on frailty syndrome available in the databases related to the population's health should facilitate the organization of policies for implementing prevention and treatment services for the health of the elderly, especially those with diabetes *mellitus*. Thus, the aim of this study was to determine the prevalence of frailty syndrome and associated factors in elderly patients with type 2 diabetes *mellitus*.

Methods

This is a cross-sectional, observational study conducted in the city of Macapá (capital of the state of Amapá) in specific locations such as the Basic Health Unit of the Universidade Federal do Amapá, the Human Promotion Center and the Women's Hospital, in the year 2013.

The study was carried out in stages. In the first, was provided information about the research, such as the identification of the researcher, the nature and objectives of the study. At this stage, there was also prior contact with the elderly with type 2 diabetes *mellitus*.

The second stage was data collection, by applying a multidimensional questionnaire containing specific sections, and instruments validated to Portuguese. All procedures for data collection were carried out by a team of employees selected and trained for the interview with the elderly, in a way that the whole collection process was done in a single day for each institution.

The study population consisted of men and women who met the following inclusion criteria: age from 60 years, diagnosed with type 2 diabetes *mellitus*, resident and domiciled in Macapá; with score ≥17 in the Mini-Mental State Examination. The exclusion criteria were: seniors with severe cognitive or motor sequelae resulting from cerebrovascular accident; with some terminal illness; diagnosed with dementia or severe cognitive impairment affecting locomotion and communication, informed by a family member, or with difficulty in memory, language and self-identification.

The study variables were sociodemographic characterization (gender, age, socioeconomic status, educational level), clinical and anthropometric data, and the verification of variables indicative of frailty syndrome according to the criteria proposed by Fried et al.[5] and Neri et al.,[6] and observing the following: unintentional weight loss, muscle weakness, self-reported exhaustion, slow gait and low level of physical activity.

Following the study proposed by Neri et al.,[6] data were collected in a single session in the hospital, entities and basic health units. The elderly who obtained a score equal to or above the cutoff point progressed to other parts of the protocol. In case of a result lower than the cutoff score, the ellderly was released from the research. For entering data into electronic databases, the protocols were successively checked by members of the research team to obtain 100% reliability in the results.

The frailty rating was divided into non-frail for seniors without any positive criterion; pre-frail, for those with up to two positive results; and frail for those with more than three positive items. The elderly classified as non-frail and pre-frail were grouped into one category because only an elderly was classified as non-frail. Thus, two groups were considered: Group 1, of non-frail or pre-frail elderly, and Group 2, of frail elderly.

Data were processed, stored and analyzed using the Statistical Package for the Social Sciences, version 20.0 for Windows and submitted to descriptive and analytical statistical analysis. The level of statistical significance was set at $p<0.05$. The quantitative variables were characterized by values of mean and standard deviation. The qualitative variables were characterized by absolute and relative frequency (in %) presented in frequency tables and/or graphs. The Fisher's exact test was adopted to study the relationship between the frailty syndrome and some quantitative and qualitative variables.

The development of the study met national and international standards of ethics in research involving human subjects.

Results

The study sample comprised 30 seniors interviewed in different locations in 2013, and 70% of them were female. The predominant age group was 60-64 years (36.7%) with mean age of 68.77±6.92 years. Table 1 provides a description of the independent variables.

Table 1. Sample characterization

Variables	n(%)
Gender	
Female	21(70.0)
Male	9(30.0)
Age, years	
60-64	11(20.0)
65-69	6(36.7)
70-74	4(13.3)
75-79	9(30.0)
Marital status	
Married	12(40.0)
Single	1(3.3)
Divorced	4(13.3)
Widowed	13(43.3)
Ethnicity	
White	14(46.7)
Black	4(13.3)
Mulatto	11(36.7)
Yellow	1(3.3)
Current work status	
Works	12(40.0)
Does not work	18(60.0)
Educational level	
Never been to school	2(6.7)
Literacy course	1(3.3)
Primary (1st-4th)	15(50.0)
Secondary (5th-8th)	5(16.7)
Tertiary school	6(20.0)
Higher education	1(3.3)
Monthly income, minimum wage*	
<1	10(33.3)
1-2	13(43.3)
>2	7(23.3)
Time since diagnosis, months	
0-24	5(16.7)
25-48	14(46.7)
49-72	9(30.0)
73-96	2(6.7)

*Minimum wage in Brazil at the time of research: R$678.00

There was predominance of widowed seniors (43.3%). There was a higher percentage of the white ethnicity (46.7%); of those who did not work (60%); those who have completed primary school

Table 2. Correlation of the frailty syndrome and sociodemographic variables

Variables	Group 1 n=13 n (%)	Group 2 n=17 n (%)	p-value
Gender			1.000
Female	9(30.8)	12(70.6)	
Male	4(69.2)	5 (29.4)	
Age group, years			0.299
60-64	4(30.8)	7(41.2)	
65-69	1(7.7)	5(29.4)	
70-74	2(15.4)	2(11.8)	
75-79	6(46.1)	3(17.6)	
Marital status			0.041
Married	4(30.8)	8(47.1)	
Single	0(0.0)	1(5.9)	
Divorced	0(0.0)	4(23.5)	
Widowed	9(69.2)	4(23.5)	
Ethnicity			
White	4(30.8)	10(58.8)	0.281
Black	2(15.4)	2(11.8)	
Mulatto	7(53.8)	4(23.5)	
Yellow	0(0.0)	1(5.9)	
Current work status			
Works	4(30.8)	8(47.1)	0.465
Does not work	9(69.2)	9(52.9)	
Educational level			0.500
Never been to school	0(0.0)	2(11.8)	
Literacy course	0(0.0)	1(5.9)	
Primary (1st-4th)	9(69.2)	6(35.3)	
Secondary (5th-8th)	2(15.4)	3(17.6)	
Tertiary school	2(15.4)	4(23.5)	
Higher education	0(0.0)	1(5.9)	
Monthly income, minimum wage*			0.721
<1	5(38.5)	5(29.4)	
1-2	6(46.1)	7(41.2)	
>2	2(15.4)	5(29.4)	
Time since diagnosis, months			1.000
0-24	2(15.4)	3(17.6)	
25-48	6(46.1)	8(47.1)	
49-72	4(30.8)	5(29.4)	
73-96	1(7.7)	1(5.9)	

Group 1 was formed by non-frail/pre-frail elderly; Group 2 comprised frail elderly; * Minimum wage in Brazil at the time of research: R$678.00

- 1st to 4th grade (50%); and of those with income between one and two minimum wages (43.3%). In face of the results related to the time since diagnosis of type 2 diabetes mellitus, the highest percentage was of elderly with time between 25 and 48 months (46.7%), with variation of 12 to 96 months and mean of 48.33±19.72 months.

Regarding the correlation of frailty syndrome with sociodemographic variables (Table 2), the female gender was prevalent (70.6%), without significant differences between men and women in relation to the frailty syndrome (p = 1.000). The predominant age range was of the elderly in Group 1, between 75 and 79 years (46.1%), in contrast to Group 2, aged 60-64 years old (41.2%), with no significant differences between groups (p = 0.299). In Group 1, there was prevalence of widowed seniors (69.2%), followed by married seniors in Group 2 (47.1%), demonstrating significant differences (p = 0.041). In the sample, there was prevalence of frail elderly among whites (58.8%) compared to the other ethnic categories, without significant differences.

With regard to the elderly who worked, there were higher scores among those who did not work in Group 1 (69.2%) compared to Group 2 (52.9%), with no statistically significant differences. The educational level was prevalent among those who com-

pleted primary school (1st to 4th grade) in Group 2 (35.3%), as well as among the elderly in Group 1 (69.2%). Between monthly income and the frailty syndrome, there were great percentages in both groups: those with income between one and two minimum wages in Group 1 (46.1%) and in Group 2 (41.2%), with no significant differences. In relation to time since diagnosis of type 2 diabetes mellitus, frailty was prevalent among the elderly with time since diagnosis of 25-48 months (47.1%), in comparison to the other times.

Discussion

The study limitations were the aspects of using a non-probability sample and the cross-sectional design that does not allow the establishment of cause and effect relationships. The prevalence of frailty syndrome in elderly patients with type 2 diabetes *mellitus* found in the present study was corroborated by previous studies,[4] showing that the frequency stood out in those considered frail. Fried et al.[7] stated that the term 'frailty' has been understood as a synonym for one or more of the following characteristics: old age, functional disability and presence of one or more chronic diseases. This can worsen the health and functional status of an individual who is already highly vulnerable or susceptible to develop frailty syndrome.

As for data correlating the frailty syndrome with sociodemographic variables in elderly patients with type 2 diabetes *mellitus*, the results showed prevalence of the syndrome in females compared to males. These findings are similar to those found in previous studies,[8-10] although in smaller proportions. However, there was predominance of the frailty syndrome in females compared to males. A possible explanation for these findings is that older women have higher vulnerability to adverse clinical outcomes related to their longevity, as found in the literature,[11] especially the lower body mass index related to reduced testosterone levels and reduced secretion of the growth hormone.

There was no significant difference between groups with respect to age range. The predominant age range in Group 1 was between 75 and 79 years

old, and in Group 2, from 60 to 64 years old, corroborating the findings evidenced in other studies,[12] where the interval with greater distribution ranged between 60 and 69 years. This average age was also similar to data found in other studies, highlighting the predominance of the age range between 65 and 69 years.[6,11] The high mean age may be related to the age structure of society, with greater evidence of the elderly living up to near 100 years.[12]

In Group 1, there was predominance of frail seniors among the widowed, while in Group 2, the frail elderly were prevalent among married subjects. It is noteworthy that the last data are similar to other studies,[12] in which prevalence in married elderly was also observed. Supposedly, the widowed in Group 1 have less incentive and engagement with health-related care than the married seniors emphasized in Group 2.

Regarding the variable of ethnicity, the present study identified predominance of frailty in white subjects, compared to blacks, mulattos and browns. This fact was observed in other studies, which revealed prevalence of white people among the subjects who participated in the analysis.[13] The reason for the prevalence of frail elderly of white ethnicity can be because the evaluations were carried out at various locations in order to cover different socioeconomic and demographic classes.

As for the variable of work, there was predominance of elderly subjects among those not working in Group 1 compared to Group 2. Although the latter had higher proportions of those not working, data were similar to that found in previous studies, where only 2% of the elderly reported developing professional activities.[14,15] Within this context, is suggested the possible explanation for the results found in this study: the fact that the elderly who work have less time to perform Activities of Daily Living, activities of self-care and search for health services, which make them susceptible to the frailty syndrome.

Regarding educational background, there was no significant difference. However, frailty was prevalent among those who completed their education from 1st to 4th grade (primary school). This finding is consistent with other studies involving the elderly over 65 years,[5,12] verifying that among those considered frail, most had low socioeconomic status and low educa-

tional level, ranging from 1-4 years of study. It is clear that those with high educational level were related to good health and living conditions, given their greater access and understanding of information, as well as better economic conditions.

There was no significant difference in the seniors of the study regarding the relation between the variable of monthly income with frailty. However, there was predominance in both Group 1 as in Group 2 of those who had monthly income between one and two minimum wages. These results differ from the findings in the literature,[14] which identified prevalence of frailty in the elderly with average income above two minimum wages. It is known that many of these seniors still work formally or informally in order to improve or add to their retirement income, but they are not immune to stress factors inherent to work that can influence their health and quality of life.

As for the time since diagnosis of type 2 diabetes *mellitus*, there was no significant difference among the study participants. The time since diagnosis of the disease did not affect the prevalence of frailty syndrome in elderly patients with type 2 diabetes mellitus. However, frailty was more prevalent in seniors with time since diagnosis in the range of 25 to 48 months. From this perspective, data from this study differed from others, in which was observed that seniors with diagnostic time of 5-10 years had higher percentages for frailty.[16,17]

Therefore, data from this study suggest that demographic and economic factors, as well as time since diagnosis did not interfere in the frailty syndrome, except for marital status, with widowed subjects predominant in Group 1 and married subjects in Group 2.

Given the context of aging and the high proportion of frailty in the elderly population with type 2 diabetes *mellitus*, it is necessary to structure, plan and implement public health policies programs in Brazil to stimulate healthy life habits, resulting in delay of detrimental effects of frailty syndrome in these elderly.

For a better understanding of the factors involved with frailty in the elderly with type 2 diabetes *mellitus*, they should be studied over time, specifically through longitudinal studies, in order to assist in planning concrete actions, whether under the physical dimensions of the human body, or by creating networks of medical and social support capable to meet the material, instrument and information needs.

Conclusion

For most elderly of this study, the correlation of the frailty syndrome with sociodemographic variables in people with type 2 diabetes *mellitus* occurred in contexts of low educational level and lack of work. This demonstrates the enormous challenges imposed on current and future cohorts of Brazilian elderly with diabetes.

Collaborations

Silva AP, Pureza DY and Landre CL contributed to the writing of the article, relevant critical review of the intellectual content and final approval of the version to be published.

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