ARTÍCULO ORIGINAL

Frailty levels in non-institutionalized older adults and sociodemographic characteristics

Niveles de fragilidad en el adulto mayor no institucionalizado y características sociodemográficas

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SUMMARY

Introduction: *Frailty in older adults is a public health challenge and a priority, given its effects on the functional decline of individuals. Several factors account for its occurrence, including individual aspects.* **Purpose:** *To determine frailty levels and their association with sociodemographic characteristics in non-institutionalized older adults.* **Method:** *A cross-sectional study was conducted on a sample consisting of 2 374 non-institutionalized adults older than 60 years from the Caribbean region of Colombia. The subjects were selected using probabilistic methods; patients with physical and mental disabilities were excluded. The frailty levels were determined based on the five criteria proposed by Fried. Results: The average age of the subjects was 72.2 ± 7.3 years, and the frailty frequency was 20.2 % among women and 25.1 % among men. Sex and age were found to be associated with frailty levels (p < 0.05). The risk of frailty was lower in women than in men (OR =0.54; CI 95 %=0.41–0.71). Subjects older than 85 years showed a frailty risk 1.95-fold higher than that of the younger subjects. (OR = 1.95; CI 95 %=1.3–2.92).* **Conclusion**: *A high frequency of frailty was found in older adults, with a significant percentage of pre-frail subjects. Identifying frailty is essential for decision-making and individualization of a treatment since it is closely related to adverse health events.*

Keywords: *Frailty, older adults, aging.*

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RESUMEN

Introducción: *La fragilidad en el adulto mayor constituye un desafío y prioridad para la salud pública por sus efectos en el deterioro funcional de los individuos. Diversos factores explican su frecuencia,*

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entre ellos, los aspectos individuales. **Objetivo:** *Determinar los niveles de fragilidad y su relación con características sociodemográficas en adultos mayores no institucionalizados.* **Método:** *Se realizó un estudio de corte transversal con una muestra de 2 374 adultos mayores de 60 años, no institucionalizados de la región caribe colombiana. La selección se realizó mediante métodos probabilísticos; se excluyeron a las personas con discapacidad física y mental. Los niveles de fragilidad fueron determinados de acuerdo a los cinco criterios propuestos por Fried.* **Resultados:** *La edad promedio fue de 72,2±7,3 años. La frecuencia de fragilidad fue del 20,2 % en mujeres y el 25,1 % en hombres. Se encontró relación entre el sexo y el rango de edad con los niveles de fragilidad (p<0,05). Las mujeres presentaron menor riesgo de fragilidad que los hombres (OR = 0,54; IC 0,41-0,71). Los sujetos mayores de 85 años mostraron 1,95 veces más riesgo de fragilidad que aquellos con una edad inferior a la referenciada. (OR = 1,95; IC 1,3-2,92).* **Conclusión:** *Se halló una alta frecuencia de fragilidad en la población adulta mayor con porcentaje considerable de ancianos prefragiles. La identificación de la fragilidad es un imperativo para la toma de decisiones y para la individualización del manejo, debido a su relación estrecha con situaciones adversas de salud.*

Palabras clave: *Fragilidad, adulto mayor, envejecimiento.*

INTRODUCTION

Aging is a complex process occurring in living organisms. In human beings, specifically, aging begins at birth and results in the gradual loss of adaptability, functional decline, and, finally, death (1). Over the past years, adult populations >60 years of age have increased worldwide. This growth occurs within the context of a phenomenon called demographic transition, in which a population shifts from high to low birth and death rates, which results in its aging, i.e., an increase in the proportion of older adults (2,3).

According to the World Health Organization (WHO), the proportion of people older than 60 years will almost double between 2015 and 2050, with an increase from 12 % to 22 %, and by 2050, 80 % of older adults (OA) will live in low and middle-income countries (4). In Colombia, this age group showed an annual growth of 3.5 %, and in 2020, the proportion was 20 people older than 59 years per 100 people in the economically active age (5). These figures show that the demographic transition is already taking place in Latin America and is leading to the occurrence of the frailty syndrome, which is associated with several factors, including sociodemographic characteristics (2).

Frailty is defined as a clinical state characterized by an increased vulnerability of the individual to endogenous or exogenous stressing factors; it is a predictor for adverse events affecting the health and wellbeing of OA, such as a decline in their functional capacity, falls, higher likelihood of institutionalization, and death (6,7). The prevalence of frailty varies worldwide; in China, it is 12.1 % in women and 7.7 % in men and increases over age, reaching 26 % in people aged ≥80 years and 4.3 % in people between 60 and 64 years of age (8). This finding is confirmed by other studies such as the one performed by Rohrmann, which reports prevalence values between 4 % and 59 %, being higher among women than in men (9). On the other hand, Hewitt et al. (10) found prevalence levels between 31.3 % and 45.8 % for pre-frailty and between 10.4 % and 37.0 % for frailty.

Frailty in OA increases the severity of coronavirus disease 2019 (COVID-19) and decreases the tolerance to acute disease. As a result, mortality rates associated with COVID-19 are higher, reaching 10.0 % for adults older than 65 years when compared to 4.9 % for adults younger than 65 years of age (12). Owing to the adverse effects associated with frailty, its assessment should be prioritized in all OA healthcare settings. The five measurement components for frailty proposed by Linda Fried (2) include unintentional weight loss, exhaustion, muscle weakness, slow gait speed, and a low level of physical activity. The purpose of this study was to determine the prevalence of frailty and the relationship between frailty levels and the sociodemographic characteristics of OA in the Caribbean region of Colombia.

METHODS

Study design and population

A descriptive cross-sectional study of the period was conducted, and the variables were

measured based on the frailty criteria proposed by Linda Fried (2). The study population consisted of 28 933 OA who attended daycare centers and health promotion programs in 5 municipalities of the Caribbean region of Colombia. A sample of 2 374 OA who were 60 years or older was selected based on probabilistic and random sampling methods. The sample was defined considering a confidence interval of 95 %, a power of 80 %, an error of 5 %, and a prevalence of frailty of 15.2 %. OA with physical and mental disabilities was excluded. The study was conducted from September to November 2019.

Procedures

Each participating institution provided the required physical space to assess and interview the participants. During the first meeting, the researchers explained the purpose of the research project and the procedure, and the participants signed an informed consent form before the interview and physical examination. In the first part of the survey, personal information such as sex, age, socioeconomic stratum, and marital status was collected.

The frailty questionnaire was then applied according to the five (5) criteria proposed by Fried and Watson (2). Unintentional weight loss over the last 3 months was measured with a question from the Mini Nutritional Assessment Questionnaire, which assessed weight loss >3 kg, weight loss between 1 and 3 kg, and no weight loss. Participants reporting weight loss over the last 3 months or those with a BMI of <21 kg/m^2 were classified as frail. Low energy or exhaustion was assessed based on the replies to two questions from the CES-D (Center for Epidemiologic Studies-Depression) scale, which inquired whether the OA felt exhausted when performing any kind of activity or felt unmotivated to do anything over the past week. The possible answers to these questions were based on a Likert scale, in which "never or almost never" scores 0 points, "sometimes" (between 1 and 2 days) scores 1 point, "frequently" (between 3 and 4 days) scores 2 points, and "almost or almost always" (between 5 and 7 days) scores 3 points. Participants who answered "frequently" (between 3 and 4 days) or "always or almost always" (between 5 and 7 days) to any of these two questions were classified as frail.

To determine low gait speed, a gait speed test was performed over 4.5 meters, adjusted by sex and height, as established by Fried. Two measurements were taken, and the cut-off point was 20 % of the shortest time (seconds) taken by the patients to complete the distance. Muscle strength was determined using a manual dynamometer, specifically, a CAMRY EH101 electronic dynamometer. A detailed explanation of the test was previously given to the participants who were sitting on a chair and were asked: "Which is your dominant hand?" The test was then performed with their shoulder and forearm in a neutral position and 90-degree elbow flexion. Maximal grip strength was maintained for 3 seconds; 2 attempts were made with each hand, with 1-minute pauses between each repetition. The highest value was selected. A decrease by 20 % with respect to the cut-off point adjusted by body height and sex was considered a sign of frailty.

Reuben's hierarchical physical activity questionnaire was used to determine the level of physical activity. According to their level of physical activity, the subjects were asked the following questions: Do you indulge in any sports activity, or do you practice any physical exercise that causes you to sweat or experience breathing difficulty? Do you walk between nine and twenty blocks without pause at least three times a week? Do you walk less than eight blocks without pause at least three times a week? Or, is it "none of the above?" i.e., the patient did not perform any physical activity. Physically inactive OA, i.e., subjects answering "none of the above," were considered frail.

The participants were considered frail if they had three or more components of frailty, pre-frail if they met one or two frailty criteria, and non-frail if they did not meet any of the criteria. The questionnaire showed an intraclass correlation coefficient of 0.77 and an internal consistency of 0.78 (13). No studies were found on the reproducibility of the questionnaire in Latin America. This investigation complied with Resolution 008430 of 1993 () and was approved by the Academic Committee of the Master in Physical Activity and Health.

Statistical analysis

Qualitative variables were presented as absolute frequencies and percentages. Quantitative variables were analyzed by estimating mean and standard deviation values. To determine the relationship between frailty levels and sociodemographic characteristics, Chi-square test, and logistic regression analysis was performed to estimate the odds ratio (OR) and their 95 % confidence intervals (CI); the method to select variables during the multivariate logistic regression analysis was Enter, all variables were entered in a single step. SPSS version 24 statistical package was used (licensed by Universidad Simón Bolívar). Statistical significance was p<00.5.

RESULTS

Table 1 shows the general characteristics of OA. The mean age of the participants was 72.2 ± 7.3 years; over half of the subjects were women (53.5 %), and 64 % were between 60 and 74 years of age.

Table 1

Baseline characteristics of the older adults

VARIABLES	FREQUENCY	PERCENTAGE
Sex:		
Female	1 269	53.5
Male	1 105	46.5
Age range		
60–74 years	1 519	64.0
75–84 years	710	29.9
>85 years	145	6.1
Marital status		
In a relationship	944	39.8
Single	1 430	60.2
Socioeconomic stratum		
Stratum: low	2 217	93.4
Stratum: high	157	6.6

Regarding the frailty phenotype illustrated in Figure 1, 65.6 % (CI 95 %: 64 %-67 %) of subjects were categorized as pre-frail and 22.5 % (CI 95 %: 21 %-624 %) as frail. Furthermore, 31 % of the

participants reported having lost weight over the last 3 months, and 14.6 % reported having low energy levels or feeling exhausted "frequently"/ "always or almost always." Concerning physical activity, 77.2 % of the subjects declared that they exercised at least three times a week. As regards their grip strength, 67.6 % demonstrated muscle weakness during the test, and 35.2 % of the subjects showed a decrease in gate speed.

Table 2 shows that the frailty levels were significantly associated with sex and age range. A higher prevalence of frailty was observed in men (25.1 %) than in women (20.2 %) (p = 0.001). As for the age range, 29.7 % of the frail individuals were older than 85 years, showing significant differences when compared with subjects between 60 and 74 years of age (20.3 %) and those between 75 and 84 years of age (25.6 %) (p = 0.001). However, the frailty levels were not observed to be associated with marital status and socioeconomic strata (p>0.05). The relationship between the patients' frailty levels and their general characteristics was analyzed, considering the statistical OR with 95 % CI as a reference. Women evidenced a lower frailty risk than men [OR = 0.54; (95 % CI 0.41–0.71)]. On the other hand, subjects older than 85 years showed a 1.95-fold higher risk of frailty than those younger than the reference age. [OR = 1.95; (CI 1.3–2.92)].
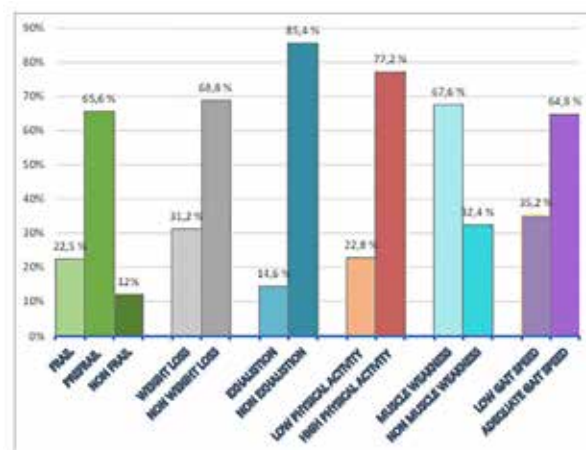

Figure 1. Frailty levels and frailty criteria in older adults.

Table 2

Association between frailty levels and sociodemographic characteristics of older adults

	Frailty levels Frail	Pre-frail	Non-frail	OR (CI 95 %)	p-value
Sex					
Female	256 (20.2 %)	824 (64.9 %)	189 (14.9 %)	1	0.0001
Male	277 (25.1 %)	733 (66.3 %)	95 (8.6 %)	0.54 (0.41-0.71)	
Age range					
60–74 years	308 (20.3 %)	1003 (66 %)	208 (13.7 %)	1	0.0001
75–84 years	182 (25.6 %)	457 (64.4 %)	71 (10)	1	
>85 years	43 (29.7 %)	97 (66.9 %)	5 (3.4)	1.95 (1.3-2.92)	
Marital status					
In a relationship	221 (23.4 %)	595 (63 %)	128 (13.6 %)		0.06
Single	312 (21.8 %)	962 (67.3 %)	156 (10.9 %)	0.77 (0.59-0.99)	
Socioeconomic stratum					
Stratum: low	497 (22.4 %)	1462 (65.9 %)	258 (11.6 %)	1.48 (0.95-2.31)	0.16
Stratum: high	36 (22.9 %)	95 (60.5 %)	26 (16.6 %)		

DISCUSSION

This study attempted to determine the frequency of frailty among OA living in a community and its relationship with sociodemographic characteristics. The results were consistent with those reported in literature worldwide, which vary depending on different factors such as health conditions and place of residence. Frailty is considered a dynamic process resulting from medical, social, and personal conditions that interact with the normal and pathological aging processes (14).

Studies performed on OA living in communities have revealed an association between frailty, older age, female sex, and education level, among others (7,15). In China, Ma et al. (7) found that frailty was more frequent in women than in men (12.1 % and 7.7 %, respectively), reaching higher levels among subjects over 80 years of age, whereas our study found a higher prevalence in men (25.1 %) than in women (20.2 %). However, both studies consistently report a higher prevalence of frailty among older people. In Poland, Jankowska et al. (15) used the Edmonton Frail Scale and found significant differences in terms of age and educational level. Subjects with higher frailty levels had an average age of 79.3 ± 8 years as opposed to those aged 68.5 ± 4.7 years who were considered non-frail.

These results confirm that old age is a predicting factor for frailty.

Rivas-Ruiz et al. (16) carried out a study in two Spanish regions and reported an association between frailty and sex (OR: 1.98; 95 % CI: 1.37–2.86), which was also found in this research. While women were observed to be at a higher risk for frailty in the Spanish study, our study reported a higher risk for men. The differences can be explained by the cultural and social conditions of the participants, factors that were not included in this study; even though men experience higher rates of years of potential life lost due to chronic diseases than women (17), and these chronic diseases are health conditions that increase the risk for frailty (18).

Frailty prevalence ranges between 13.6 % (19) and 26.2 % (16), and the value obtained in this study falls within this range. Most studies report a frequency of pre-frailty higher than 50 %; 52 % was reported for OA in Brazil (20) and 55.6 % in Peru (19). Both studies highlight the increase in the number of older adults with at least one or two indicators of frailty, which is why OA should be continuously assessed in the environments in which they receive clinical or community healthcare. In this way, people at risk for frailty can be identified early so that measures to intervene and prevent their progression to frailty can be applied (21). In Colombia, the

prevalence is 17.9 % for frailty and 63.3 % for pre-frailty (22).

With regard to the evaluated frailty criteria, most of the participants were found to present low muscle strength. When comparing these results with the ones reported by other authors using the Fried phenotype to assess frailty, this criterion was found to yield high frequencies, for example, 51.2 % in the study by Alcalá et al. (23). Grip strength is considered an important health indicator, given its capacity to predict performance during daily activities and functional independence (24). Moreover, it is important to stratify cardiovascular and metabolic risk in healthy subjects and those with aging-associated diseases (25).

The decrease in grip strength observed in participants who reported having followed the recommendations on physical activity may be explained by the low frequency of strength training when compared with the high frequency of aerobic activities, such as walking and dancing. Muscle strength training is an essential component of exercising programs for OA since it complements the positive effects of aerobic training on the individuals' physical condition, health, and general wellbeing (27).

One of the limitations of this study is its cross-sectional design, which hinders the establishment of causal relationships between the study variables; however, this design contributes to the development of hypothetical relationships between the variables. A wide range of frailty determinants has not been included in the study, given their multicausal nature. However, the use of Fried's criteria has enhanced the likelihood of estimating the frequency of frailty among OA, which can be used as a basis for the setting of goals and health intervention strategies for this age group. This aspect is highly relevant for Colombia since its population demonstrates progressive and accelerated aging.

Based on these results, it is proposed to continue conducting cohort studies to follow up the participants, analytical studies that account for socio-cultural factors on frailty between men and women, as well as experimental studies that determine the effect of multicomponent interventions on the fragility and pre-frailty.

CONCLUSION

Identifying the prevalence of frailty and the associated sociodemographic factors such as sex, age, marital status, and socioeconomic stratum will help in raising the interest of healthcare professionals. This kindled interest will in turn have an impact on the decision-making process and encourage individualization of healthcare for OA. Such personalized healthcare is the need of the hour, considering the close relationship between frailty and the development of limitations, dependence, and disability, which have harmful effects on the subjects, their family, and the healthcare system. Managing frailty should be a priority for the country's public healthcare system, which is why the information collected in this study is expected to serve as the basis for the design and implementation of health promotion and disease prevention programs to ensure healthy aging. These measures are in line with the Decade of Healthy Aging (2020–2030) proposed by WHO and can ultimately augment the quality of life for human beings.

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