CORRELATION BETWEEN FRAGILITY AND MANUAL PRESSING FORCE IN ELDERLY

CORRELAÇÃO ENTRE FRAGILIDADE E FORÇA DE PREENSÃO MANUAL EM IDOSOS CORRELACIÓN ENTRE FRAGILIDAD Y FUERZA DE ASIMIENTO MANUAL EN ANCIANOS

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ABSTRACT

Objective: to verify the relationship between BMI and grip strength with the fragility classification criteria. **Method:** this is a quantitative field study, exploratory and descriptive, through a questionnaire with 300 elderly people. Data was recorded in the SPSS program, version 20, and analyzed by descriptive and inferential statistics. **Results:** sex associations with gait duration fragility, grip strength and activity level were observed, as well as in the correlation of the structure with grip strength and body mass with grip strength for the elderly and the elderly. Finally, statistical differences were identified between the grip strength, body mass and height of men. **Conclusion:** with regard to fragility components, there was difference between the sexes. The women presented fragility for the variable walking time and the elderly were more fragile for the grip strength and the level of physical activity. **Descriptors:** Anthropometry; Difference Between the Sexes; Aging; Nutritional Status; Fragile Elderly; Muscular Strength of the Hand.

RESUMO

Objetivo: verificar a relação entre IMC e força de preensão com os critérios de classificação da fragilidade. **Método:** trata-se de um estudo quantitativo, de campo, exploratório e descritivo, por meio de um questionário com 300 idosos. Os dados foram registrados no programa SPSS, versão 20, e analisados por estatística descritiva e inferencial. **Resultados:** observaram-se associações do sexo com a fragilidade em tempo de caminhada, força de preensão e nível de atividade como, também, na correlação da estrutura com a força de preensão e da massa corporal com a força de preensão para os idosos e as idosas. Por fim, identificaram-se diferenças estatísticas entre a fragilidade em força de preensão, massa corporal e estatura dos homens. **Conclusão:** com relação aos componentes de fragilidade, houve diferença entre os sexos. As mulheres apresentaram fragilidade para a variável tempo de caminhada e os idosos foram mais frágeis para a força de preensão e o nível de atividade física. **Descritores:** Antropometria; Diferença Entre os Sexos; Envelhecimento; Estado Nutricional; Idoso Fragilizado; Força Muscular da Mão.

RESUMEN

Objetivo: verificar la relación entre IMC y fuerza de asimiento con los criterios de clasificación de la fragilidad. **Método:** se trata de un estudio cuantitativo, de campo, exploratorio y descriptivo, por medio de un cuestionario con 300 ancianos. Los datos fueron registrados en el programa SPSS, versión 20, y analizados por estadística descriptiva e inferencial. **Resultados:** se observaron asociaciones del sexo con la fragilidad en tiempo de caminata, fuerza de asimiento y nivel de actividad como, también, en la correlación de la estructura con la fuerza de asimiento y de la masa corporal con la fuerza de asimiento para los ancianos y las personas de edad avanzada. Por último, se identificaron diferencias estadísticas entre la fragilidad en fuerza de asimiento, masa corporal y estatura de los hombres. **Conclusión:** con respecto a los componentes de fragilidad, hubo diferencia entre los sexos. Las mujeres presentaron fragilidad para la variable tiempo de caminata y los ancianos fueron más frágiles para la fuerza de asimiento y el nivel de actividad física. **Descriptors:** Antropometría; Diferencia entre los sexos; Envejecimiento; Estado Nutricional; Ancianos Fragilizados; Fuerza Muscular de la Mano.

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INTRODUCTION

Aging is characterized by a continuous process during which changes occur in the various physiological systems, reduction of functional capacity and consequent repercussion on the quality of life of the elderly. To this set of aspects, which involve a sequence of aging processes, the "biological fragility syndrome", here called fragility is conditioned.¹⁻²

Fragility is represented as an important public health problem and its development is understood as arising from the interaction of biological, psychological, cognitive and social factors throughout life and with potential for the prevention, identification and treatment of symptoms. The prevalence of fragility is approximately 6.9% in the elderly living in the community surrounding the FHU and this frequency tends to increase with increasing age.³

It is known that the main clinical manifestations of this syndrome are weakness, exhaustion, decreased physical activity, involuntary weight loss, decreased walking speed and balance. In this way, fragility is defined as the gradual and progressive process of diminishing the capacity of control of homeostasis, manifested by sarcopenia, dysregulation of the neuroendocrine system and dysfunctions of the immune system.⁴

It is added, therefore, that the evaluation of the physical capacity of the elderly usually involves the performance of functional tests, such as muscular strength and flexibility, which are directly involved in the good performance of these activities. One of the important tests used is the manual gripping force (MGF), used as an indicator of total muscular strength, being the most used measure for the evaluation of strength, since it does not require great physical effort on the part of the elderly. This measure is of great scientific and ambulatory value, since the deficit of muscular strength can be related to the incapacity and the dependence.⁵ This test is essential, since it is an important predictor of the reduction of the functional capacity and mobility and the quality of life in the elderly.⁶

In view of the above, the following question was raised: What is the relationship between the BMI and the grip strength with the fragility criteria in a family health unit in the municipality of Cajazeiras - PB?

This work is justified by the importance of understanding the relationship between the manual grip strength and the fragility criteria

in the elderly since the human aging process leads to several modifications, among them, the decrease of muscle strength. Thus, manual grip strength measurements become a sensitive indicator of physiological losses important to the performance of daily living activities characterizing the fragility syndrome.

OBJECTIVE

- To verify the relation between the BMI and the grip strength with the measures of fragility between the sexes.

METHOD

It is a quantitative, field, exploratory and descriptive study, based on a Family Health Unit (FHU) located in the municipality of Cajazeiras/PB, Brasil.

The population was composed by all the elderly enrolled in the FHU and the sample consisted of 300 elderly people who were selected according to the following inclusion criteria: (a) they were aged over 60 years; (b) be bound by the above service; (c) be aware and oriented. And as exclusion criteria: (a) temporary or permanent lodging; (b) neurological changes.

Data was collected in June and July 2015, after approval of the research project by the Research Ethics Committee of the College of Medicine of ABC (CAAE: 11781113.3.0000.0082). Initially, a contact was made with the Secretary of Health of the Municipality of Cajazeiras - PB. Then, the researcher went to the units to schedule with the nurses the days to carry out the research. Prior to the application of the instrument, the elderly were informed about the objectives of the study and presented to them the Free and Informed Consent Term (FICT).

For data collection, an instrument validated by Fried in 2001 was considered low-cost and easy to apply, with the following criteria:

(1) Unintentional weight loss - will be assessed by the question "In the past year, have you lost more than 4.5 kg unintentionally (ie, no diet or exercise)?" If the answer is yes then the elderly person met the fragility criterion for this item;

(2) Exhaustion evaluated by self-report of fatigue - through the Center for Epidemiological Studies (CES-D) depression scale, for items seven ("I felt I had to make an effort to do usual tasks") and 20 ("I could not carry my stuff"). The CES-D consists of 20 scalar items about mood, somatic symptoms, interactions with each other and motor

functioning. The answers are on a Likert scale (never or rarely = zero, sometimes = one, often = two, always = three) and the final score ranges from zero to 60 points. In the validation of the CES-D for Brazilian elderly, the score > 11 was the one that best discriminated between cases and non-cases, with a sensitivity of 74.6%, with a specificity of 73.6%, with high internal consistency ($\alpha = 0.86$). Elderly who scored two or three on any of the two questions met the fragility criterion for this item;

(3) Muscle weakness measured by means of decreased palmar grip strength measured with dynamometer in the dominant and associated hand adjusted for gender and body mass index;

(4) Low level of physical activity measured by weekly energy expenditure in kcal (based on self-report of activities and physical exercises performed through the Minnesota Leisure Time Activities Questionnaire);

(5) Slowness measured by the indicated walking speed in seconds - distance of 4.6 meters adjusted for sex and height. The elderly will walk a total distance of 8.6 meters, the initial two meters and the final two meters being disregarded for the calculation of the time spent in walking, as the literature recommends not considering the acceleration and deceleration period for the calculation of walking speed. A verbal command will be given for the elderly to initiate the test and he will wear his usual footwear and gait aid (when necessary) and will roam at his usual walking speed. Three measurements will be performed, presented in seconds, and the average value of the three averages.

In relation to the anthropometric measurements, the body mass was measured with a portable digital scale Glass 3 Control, brand G-TECH, and height with a tape measure, with the elderly barefoot in the upright position looking at the horizon. To measure the manual grip strength, a digital manual camry dynamometer was used.

Data was tabulated in Excel software and analyzed in SPSS (version 21). Descriptive statistics were used. As inferential tests, Pearson's parametric correlation tests and Student's t-test were used, since the Kolmogorov-Smirnov test pointed to groups with parametric distribution. We also used the Pearson Chi-square test (χ^2). A statistically significant alpha value was accepted at $p < 0.05$.

RESULTS

The data was divided into two parts in order to achieve the proposed objectives of the study and to better understand the results. The first one refers to the sociodemographic data of the sample and the second one, referring to the fragility components, seeking to verify the relationship between the BMI and the grip strength with the measures of fragility between the sexes.

The demographic data of the sample are described according to sex. It was found that the highest percentage of the total sample of the study was female (54.7% = n-164). In addition, a majority of males, aged between 60 and 70 years (40.4%), married (49.3%), attended the school (44.1%), received a minimum wage (49.3%) and has two or three people in the household where he / she lives (47.8%). Among women, the majority were aged between 70 and 80 (48.2%), widowed (39.6%), attended school (51.2%), received a minimum wage (63, 4%) and lives with two or three people at home (49.8%).

A description and comparison of fragility components between the sexes is presented. Statistically significant association of gender with walking frailty ($p = 0.001$), grip strength ($p = 0.001$) and activity level ($p = 0.001$) were observed. The elderly women were more fragile in walking time (80.1%) and the elderly, in grip strength (77.9%) and in physical activity level (27.2%).

It is shown the description of the anthropometric measurements between the sexes. Additionally, the significance of the difference between the sexes is presented. The men presented significantly higher mean values in two variables (body mass and height) and discreetly in BMI.

The correlation between the anthropometric measures between the sexes is evidenced. For the elderly and elderly, there is a statistically significant positive and moderate correlation of stature with grip strength and body mass with grip strength. The elderly still had a statistically significant and positively moderate correlation between stature and BMI ($r = 0.24$).

It is demonstrated, the comparison of body mass, height and BMI between fragility and grip strength. There were statistically significant differences between the fragility and grip strength, body mass and height of the men, and the non-fragile ones had a higher average body mass (71.38) and higher stature ($p < 0.05$). For females, the only statistically significant difference was for height, with

non-fragile older adults exhibiting higher mean (157.70).

DISCUSSION

It is revealed, in studies conducted within the community or in groups of coexistence, a greater percentage of women, pointing out that the increase of women in the Brazilian population occurs due to different factors, among them, the search for leisure activities, self-care and the coexistence, thus showing a better health condition associated with the female sex.^{7,8}

The high female participation in research with the elderly is explained by several factors: women were less exposed to occupational risk situations compared to men; are more concerned about health; often use health services. It is also worth noting that women are less exposed to mortality from external causes and have a lower prevalence of smoking and alcoholism when compared to men.⁹

It is understood, however, with regard to males, that there was a majority of elderly, aged between 60 and 70 years, as found in another study developed in the hospital setting that identified a greater percentage of elderly people in the age group between 60 and 70 years⁹ corroborating the findings of the research. It is observed that there was a predominance of females and of the age group of 80 years or more, data that are like other results.¹⁰ In another study, the majority of the elderly women were found, between 60 and 79 years (60%), differing from the age group found in this study.¹¹

It is pointed out, in relation to the marital status, that the sample presented a difference in relation to the sexes. While men were mostly married (49.5%), widowhood was more common among women (39.6%). In the literature, there are no studies that describe the marital status of the elderly according to sex, there is only a general description of the sample, as found in another study¹², where the prevalent marital status was married, followed by a widow, a similar finding found in a study¹³ 52.9% of the participants are married and 33.8% are widowers. Already in studies performed by Lana⁸, the data reveal 45.5% of widowed elderly and 41.1% of married couples showing a difference of the data previously found.

It is pointed out that, in terms of educational level, both men (44.1%) and women (51.2%) attended school in the vast majority. In a study carried out,⁹ it was verified that 49.2% of the interviewees had

one to four years of study, a result similar to the one found in this research. Among the elderly studied¹² the majority (54%) had less than five years of study. In this way, the schooling of the Brazilian elderly is still considered low.

Attention is drawn to the predominant monthly income, which was a minimum wage for men (49.3%), as well as for women (63.4%). Family income is a variable because it incorporates other conditions that imply shortage of social resources, limited access to health services, poor conditions of health services, presence of diseases, unhealthy lifestyles, self-prejudicing beliefs, a low sense of self-efficacy, and a lack of self-care, the latter due to lack of information¹⁴. One study showed that low income had a negative influence on the quality of life assessment of participants who received up to a monthly minimum wage and that there was a relation between low income and impairments in general health status.¹⁵

In terms of the number of people living in the household, the number of two to three persons for men (47.8%) and women (49.8%) was prevalent. According to other studies, there is a greater frequency of elderly people residing mainly accompanied by their relatives.¹¹ It was identified that the majority of the elderly live with relatives, be it son, wife or grandchildren. Increasingly, there are elderly people residing in multigenerational households (54.9%).²

It is emphasized the importance of gait velocity in the evaluation of the elderly individual.¹⁶ In his study, it was emphasized that there is enough evidence to characterize walking speed as a consistent predictor of adverse events in the elderly. The low gait marker showed a correlation with incapacity for the basic activity of daily living (BADL), dementia, mortality, falls, institutionalization and hospitalization. It has been considered the clinically relevant variable as a good predictor of functional performance and health status in elderly individuals.¹⁷

It is reported that the fact that older women are more fragile for walking time agrees with the literature where it was shown that females could have a greater vulnerability on the extrinsic effects of the fragility, such as sarcopenia, because older women are more likely to have inadequate nutritional intake compared to men because they live alone more frequently.¹¹

One of the explanations for the greater loss of muscle strength among women is of a hormonal nature.¹⁴ It is believed that the decline in the production of female hormones,

which occurs after menopause, leads to a decrease in fat-free mass, increased adiposity, decreased bone density and changes in body proportions, which in turn lead to a reduction in muscle strength and, consequently, changes in gait velocity and low mobility.

It is determined that the decline of muscle strength occurs due to the quantitative and qualitative changes of muscle fibers that are accompanied by the replacement of muscle tissue by adipose tissue. Such changes can affect the performance of complex social, productive, leisure and organizational activities and the execution of practical life tasks. The physiological changes of aging cause an increase in the probability of the elderly presenting with low palmar grip strength.¹⁸

In the aging process, a decrease in muscle mass and muscle quality occurs, but this decline varies according to muscle type and sex. There is a tendency for the decrease of FPM with the advancement of the age being that the decrease of the force of grip occurs of form more accelerated than the force of lower limbs.¹⁹

It is reported that, in some studies, what is found is that women have the fragility component, for the grip strength variable,¹⁸⁻⁹ differently from what was found in this study, where the men were the ones with the greatest fragility.

It is admitted, about fatigue, that there was no significant difference between the sexes. For both men (69.1%) and women (69.9%), there was a predominance of non-fragile. In a study¹¹, fatigue was more frequent in the pre-frail elderly, which implies a direct relation of the fatigue report with the onset of frailty in the elderly. Already the complaint of fatigue was more frequent among women, probably because of the imperative to perform household tasks, often under conditions of low muscular strength.⁴

In terms of physical activity level, men were more fragile (27.2%) than women (18%). Men, when they retire from their work activities, seem to suffer greater functional impairment due to the rapid decline of their physical activities.² The time spent for physical activities decreases over the years because of the physiological changes inherent in aging and the presence of comorbidities and functional disability.⁹

The ability to perform activities of daily living improves self-esteem, favoring social interaction, leisure and maintenance of functional capacity, a worrying factor, since it

is proven that inactivity leads to problems not only physical, such as the onset of chronic and / or mental illness.⁹⁻¹⁰

It is added that, in the variable weight loss, there were no elderly people framed in the criterion of fragility. Weight loss is an important variable that requires vigilance and care of health professionals, since it implies risks of other morbidities and even mortality. In addition, it is one of the factors that determine the beginning of the cycle of fragility among the elderly. The elderly present peculiar conditions, which condition their nutritional status to the physiological changes, characteristic of aging, the present diseases, socioeconomic, psychological and family structure factors.

In the question of fragility, a greater percentage of frail elderly men (32.4%) were found. In studies conducted, very different data can be found that bring, in their results, a value of 8% of frail elderly. Some authors²⁰ indicated a prevalence of fragility ranging from 6.9% to 21% and, when separated by sex, a fragility of 19.2% was found for men. Santos²¹ obtained a value of 16.9%, with the predominance of females. One author also states in her studies that no discrepancy was detected between the elderly female and male subjects regarding the fragility.¹¹

Data on fragility in the elderly vary widely and there is still little data available on the incidence and prevalence of Fragility Syndrome in the elderly, mainly due to a lack of consensus regarding the term. There is no gold standard for assessing human frailty. What was verified in the works were instruments that use diversified parameters of both performance and perception, analyzed separately or jointly.²⁰

It is known that procedures that use anthropometric measurements of body mass, height and BMI are alternatives that have shown good results in the estimation of body components in the elderly.²¹

In this study, in relation to body mass, men presented a higher mean (67.18 kg / m²) differing from the results found in other studies where, predominantly, women had a higher body mass.²² The assessment of body composition of the elderly is very important because changes in body fat distribution may be associated with metabolic and cardiovascular disorders.²³

For the variable men, the height was also higher (162.54 cm). There are no well documented differences in height and sex differences in elderly individuals, but one study reports that there is a reduction in

height with age due to increased curvature of the spine as a result of flattening of the intervertebral discs and due to such changes such as: osteoporosis, dorsal kyphosis, scoliosis, loss of muscle tone, arching of the lower limbs and / or flattening of the arch. There is no consensus on the value of stature reduction with age, which appears to be 0.5 to 2 cm / decade after the age of 60, increasing at more advanced ages in both sexes.²⁴

It is reported that the BMI had a higher mean with the elderly male (42,22). Again, this finding differs from the literature where women had significantly higher mean values (27.83kg / m²) than men (25.46kg/m²).²⁵

It has been demonstrated for a long time that the inversion in the distribution patterns of nutritional problems in the population characterizes the process of nutritional transition, with a decline in the prevalence of underweight and an increase in the prevalence of overweight and obesity, including among the elderly. In researches, it was possible to perceive that the nutritional status of the elderly is marked by the presence of obesity,²² which is in consonance with the findings of this study.

In order to avoid progressive functional decline in the obese elderly, it is proposed to propose lifestyle interventions such as reduction of daily caloric intake combined with a program of physical exercises, preferably aerobic and resistance exercises.²⁶

It is suggested, in evidences found in the literature, that the variables body mass and height influence the result of manual grip strength evaluation. In a study carried out,¹⁴ the elderly that presented reduced hand grip strength also had body mass deficits, which is in agreement with the finding of this research. Body composition relationships, together with manual grip strength in the elderly, can be used as an evaluation of indicators of activities of daily living.²⁷

It is revealed, from the data presented, that the body mass is directly linked to the grasping force. Low-weight individuals have a lower amount of muscle mass and, therefore, have lower muscular strength characterizing the fragility state.⁵ No studies have been found in the literature that report the relevance of height between grip strength and fragility.

A single finding relevant to height was found with regard to females, where the highest mean was obtained for non-fragile elderly women. A similar finding was found in a study comparing the means of men and

women, and the women were older and had higher height.²³

Researchers are challenged to obtain an instrument that can be considered of great effectiveness in the measurement of the human fragility index to make possible greater comparability of results.²⁰

CONCLUSION

It was concluded, with respect to the components of fragility, that there was difference between the sexes. Women showed fragility for the variable walking time and the elderly were more fragile for grip strength and level of physical activity. In this study, it was also found a correlation of stature with grip strength and body mass with grip strength for the elderly in general. For women, a correlation of height and BMI.

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