

FALLS IN INSTITUTIONALIZED ELDERLY PEOPLE: GENERAL CHARACTERISTICS, DETERMINANT FACTORS AND RELATIONSHIP WITH HANDGRIP STRENGTH

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SUMMARY

Objective. To identify the occurrence of falls among institutionalized elderly in São Carlos City, to describe its determining factors and to verify its relationship with handgrip strength. **Methods.** 61 elderly subjects (31 men and 30 women) took part of the study, being assessed regarding handgrip strength and interviewed regarding falls and possible factors for its occurrence. **Results.** It was found that 54.1% of the elderly had fallen at least once in the 12 months preceding the study. The disability of watching television presented a significant correlation with falls ($p=0.05$), in contrast to other functional activities studied (walk, take shower and seat independently), pain and diseases. Statistically significant differences were

found between the mean age of the elderly who had fallen (76.76 years, ± 9.17) and those who hadn't fallen (71.05 years, ± 8.67); and among grip strength of those who had fallen (19.37 kgf, ± 8.92) compared to the ones who hadn't fallen (25.45 kgf, ± 12.14). The variance analysis didn't show differences in the number of falls between men and women. **Conclusions.** The incidence of falls among institutionalized elderly in São Carlos City is high and the individuals who were more likely to suffer falls were the older and weaker ones, as well as those unable to watch television.

Keywords: Accidental falls, Aged, Institutionalization, Muscle strength.

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INTRODUCTION

The fast increase of elderly population is a global phenomenon, noticed since the end of 19th Century. In developed countries, population's aging happened gradually in the last two centuries, and was accompanied by an economy growth that enabled the improvement of quality of life, basic sanitation, food, houses, and an adjustment of the geriatric health and social security. In Brazil, people has also been through a major demographic change from the second half of 20th century on, showing a 70% increase of the number of elderly individuals between 1950 and 2000⁽¹⁾, a fact that ultimately led to an overloaded pension sector⁽²⁾, increased demand on social services, and health and sanitary assistance⁽³⁾. In the state of São Paulo, 9.57% of the population is constituted of elderly individuals, and, in São Carlos city, the percentage of this population is even higher, about 10.81%⁽⁴⁾, requiring the implementation of strategies for early detection and prevention of overburden in that city.

Reducing the risk of falls is a way to minimize costs with healthcare for the elderly, and becomes feasible as determinant factors for falls are identified. Some studies point out the following factors as predictive of falls: female gender, Caucasian ethnicity, presence of chronic diseases, use of drugs, balance deficit⁽⁵⁾, events of previous falls and fear of

falls^(6,7). In addition to these, muscle weakness may be highlighted, because it causes locomotive damage and balance response delays. Thus, the assessment of muscular strength allows for inferring the risks of falls and maybe the handgrip strength alone is also a predictor, since people presenting weak handgrips usually present weakness on other muscle groups as well⁽⁸⁾.

Institutionalized elderly people present higher likelihood to suffer falls than the non-institutionalized ones, because the previous have lower levels of strength, balance, flexibility and physical endurance⁽⁹⁾. According to Chaimowicz and Greco⁽¹⁰⁾, institutionalized elderly people present a pathological aging process, sometimes associated to Parkinson's, Alzheimer's and other serious diseases, turning them unable to perform activities of daily life, such as taking a shower, ambulating and communicating. The inability to perform such activities may have a correlation with falls rate and it is important to clarify it in order to enable the identification of institutionalized elderly individuals most likely to suffer falls, requiring a higher level of attention and close watch. From these questions, this study targeted to identify the occurrence of falls in institutionalized elderly people at São Carlos city, to describe their overall characteristics, determinant factors and to check the correlation with handgrip strength.

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METHOD

A cross-sectional observational study was conducted in five of the six nursing homes of São Carlos city, SP, Brazil. One hundred sixty nine people lived in those institutions, 98 of which were excluded due to lack of physical conditions to evaluate muscular strength or due to clinical evidences of mental disorders. Three people were also excluded for being less than 60 years old, and seven people didn't want to participate. Thus, 61 volunteers were enrolled in the study (31 men and 30 women), who answered to a questionnaire and underwent a handgrip strength assessment. The questionnaire was applied by only one researcher and included personal data, questions concerning falls, physical activity practice, activities of daily life (ability to watch TV, walk, taking shower, sit, lay down, stand up, going up and down stairs in an autonomous way), orthosis use, insomnia and reported morbidity. Handgrip strength was measured for dominant upper limb by means of a handheld hydraulic dynamometer. The instrument provides a quick and direct reading of the isometric strength and it is adjustable to different hand sizes⁽¹¹⁾. The test was performed three times, with 10-minute intervals between each execution and was regarded as the most valuable measurement. The volunteers were guided to grip during expiration, without performing Valsalva's maneuver, and were verbally encouraged throughout the test. The study was conducted according to standards required by Declaration of Helsinki and approved by the committee on ethics in research of the Federal University of São Carlos.

RESULTS

No evidence was found towards institutionalized elderly presenting higher likelihood to suffer falls compared to other elderly populations, according to Pearson's chi-squared test, which revealed a p value > 0.05 (p=0.43). Thus, institutions segregation was not required for assessing results concerned to falls. Figure 1 illustrates the occurrence of falls during the 12-month period preceding the interview. Twenty eight elderly individuals (45.9% of the studied population) reported no falls in the previous year; however, eight of them had already fallen at least once since they were admitted in the institution.

Of the 30 women, 23 (76.67%) had already fallen after institutionalization, and of the 31 men, 18 (58.06%) had previously fallen. The average number of falls among men within a period of one year was 0.806 (± 1.046), while, among women, this rate was 1.600 (± 2.175). The variance analysis (ANOVA) revealed a p value of 0.073, indicating no significant difference between genders regarding the number of falls occurred in a 1-year period.

The mean age of the 41 elderly individuals who suffered falls while institutionalized was 76.76 (± 9.17) years and of the 20 elderly individuals who haven't suffered falls was 71.05 (± 8.67). By applying the Levene's test (p=0.95), we can verify that the variances of the age variable are the same for elderly individuals who had previously fallen or not, thus the use of Student's t-test was more appropriate. This test provided a p value of 0.02, which evidences the difference on the risk of falls among younger and older individuals.

The Tukey's test for average equity among independent samples showed equality between average handgrip strengths of individuals in each institution, because all of them are included in the same group (A). Therefore, it will not be

required to assess strength alone among the individuals in each institution. The average handgrip strength showed by elderly individuals who had already fallen after admitted in

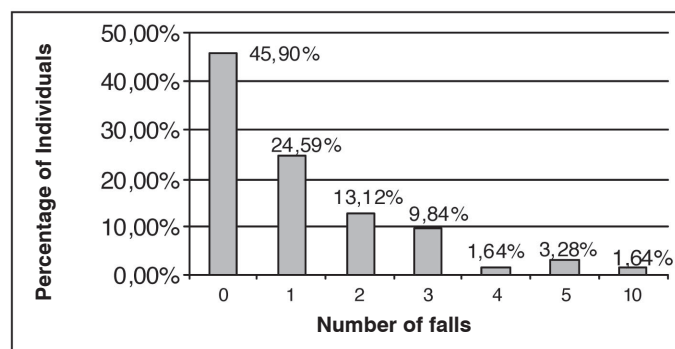


Figure 1- Percentage of elderly individuals by number of falls occurred within a 1-year period.

the institution was 19.7 Kgf (± 8.2) and for those who hadn't suffered falls was 25.45 Kgf (± 12.14). The Levene's test revealed a p value of 0.20, indicating that the variances of the strength variable are the same for individuals who fell and for those who didn't fall. Thus, the Student's t-test was appropriate (p=0.03), reporting a difference between handgrip strengths average between elderly individuals who fell and who did not fall since institutionalization. Figure 2 enables to notice that most of the elderly individuals who suffered falls had a score ranging from 11 to 20 kgf, while most of those who had not fallen have scored 21 - 30 kgf.

Of the 61 interviewed elderly individuals living in nursing homes, 11% were not able to watch TV and about three fourths were independent to walk, bath and sit. Most of the elderly were sedentary, with only 26% practicing some kind

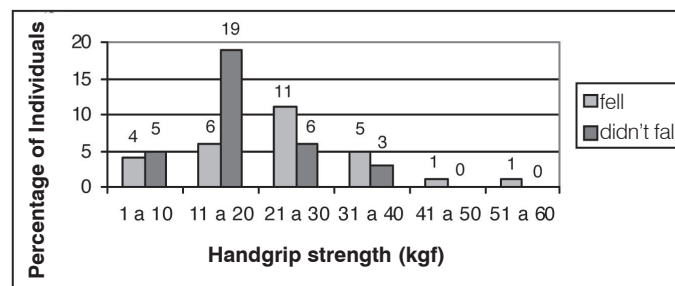


Figure 2- Population distribution according to the incidence of falls after institutionalization and handgrip strength score.

of physical activity (Figure 3). Only the ability to watch TV showed a significant correlation with the rate of falls, as per Pearson's chi-square test (p=0.05) (Table 1). There was no suggestion that falls would be correlated to the presence of diseases (p=0.80) or to pain complaints (p=0.22 for pain on upper and lower limbs, and p=0.94 for spine pain).

The variance analysis (ANOVA) of handgrip strength and AVDs showed a p value below 0.0001, indicating that strength influences AVDs. Thus, a linear regression model could be applied to evaluate the presence and magnitude of the AVDs-related variables' effects on strength, which showed a p value < 0.05 only for variables "pain on upper limbs" (p=0.013) and "use of orthosis" (p=0.022). We verified that elderly individuals reporting pain on upper limbs have ap-

proximately 6.8 kgf less than those reporting no pain, and the individuals using orthosis to walk have approximately 6.7 kgf more than those not using it.

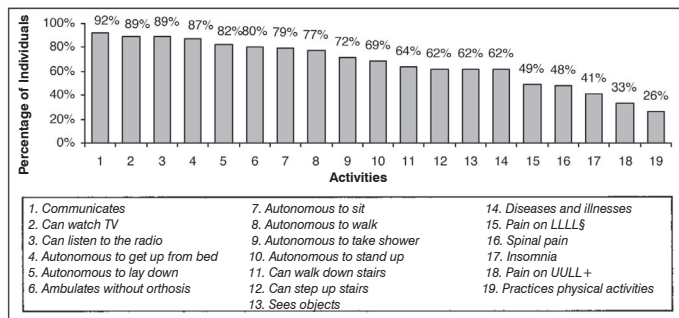


Figure 3- Percentage of elderly individuals able to perform functional and physical activities.

Questions	Chi-square	GL*	P value
Sees objects	0.093	1	0.76
Can watch TV	3.857	1	0.05
Can listen to the radio	1.228	1	0.27
Communicates	0.128	1	0.72
Autonomous to take shower	0.067	1	0.79
Autonomous to walk	0.674	1	0.41
Autonomous to stand up	0.018	1	0.89
Walks using orthosis	1.762	1	0.18
Autonomous to get up from bed	1.720	1	0.19
Autonomous to lay down	0.887	1	0.35
Autonomous to sit	2.270	1	0.13
Can step up stairs	0.093	1	0.76
Can walk down stairs	0.015	1	0.90
Diseases and illnesses	0.070	1	0.80
Insomnia	0.012	1	0.91
Practices physical activities	0.597	1	0.44
Pain on UULL+	1.476	1	0.22
Spinal pain	0.005	1	0.94
Pain on LLLL§	1.484	1	0.22

* Degrees of Freedom + upper limbs § lower limbs

Table 1- Chi-squared test for assessing the correlation of falls with the questions asked in the questionnaire.

DISCUSSION

The majority of the studied population was sedentary and a high rate of falls was reported, a fact that has been previously observed in nursing homes⁽¹²⁾. The oldest seem to be more

prone to suffer falls, which is consistent to other studies, and can be partially justified by a progressive strength loss resulting from senescence. In a meta-analysis, Ueno et al.⁽⁶⁾ identified female gender and age above 70 years as some of the factors more commonly correlated to falls.

Regarding handgrip strength, we noticed that the subjects who suffered falls had significantly inferior strength levels when compared to those who had not fallen. Thus, muscular strength seems to be a major determinant for the incidence of falls. Other studies also found similar results using other methods for assessing muscular strength, such as the maximum isometric strength of the quadriceps⁽¹³⁾ and the 30's chair-stand test, which assesses lower limbs strength by the number of repeated chair-stand movements for a period of 30 seconds⁽¹⁴⁾. However, manual dynamometry is a user-friendly, cost-effective measurement, and a good predictor of body's musculoskeletal function⁽¹⁵⁾. The studies using handgrip strength to infer on body strength, have also identified its correlation with prevalence of falls^(5,6).

Functional limitations (use of orthosis for ambulating, assistance for sitting and bathing, and inability to go up and down stairs), and the presence of pain or diseases do not show correlation with falls in this population. Other studies detected the correlation between falls and functional limitations by means of timed up and go tests⁽¹⁶⁾, ability of standing up from chairs five times repeatedly and 400-meter walking⁽⁵⁾; or by means of a questionnaire assessing the independence level for performing activities such as bathing, feeding, changing clothes, combing hair, and ambulating⁽¹⁶⁾. The correlation between falls and use of orthosis for ambulation has also been reported⁽¹⁸⁾, with complaints of pain⁽¹⁹⁾ and presence of diseases⁽⁵⁾. In this study, those data were collected by means of questions allowing for "yes" or "no" answers, and, maybe because of that they haven't expressed the real functional status of the volunteers.

Only the ability to watch TV showed a significant correlation with occurrences of falls, probably because those unable to watch TV present associated cognitive disorders making them more prone to suffer falls. In two prospective cohort-based studies, the high correlation degree between low cognition and muscular weakness⁽²⁰⁾, impaired activities of daily life⁽²¹⁾ and functional loss⁽²²⁾ was evidenced, increasing the risks of falls.

Muscular weakness among institutionalized elderly individuals establishes a bidirectional relationship with their functional losses, dependence on caregivers, sedentariness and hastened physiological aging. Therefore, implementing a program for physical activity adjusted to nursing homes could halt this cycle, since it promotes an increased muscular strength and may prevent cognitive disorders⁽²³⁾. Although physical activity and the prevalence of falls did not present a statistical correlation, it is important to highlight that the number of individuals included in this sample who practiced some kind of physical activity was small (only 16 individuals), a limiting factor for examining such correlation.

From data collected, it is possible to conclude that the incidence of falls in institutionalized elderly individuals living in São Carlos city is high, with the oldest ones being more commonly unable to watch TV and presenting the weakest handgrip are more likely to suffer falls.

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