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, ±6.67); 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.

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 a higher level of attention and close watch. From these questions, this study targeted to identify the occurrence of falls among 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 among 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 among 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 among 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 among 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 among institutionalized elderly individuals most likely to suffer falls, requiring a higher level of attention and close watch.
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 h (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 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 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-

![Figure 1](https://via.placeholder.com/150)

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

![Figure 2](https://via.placeholder.com/150)

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

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 identified female gender and age above 70 years as some of the factors more commonly correlated to falls.

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

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

* Degrees of Freedom  + upper limbs § lower limbs

**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 (15). 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.

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.
REFERENCES