

Falls and fractures among older adults living in long-term care

Quedas e fraturas entre residentes de instituições de longa permanência para idosos

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Abstract

Objective: To investigate the prevalence of falls and fractures over the past 12 months and associated factors among older adults living in long-term care. **Methods:** Census of all long-term care located in the city of Pelotas, Brazil, in 2008. Falls over the past 12 months were assessed using the following question: "Over the last 12 months, have you fallen?" For those who replied positively, another question was asked: "In any of these falls, have you fractured a bone?" Sex, age, schooling, disability relating to basic activities of daily living, type of financing of the long-term care and hospital admissions were the independent variables. We used chi-square tests for heterogeneity and linear trend in the unadjusted analysis, and Poisson regression with robust variance in the adjusted one. **Results:** Within the 24 long-term care studied, we collected data for 466 individuals. The prevalence of falls in the past year was 38.9% (95%CI 34.5; 43.4). Among those who have fallen, 19.2% had fractures. Femur (hip) was the most frequent site fractured (43.4%), followed by wrist (10%). In the adjusted analysis, older age, disability for 1-5 basic activities of daily living, living in public institutions and hospital admissions in the last year were associated with higher risk of falls. **Conclusion:** The high prevalence of falls and fractures highlights the fragility of the individuals living in long-term care. Special attention should be paid to older adults and those with hospital admissions in the last year.

Keywords: Aging. Aged. Institutionalization. Health of Institutionalized Elderly. Accidental Falls. Fractures Bone. Cross-Sectional Studies.

Resumo

Objetivo: Investigar a ocorrência de quedas e fraturas no último ano e fatores associados entre residentes de instituições de longa permanência para idosos (ILPI). **Métodos:** Estudo transversal exploratório, a partir de um censo realizado em ILPI localizadas em Pelotas, Rio Grande do Sul, em 2008. As quedas e fraturas decorrentes dessas foram investigadas a partir de autorrelato referente ao último ano. Sexo, idade, escolaridade, incapacidade funcional para atividades básicas da vida diária, tipo de financiamento da instituição e hospitalização no último ano foram coletados como potenciais fatores associados à ocorrência de queda no último ano. Empregou-se o teste qui-quadrado para heterogeneidade e tendência linear e, na análise ajustada, a regressão de Poisson com variância robusta. **Resultados:** Nas 24 ILPI incluídas no estudo, coletaram-se dados de 466 indivíduos. A prevalência de quedas no último ano foi de 38,9% (IC95%: 34,5 – 43,4). Dentre aqueles que caíram, as fraturas acometeram 19,2%. As fraturas mais frequentes foram: fêmur/quadril (43,3%) e punho (10%). Na análise ajustada, o avanço da idade, apresentar incapacidade funcional em uma a cinco atividades da vida diária, residir em instituições públicas/filantrópicas e ter sido hospitalizado no último ano associaram-se à queda no último ano. **Conclusão:** A alta ocorrência de quedas e fraturas entre residentes de instituições de longa permanência para idosos revela a fragilidade da população avaliada. Atenção específica deve ser destinada a indivíduos mais velhos e hospitalizados no último ano.

Palavras-chave: Envelhecimento. Idoso. Institucionalização. Saúde do Idoso Institucionalizado. Acidentes por Quedas. Fraturas Ósseas. Estudos Transversais.

Introduction

Falls can be defined as unexpected changes in an individual's expected position, causing them to remain on a lower level compared to their initial position, such as on the ground or a piece of furniture¹. Among the elderly, falls continue to be one of the main public health problems, due to their high frequency, resulting health complications and high health care costs². In 2005 alone, in Brazil, there were 61,368 hospitalizations due to falls among individuals aged 60 years or more, representing 2.8% of all hospitalizations among the elderly in this country³.

In terms of health conditions of the elderly, falls and the resulting loss of functional independence can be indicated as important reasons for hospitalization. While nearly one third of the elderly population living in their community suffer falls every year⁴, international studies^{5,6} report that approximately 50% of institutionalized ones suffer falls. This percentage is consistent with the national values found by the National Institute of Traumatology and Orthopedics⁷.

According to Rubenstein et al.⁴, among institutionalized elderly individuals, there are specific risk factors that significantly increase the probability of falls, such as lower limb weakness, postural instability, lack of functional capacity, dizziness, visual and hearing impairments, arthritis, depression and use of drugs such as psychotropics, sedatives and non-steroidal anti-inflammatories. To value the interaction among multiple risk factors is important for the clinical evaluation and prevention of falls with more serious consequences.

In many cases, falls result in fractures and other severe injuries. Due to these injuries, elderly individuals suffer with the restrictions in their activities, leading to loss of functional capacity in daily life activities and social isolation⁸. In the specific case of institutionalized individuals, there is a high frequency of hip fractures and higher mortality rates due to such fractures,

when compared to those living in their community⁴.

Although the increase in the occurrence of falls is evident as a result of the growth in the elderly population in Brazil, few epidemiological studies have dealt with this issue, especially in the case of those living in long-term care institutions. Thus, the present study aimed to investigate the occurrence of falls and fractures in the previous year and factors associated with these falls among elderly individuals living in long-term care institutions.

Methods

An epidemiological cross-sectional exploratory study was conducted from a census performed in long-term care institutions for the elderly located in the city of Pelotas, Rio Grande do Sul, Southern Brazil. Based on the survey of records of the institutions registered with the Department of Health Surveillance and City Council for the Elderly and on the search for legal records concerning the legalization of these institutions, filed in the Municipal Ministry, researchers found 25 long-term care facilities, all in the city's urban area. Of these, one was excluded as it was aimed at exclusive care for mentally ill adults. All individuals living in institutions were included in this study, regardless of their age.

Data were collected between June and November 2008. The instrument used was a standardized pre-coded questionnaire, which included socioeconomic, demographic, behavioral and health questions. This collection was conducted by nine interviewers, who were university students and who had been trained to approach participants adequately and apply the questionnaire.

Interviews were conducted face-to-face in private rooms of the institutions. Prior to these interviews, those responsible for such institutions had been contacted, informing whether elderly individuals could respond to the questions on their own or had health problems that prevented them from giving reliable responses. In the latter case, the

information was collected by proxy from caregivers' reports. Interviews not conducted after three attempts on different days and at different times, one of which was made by the field work supervisor, were considered as losses/refusals. Quality control of the study was performed by a research assistant, who visited all institutions again and checked the interviewers' visit to these locations and the performance of interviews with all residents.

The "fall in the previous year" outcome was assessed with the following question: "In the last year, did you suffer any falls?". If their response was positive, another question was asked: "Did any of these falls cause a fracture?". In this way, the occurrences of falls and fractures were established, respectively. The independent variables in this study were as follows: sex (male or female); age (until 59, 60 to 69, 70 to 79; \geq 80 complete years); level of education (0, 1 to 4, 5 to 8 and \geq 9 completed school years); disability for activities of daily living (none, one to five, and six activities of daily living without functional capacity using the Katz Index⁹, which investigated six basic activities: feeding, bathing, dressing, toilet hygiene, functional mobility (lying down and getting up from bed and/or chair) bowel and bladder management. Lack of functional capacity was defined by the need for partial or full support for each of the activities of daily living assessed); type of funding of the institution (public/philanthropic and private); and self-report of hospitalization in the previous year (yes and no).

Double data entry was performed with the Epi-Info software – version 6.04d (Centers for Disease Control and Prevention, Atlanta, USA), including automatic amplitude and consistency checking. Data were analyzed with the Stata statistical package – version 9.0 (Stata Corporation, College Station, USA). Descriptive statistics was used to calculate the prevalence, 95% confidence intervals (95%CI), means and standard deviations (sd). In the unadjusted analysis, the chi-square test for heterogeneity and linear trend was employed,

considering $p \leq 0.05$ to be statistically significant. In the adjusted analysis, Poisson regression with robust variance was used¹⁰, respecting the hierarchy among possible factors associated with the outcome. For the statistical modeling, the backward selection strategy and a critical level of $p \leq 0.20$ to remain in the model were used in the adjusted analysis, aiming to control confounding. The following model of analysis was used: level 1 (distal): sex and age; level 2: level of education; level 3: disability; level 4: type of funding of the institution; and level 5 (proximal): hospitalization. The effect of each exposure on the outcome was adjusted for the remaining variables on the same level or on higher ones. Prevalence ratios (PR) and respective 95%CI were calculated.

The protocol for the present study was approved by the Federal University of Pelotas Medical School Research Ethics Committee (under number 005/08) and institutionalized participants and responsible adults signed an informed consent form prior to interviews.

Results

Of all 24 long-term care institutions, 22 were categorized as private institutions, one was philanthropic and one was public. Only one institution that had 12 elderly individuals did not authorize the entry of researchers to interview them. The remaining losses/refusals were scattered. Among all the 521 eligible individuals, 466 (89.4%) were interviewed. Of these, information was collected with the help of the caregiver in 58.6% of cases.

The majority of institutionalized individuals were women (70.8%), with a mean age of 75.1 years ($sd = 13.8$), of which 15.9% were younger than 60 years. Most of them had no formal education (52.8%) and lacked functional capacity to perform between one and five activities of daily living (57.5%; Table 1).

The prevalence of falls in the previous year was 38.9% (95%CI: 34.5 – 43.4). Among individuals who fell, 19.2% suffered fractures. Figure 1 shows the distribution of

fractures on the body. Fractures on lower limbs were found to be the most frequent (59.9%). The fractured body parts were identified, showing that the femur/hip (43.3%) and wrist (10%) were those most often reported.

In the unadjusted analysis (Table 2), the prevalence of falls in the previous year was significantly associated with the fact of elderly individuals lacking functional capacity and living in philanthropic or public institutions. In contrast, in the adjusted analysis (Table 2), the advance of age was directly associated with the occurrence of falls, i.e. the older an individual was, the higher their chance of having fallen in the previous year. Individuals who reported disability for one to five activities of daily living had a 46% higher probability of falling, while those who had disability for all activities of daily living had a lower probability (PR = 0.57; 95%CI: 0.34 – 0.96), when compared to others who did not have disability for any activities. As observed in the unadjusted analysis, individuals living in public and philanthropic institutions who had been hospitalized in the previous year also had a higher probability of falling.

Discussion

The percentage of participants who reported falls in the present study (38.9%) is very close to the results observed by Gonçalves et al.¹¹, who studied 180 elderly individuals living in institutions of the city of Rio Grande, RS, and found a prevalence of falls of 38.3%. However, this result is higher than the percentage found in studies that investigated the occurrence of falls in elderly individuals living in the community^{12,13}. The highest percentage of falls among institutionalized individuals could occur as a result of suffering with the absence of family members, lack of physical activities and a greater burden of diseases and disabilities¹⁴.

Among the individuals studied, 19.2% had suffered fractures due to falls and the majority of them were located in the lower limbs. Other studies conducted with

Table 1 - Description of the institutionalized older adults. Pelotas, Brazil, 2008.

Tabela 1 - Descrição dos indivíduos institucionalizados. Pelotas, Rio Grande do Sul, 2008.

Variable	N (%)
Sex	
Male	136 (29.2)
Female	330 (70.8)
Age (complete years)	
≤ 59	73 (15.9)
60 to 69	62 (13.5)
70 to 79	121 (26.4)
≥ 80	203 (44.2)
Level of education (completed school years)	
0	227 (52.7)
1 to 4	74 (17.3)
≥5	128 (29.8)
Activities of daily living without functional capacity	
None	107 (23.0)
1 to 5	268 (57.5)
6	91 (19.5)
Type of funding of the institution	
Private	373 (80.0)
Public/philanthropic	93 (20.0)
Hospitalization (in the previous year)*	
Yes	109 (23.9)
No	348 (76.1)

* Variable with the greatest amount of information ignored (n = 9).

* Variável com maior número de informações ignoradas (n = 9).

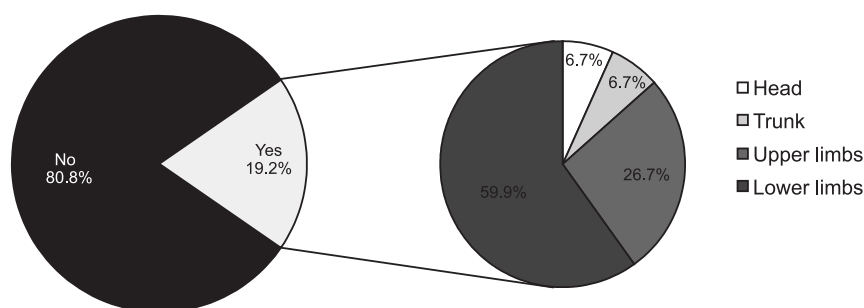


Figure 1 - Prevalence of fractures over the past 12 months and anatomic sites of the fractures among older adults living in Nursing Home (n=466). Pelotas, Brazil, 2008.

Figura 1 - Ocorrência e localização das fraturas ao longo do último ano entre residentes de instituições de longa permanência para idosos (n=466). Pelotas, Rio Grande do Sul, Brasil, 2008.

institutionalized elderly individuals also mention that both fractures and the remaining injuries caused by falls are more common in the lower limbs^{11,15,16}. According

to Rapp et al.¹⁷, preventive measures in institutions must be intensified, as fracture rates are particularly high in this context. Prevention must be aimed at elderly

Table 2 - Risk of falls according to the independent variables: unadjusted and adjusted analyses. Pelotas, Brazil, 2008.**Tabela 2** - Prevalência, análise bruta e ajustada das quedas no último ano conforme variáveis sociodemográficas e relacionadas à saúde de indivíduos institucionalizados. Pelotas, Rio Grande do Sul, 2008.

Variable	Falls in the previous year (%)	Unadjusted analysis	p-value	Adjusted analysis	p-value
Sex			0.75		0.88
Male	37.8	1.00		1.00	
Female	39.4	1.04 (0.75; 1.44)		1.02 (0.78; 1.33)	
Age (in complete years)			0.09*		0.02*
≤ 59	27.4	1.00		1.00	
60 to 69	37.1	1.35 (0.83; 2.22)		1.37 (0.83; 2.28)	
70 to 79	47.1	1.72 (1.13; 2.61)		1.93 (1.26; 2.94)	
≥ 80	39.6	1.45 (0.96; 2.18)		1.63 (1.07; 2.48)	
Level of education (completed years of school)			0.10*		0.07*
0	36.7	1.00		1.00	
1 to 4	44.6	1.21 (0.89; 1.65)		1.20 (0.89; 1.63)	
≥ 5	45.3	1.23 (0.95; 1.59)		1.26 (0.97; 1.63)	
Activities of daily living without functional capacity			<0.001		<0.001
None	35.5	1.00		1.00	
1 to 5	46.8	1.32 (0.99; 1.75)		1.46 (1.08; 1.66)	
6	19.8	0.56 (0.34; 0.91)		0.57 (0.34; 0.96)	
Type of funding of the institution			<0.001		0.003
Private	34.9	1.00		1.00	
Public/philanthropic	55.4	1.59 (1.26; 2.00)		1.49 (1.15; 1.92)	
Hospitalization (in the previous year)			<0.001		<0.001
Yes	56.0	1.64 (1.31; 2.04)		1.66 (1.34; 2.07)	
No	34.2	1.00		1.00	

* Valor p referente ao teste de tendência linear.

* P-value refers to the linear trend test.

individuals who require less care. Measures must be implemented immediately after institutionalization, as the risk of fractures is higher during the first months of life in an institution, which could be associated with the fact that one is not fully adapted to the new environment. Measures such as adjustments to the bed, anti-skid socks, adequate lighting, mats secured to the floor and hip protectors can be made available to reduce such risks.

There was no statistically significant association between sex and the occurrence

of falls. National^{13,18} and international studies¹⁹⁻²¹ have shown that women suffer more falls than men. Benedetti et al.²² reported that such fact could be associated with women's greater involvement with household activities, which causes them to be more exposed to falls. However, as the elderly individuals of this study are institutionalized, such activities are not performed, as they are the responsibility of the institution, which can probably explain the present findings.

The greater occurrence of falls with

the increase in age has been observed in studies that investigate both elderly individuals living in their community¹³ and those institutionalized²³. Additionally, this study showed the occurrence of falls among institutionalized individuals who are not considered to be elderly yet, due to their younger age. Findings of this study point to these individuals falling with a frequency much lower than the values found for the remaining study population and corroborate the evidence that the aging process leads to a reduction in functional capacity in advanced ages, caused by diseases such as sarcopenia and osteoporosis, which are directly associated with the occurrence of falls and fractures in this age group.

Institutionalized individuals who lack functional capacity in up to five activities of daily living showed a high probability of falling; however, those who did not lack functional capacity or who had restrictions to all activities of daily living were less likely to fall. This result could be explained by the fact that elderly individuals who lack capacity in several activities do not move as much, perform fewer tasks and, in certain cases, are bedridden and, consequently, less exposed to high-risk situations for falls in their institutions. Similar results have been indicated by Lord et al.²⁴, who justified these results by showing that the low prevalence of falls among elderly individuals with greater functional incapacity probably reflects the reduction in exposure to risk factors and the increase in levels of supervision and care. Laessoe et al.²⁵ studied elderly individuals aged 70 years and more and observed that falls occurred when they challenged their limits, regardless of their physical condition. Those who did not report falls avoided loss of balance, reducing walking speed or avoiding walking on very cold days.

Reduction in functional capacity in many institutionalized elderly individuals does not entirely result from a reduction in physical function or negative biological changes, but rather from an environment that emphasizes an incomplete, ineffective and dependent behavior¹⁴, which, in a way,

is revealed in the present results through the significant association between falls and individuals living in public and philanthropic institutions. According to Moraes et al.²⁶, elderly individuals who live in poor and unsafe environments, especially those with poor clinical conditions, have a greater chance of falling.

Institutionalized individuals who reported hospitalizations in the 12 months prior to the study also showed a higher probability of falling, when compared to those not living in institutions. However, Gawryszewski et al.²⁷ mentioned that, in 2000, in Brazil, falls were the first cause of hospitalizations among the elderly. In contrast, in 2005, according to the Ministry of Health³, the number of falls increased among individuals aged 60 years and more, representing 2.8% of all hospitalizations in the elderly population in Brazil. It should be emphasized that elderly individuals hospitalized due to falls have a mortality risk in the year following their hospitalization varying from 15% to 50%^{8,28-30}.

One of the limitations of the present study was that the reasons for institutionalized individuals to have fallen were not investigated, as researchers sought to understand the relationship of the structural environment of the long-term care institutions for the elderly and their own physical impairment with the occurrence of falls. The possibility of recall bias, as self-reports of falls in the previous year are considered, and the possibility of underestimation of falls, as only the more severe ones are usually reported, should not be ignored. Additionally, relevant risk factors were not included in this study, such as the use of certain drugs that are known to be associated with the occurrence of falls. On the other hand, the positive aspects of this study were the representativeness of its target population that included individuals aged less than 60 years in the analysis, as they represent more than 15% of the institutionalized population, and the specific investigation of the relationship between the type of funding of institutions and the occurrence of falls. This variable has

been frequently ignored in studies dealing with this population.

The high occurrence of falls in the previous year among individuals living in long-term care institutions for the elderly should be emphasized by organizations that provide services to this population, public policies and inspection agencies. Adequate

physical environments and professionals qualified to provide care can help to reduce such incidents. It is recommended that future studies should investigate the quality of the physical environment of these institutions in terms of its association with falls and fractures.

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