Prevalence of falls in elderly in Brazil: a countrywide analysis

Prevalência de quedas em idosos no Brasil: uma análise nacional

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Abstract

We conducted a cross-sectional study of a sample of 6,616 elderly living in urban areas of 100 municipalities in 23 Brazilian states, who responded to questions on the occurrence of falls in the 12 months prior to the interview, and occurrence of fractures due to the falls. The prevalence of falls among the elderly was 27.6% (95%CI: 26.5-28.7). Among those reporting falls, 11% had suffered fractures as a result. Of the elderly, 36% had received guidance about the precautions necessary to prevent falls, and about 1% had required surgery. Falls were associated with female gender, older age, low socioeconomic status, obesity and sedentary lifestyles. The prevalence of falls differed significantly between the North and other regions of Brazil. The study shows a high prevalence of falls, and underlines the need for preventive strategies targeting modifiable risk factors.

Aged; Accidental Falls; Prevalence

Introduction

The demographic transition characterized by population aging is a global phenomenon resulting from factors that include lower fertility rates and increased life expectancy. It is estimated that the proportion of elderly in the population will grow 300% by 2025, and this process of aging is expected to cause major impact on countries' economies and health systems [1].

Falls are one of the most important health hazards at this stage of life, which has drawn researchers' interest to improving the understanding and prevention of what are considered modifiable risk factors, and to building the human resources necessary to provide preventive care for this population.

Studies by researchers in different regions of the world currently report different prevalences for the outcome "falls among the elderly" [2,3,4,5,6]. In Beijing, China, Yu et al. [2] found a prevalence of falls of 18% associated with age from 60 to 70 years, female sex, low level of physical activity, poor eyesight, living alone, and other health problems, such as diabetes. In Latin American countries, Reyes-Ortiz et al. [3] found prevalences of 27% in Uruguay, 28.5% in Argentina, and close to 34% in Santiago, Chile, and Mexico City. In Brazil, Mota et al. [4] studied an elderly population in the Rio de Janeiro municipal area, finding prevalence of falls of 30.3% associated with female sex, advanced age, divorce, living alone, poor

health conditions, low functional capacity, and little life satisfaction. In a study in Brazil's South and Northeast regions, Siqueira et al. [6] found the prevalence of falls to be 34.8%, and significantly higher (40.1%) among women. In a study of a cohort of elderly by Perracini & Ramos [5], in one of the surveys, about 30% reported at least one fall in the previous year.

Although many studies on the subject have been conducted in Brazil [4,5,6], there is still little information on falls in a national sample. This study is intended to determine the prevalence of falls in Brazil and the health status of the elderly as regards falls, in terms of guidance received on avoiding falls, the occurrence of fractures, and the need to use the health system to undergo surgery.

Materials and methods

A cross-sectional population-based study was conducted with a sample of elderly aged 60 years or more, residing in the urban areas of 100 municipalities in 23 of Brazil's states – Acre, Alagoas, Bahia, Ceará, Espírito Santo, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Paraíba, Paraná, Pernambuco, Piauí, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Rondônia, Santa Catarina, São Paulo, Sergipe and Tocantins – in the country's five geographical regions.

The representative sample of the population of elderly in Brazil was located by: (a) municipal population size in five categories (less than 10,000; 10,000 to less than 20,000; 20,000 to less than 100,000; 100,000 to less than 1 million; and 1 million or more), (b) census tracts, and (c) domiciles, forming a complex framework of samples at multiple levels of sampling unit [7,8]. The municipalities and census tracts were selected by territorial division and the tract grid used by the official 2000 population census (Instituto Brasileiro de Geografia e Estatística. *Censo Demográfico 2000*. http://www.ibge.gov.br). After listing Brazil's municipalities by population size, the study municipalities were selected by random draw. In each municipality selected, tracts were selected by random draw in proportion to the number of valid tracts and the population size.

All the elderly in the selected tracts responded to the study questions, and data were collected by 55 interviewers with over 40 hours special training, who used a personal digital assistant (PDA) for data collection. Once collected, data were stored on personal computers and the datasets were transferred immediately to the study coordinators at Pelotas Federal University (UFPel) by Internet. For quality control purposes, 5% of the interviews were selected by random draw at most three days after the first interview. Another quality control strategy used was to compare the geographical coordinates of each domicile, as given by the data recorded on the PDA, with the location in the census tract as mapped by the IBGE, so as to monitor the sample distribution over the area of the tract, thus avoiding the possibility of biases.

The questionnaire used was standardized and pre-tested, and the outcome was operationalized by the question: "*Have you fallen at any time in the past year?*" [9]. All the individuals responded about receiving guidance on environmental precautions to prevent falls. Those who reported falls were also asked about the occurrence of fractures resulting from the fall, and the need for surgery because of the fracture. The questions used were: "*Did a fracture occur in any of these falls?*" and "*Did you need surgery because of that fracture?*".

The independent variables included in the analysis were: sex; age (60 to 69 years, 70 to 79 years, 80 years or more); marital status (with or without partner); socioeconomic status (as classified by the Associação Brasileira de Empresas de Pesquisa; http://www.abep.org); body mass index (BMI) in four categories [underweight (> 18.5kg/m^2), normal (18.5kg/m^2 to 24.9kg/m^2), overweight (25kg/m^2 to 29.9kg/m^2) and obesity (> 30kg/m^2)]; sedentary in leisure time, according to the cutoff point taken from the *International Physical Activity Questionnaire* (IPAQ) of < 150 minutes of physical activity per week [10].

The descriptive analyses included calculating proportions and the corresponding 95% confidence intervals (95%CI). In the crude analysis, the prevalence of falls was calculated for each group of independent variables, and the level of significance was ascertained using Wald tests for heterogeneity and linear trend. The adjusted analysis was performed by Poisson regression [11], with robust estimates of variance, adjusted calculation of prevalence ratios (PRs), 95%CI, and significance values by the test mentioned above. All the analyses were performed using the Stata 9.2 statistics package (Satat Corp., College Station, USA).

The study protocol was approved (No. 152/07, 23 November 2007) by the Ethics Committee of the UFPel School of Medicine, and informed consent was obtained from all participants. The authors declare having no conflicting interest in the present study.

Results

Of an expected total of 6,624 elderly, 6,616 were interviewed, representing loss of 0.2%. In the final sample, the margin of error in estimating prevalence of falls was 1.1 percentuals points. In evaluating the associations, the study achieved 80% power to detect prevalence ratios of 1.2 or greater as significant to a 95% level of confidence.

The study sample included 59% women, 42% of socioeconomic status C, 58% with partner, 20% with BMI classified as obese, and 86.5% sedentary during their leisure time (Table 1). Mean age was 70.9 years (standard deviation – SD = 8.0), from 60 to 104 years old, with 15.8% aged 80 years or more.

The prevalence of falls in the sample was 27.6% (95%CI: 26.5-28.7). The prevalence of falls by geographical region of Brazil ranged from 18.6% (95%CI: 15.3-21.8) in the North Region to 30% (95%CI: 28.2-31.9) in the Southeast Region. The prevalences displayed no difference or trend by size of municipality (Figures 1a and 1b). Of respondents who reported falls during the past year, 53.5% had suffered a single fall, 21.2% mentioned two falls, 13.3% three falls, and 12% four or more falls. Of those who reported falls, 11% had suffered fractures as a result.

Table 2 shows the prevalence of falls among elderly by regions of Brazil, stratified by age. In the North Region the prevalences of falls among the 60 to 69 year-olds (15.3%; $p = 0.004$) and 70 to 79 year-olds (18%; $p < 0.001$) were lower than in the other regions.

The crude analysis showed that falls were more frequent in the female sex ($p < 0.001$), in the older elderly ($p < 0.001$), in the obese elderly ($p < 0.001$), and in those who were sedentary during their leisure time ($p < 0.001$). In the crude analysis, there is a tendency for falls to associate with socioeconomic status, although it is not possible to specify in what category. Living with a partner proved protective against falls as compared with those who lived alone ($p < 0.001$). In the adjusted analysis, falls continued to associate with female sex, advanced age, obesity and sedentary leisure. In the same way, the tendency to associate with socioeconomic level also persisted (Table 3).

The study furnished evidence in Brazil of prevalences relating to health status and the need for health care for the elderly with regard to falls. Although 36% of the elderly studied had received guidance on environmental precautions with a view to avoiding falls, nonetheless the prevalence of falls was 27.6%. Of those who suffered falls, 3% suffered fractures as a result and 0.7% needed surgery because of the fracture (Figure 2).

Table 1

Description of sample of elderly in 23 states in Brazil.

Variables (n)	Prevalence (%)
Sex (6,616)	
Male	41.0
Female	59.0
Age (6,061) [years]	
60-69	50.1
70-79	34.1
80 or more	15.8
Marital status (6,614)	
No partner	41.9
With partner	58.1
Socioeconomic status (6,346)	
A	2.2
B	14.8
C	41.8
D	36.2
E	5.0
Body mass index (5,383)	
Underweight	4.1
Normal	38.8
Overweight	37.1
Obesity	20.0
Sedentarism in leisure (6,594)	
No	13.5
Yes	86.5

Source: Projeto AQUARES, Universidade Federal de Pelotas, 2009.

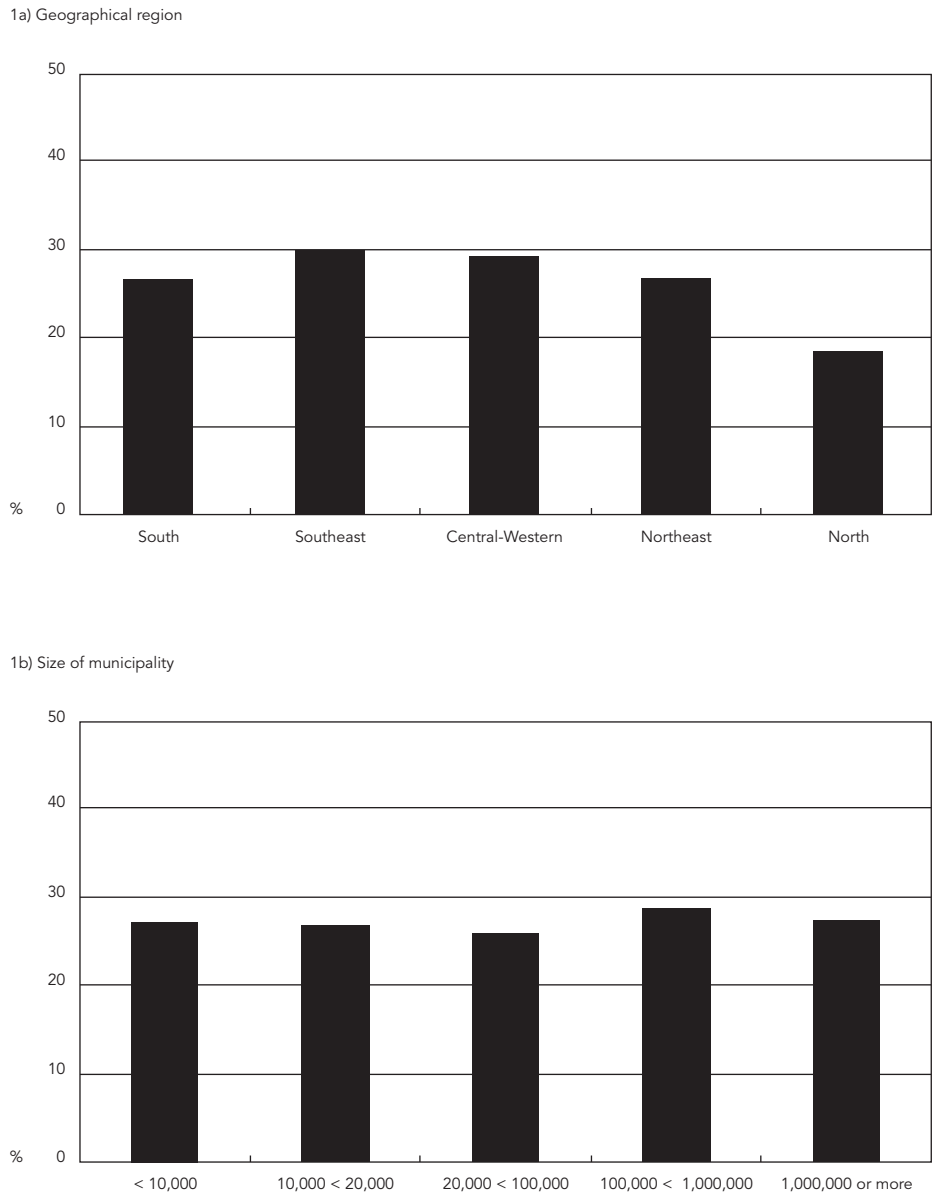
Discussion

A prevalence of falls found for the population of elderly in Brazil was 27.6%. This result is very similar to some of the results found by Reyes-Ortiz et al. [3], who report 27% for Uruguay, 28.5% for Argentina, and close to 34% for Santiago and Mexico City. Another study in Turkey returned a prevalence of 31.9% for falls among the elderly in the previous 12 months [12].

As regards the prevalence of falls found for the different regions of Brazil, the prevalence of 26.9% found for the South Region was lower than the 33.5% reported by Carvalho et al. [9] for the town of Pelotas, Rio Grande do Sul, and also the 38.3% of the study by Gonçalves et al. [13] in the town of Rio Grande, Rio Grande do Sul. Nonetheless, it is important to stress that these studies considered institutionalized elderly over 65 years of age. Another study of exclusively female elderly in the municipality of Rio de Janeiro found a prevalence of 23.3%, which is lower than the

Figure 1

Prevalence of falls in the elderly by geographical region (p < 0.001) and size of municipality in Brazil (p < 0,42). UFPel, AQUARES, 2009.



30% we found for the Southeast Region [14]. These comparisons should be viewed with caution because of the methodological differences among the studies, although they are believed to be appropriate to discussing the values found here for the different regions of Brazil. The low prevalence of falls in Brazil's North Region (18.6%) is striking when compared with the other regions. Our hypothesis for this finding relates to the lower prevalence of falls found in the younger elderly age groups. We strongly suggest that further studies be made with a view to understanding better the reasons for these lower prevalences.

Among the elderly who suffered falls, 11% reported at least one fracture as a result of the event. A recent study of a sample of elderly resi-

Table 2

Prevalence of falls in the elderly by geographical region of Brazil, stratified by age.

Region	Falls	
	No	Yes
North		
Age (years)		
60-69	84.7	15.3 *
70-79	82.0	18.0 **
80 or more	69.5	30.5 ***
Northeast		
Age (years)		
60-69	76.5	23.5
70-79	72.7	27.3
80 or more	64.4	35.6
Southeast		
Age (years)		
60-69	73.9	26.1
70-79	67.6	32.4
80 or more	61.9	38.1
South		
Age (years)		
60-69	75.0	25.0
70-79	75.2	24.8
80 or more	60.8	39.2
Mid-west		
Age (years)		
60-69	73.7	26.3
70-79	70.6	29.4
80 or more	61.3	38.7

Source: Projeto AQUARES, Universidade Federal de Pelotas, 2009.

* $p = 0.004$ (p-value for the 60 to 69 year old category in the various different regions);

** $p < 0.001$ (p-value for the 70 to 79 year old category in the various different regions);

*** $p = 0.654$ (p-value for the 80 years or older category in the various different regions).

dents in the catchment areas of primary health care centers in Brazil's South and Northeast regions found a prevalence of 12% [6]. Another study in Spain came to the same result, which strongly reinforces the findings of this study [15].

Our study showed a greater likelihood of falls among female elderly. This result is consistent with the findings of other studies in the scientific literature, although the prevalence of falls found among women in Brazil was higher than found by the study in Turkey [12]. Our result shows a lower prevalence of falls among women than found in the Brazilian study of populations of elderly by primary health care (PHC) catchment area [6] (32.1% as against 40.1%), although the likelihood of falls (PR) was exactly the same, i.e., about 50%. One hypothesis for this finding is that the population studied in this Brazil-wide sample has different characteristics from the notoriously disadvantaged populations of PHC catchment areas. That hypothesis is strengthened by our finding that falls tend to an association when socioeconomic status is changed, although the category cannot be specified.

Several studies have shown clearly the trend for prevalence of falls to increase with age. Our results show the same positive association between this outcome and increasing age [6,16,17,18,19]. Meanwhile, the variables BMI and sedentarism revealed that obese and sedentary individuals showed greater likelihood of suffering falls. Similar results are reported by Siqueira et al. [6] in their study of a population in PHC catchment areas. That finding shows the importance of interven-

Table 3

Prevalence, crude and adjusted analysis of the outcome "falls in the elderly" in Brazil.

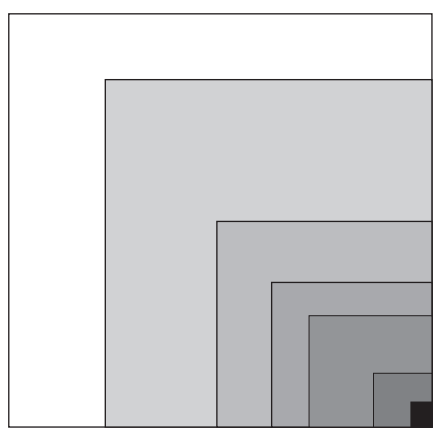
Variables (level)	Prevalence (%)	Crude analysis		Adjusted analysis	
		PR (95%CI)	P-value	PR (95%CI)	P-value
Sex			< 0.001		< 0.001
Male	21.2	1.00		1.00	
Female	32.1	1.51 (1.39-1.65)		1.50 (1.36-1.66)	
Age (years)			< 0.001 *		< 0.001 *
60-69	24.4	1.00		1.00	
70-79	27.9	1.14 (1.04-1.25)		1.13 (1.02-1.25)	
80 or more	37.1	1.52 (1.38-1.66)		1.46 (1.30-1.64)	
Marital status			< 0.001		0.79
No partner	31.7	1.00		1.00	
With partner	24.6	0.78 (0.72-0.84)		0.99 (0.90-1.09)	
Socioeconomic status			< 0.001 *		0.023 *
A	22.6	1.00		1.00	
B	23.5	1.04 (0.75-1.44)		1.12 (0.74-1.70)	
C	27.6	1.22 (0.89-1.67)		1.31 (0.87-1.95)	
D	29	1.28 (0.93-1.76)		1.30 (0.87-1.94)	
E	31.1	1.37 (0.97-1.95)		1.43 (0.93-2.21)	
Body mass index			< 0.001 *		< 0.001 *
Underweight	21.5	1.00		1.00	
Normal	26.4	1.22 (0.94-1.59)		1.23 (0.95-1.59)	
Overweight	27.7	1.29 (0.99-1.67)		1.33 (1.03-1.71)	
Obesity	31.6	1.47 (1.13-1.94)		1.49 (1.14-1.93)	
Sedentarism in leisure			< 0.001		0.001
No	19.6	1.00		1.00	
Yes	28.9	1.47 (1.28-1.69)		1.29 (1.11-1.50)	

Source: Projeto AQUARES, Universidade Federal de Pelotas, 2009.

* Wald test for linear trend.

Figure 2

Profile and need for health care for the elderly due to falls in Brazil. UFPel, AQUARES, 2009.



tions targeting these variables, given that they are risk factors that can be modified through the day-to-day activities of health personnel involved with this population group.

As for profiling the need for health care for the elderly as regards falls and consequent fractures, the results presented here show that many associated factors could be minimized through policies to encourage healthier living, through higher levels of physical activity, dietary care, and better guidance on environmental hazards so as to prevent falls. There is a need for inter-sector actions, including investment in urban planning and reorganization of the household environment in the short and medium terms, so as to adjust urban spaces to this population's needs. According to figures for hospital morbidity by place of admission, issued by the data processing department of Brazil's national health service (http://tabnet.datasus.gov.br/cgi/tabcgi.exe?sih/cnv/niuf.def, accessed on 16/Mar/2011), in Brazil, 35,426 elderly (60 years or more) were admitted with fracture of the femur (all causes).

Although studies of populations of elderly can raise concerns as regards memory bias, the literature has shown that this bias is small in outcomes such as falls and fractures, because these events are strongly remembered when elderly people are asked, even with a 12-month recall period [12,20,21].

Finally, our results show that the prevalence of falls is high among the elderly, warranting the conclusion that a high proportion of elderly still suffer falls. Meanwhile, there are still shortcomings in the promotion of health care for the elderly with regard to sedentarism, overweight and obesity, and in guidance on necessary environmental precautions to prevent falls, many of which result in fractures and the need for health care. In that regard, there is an urgent need for more care for this population, including interventions to bring about a reduction in the high rates encountered and promotion of better health conditions in this population group.

Resumo

Foi realizado um estudo transversal com uma amostra composta de 6.616 idosos, moradores em áreas urbanas de 100 municípios de 23 estados brasileiros, que responderam sobre a ocorrência de quedas no último ano, e consequente fratura devido a quedas. A prevalência de quedas entre os idosos foi de 27,6% (IC95%: 26,5-28,7). Entre os que sofreram quedas, 11% tiveram fratura. Do total de idosos, 36% haviam recebido orientação sobre os cuidados necessários para evitar quedas, e cerca de 1% necessitou intervenção cirúrgica. As quedas associaram-se ao sexo feminino, idade avançada, nível socioeconômico E, aos obesos e aos sedentários. A prevalência de quedas na Região Norte mostrou-se significativamente diferente em relação às demais regiões. O estudo mostra que a prevalência de quedas no Brasil é alta e que a promoção de cuidados à saúde dos idosos relacionada a variáveis possíveis de serem modificados é uma necessidade.

Idoso; Acidentes por Quedas; Prevalência

Contributors

F. V. Siqueira participated in the study conception, analyses, interpretation of results, and drafting of the article. L. A. Facchini collaborated in the study conception, and review of the article at its various stages of drafting. D. S. Silveira contributed to the conception, analysis, and review of the article. R. X. Piccini collaborated in the conception, and the final review of the article. E. Tomasi contributed to the final review of the article. E. Thumé collaborated in the literature review, and the final review of the article. S. M. Silva participated in data collection, and final review of the article. A. Dilélio contributed to the literature review, data collection, and final review of the article.

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