

EPIDEMIOLOGY OF FALLS IN OLDER ADULTS IN BRAZIL: AN INTEGRATIVE LITERATURE REVIEW

Epidemiologia das quedas entre idosos no Brasil: uma revisão integrativa de literatura

Sarah Musy Leitão^{a,b} , Samily Cordeiro de Oliveira^c , Luciana Ramalho Rolim^b ,
Raquel Pessoa de Carvalho^b , João Macêdo Coelho Filho^{a,c} , Arnaldo Aires Peixoto Junior^{a,b,c} 

ABSTRACT

OBJECTIVE: To conduct an integrative literature review on epidemiology of falls in older adults in Brazil, seeking to identify occurrence rate, recurrence, and potentially modifiable factors associated with these events. **METHOD:** This literature review consisted of searching the Medical Literature Analysis and Retrieval System Online (MEDLINE), Scientific Electronic Library Online (SciELO), and Latin American and Caribbean Center on Health Sciences Information (LILACS) databases for scientific articles on November 14, 2017. The following keywords were used for finding articles: “accidental falls,” AND/OR “elderly,” AND/OR “Brazil.” Epidemiological data were collected from primary studies and then compared. **RESULTS:** Thirty-five studies were selected. Most of them were performed in the Brazilian Southeast (15) and South (11) regions. The occurrence rate of falls ranged from 10.7 to 59.3%. The most common setting for falls was the home during daytime. The most commonly described circumstances were tripping, slipping, dizziness, and uneven flooring, resulting in falling from one’s own height. The factors most frequently associated with falls were female sex, age greater than 80 years, cognitive impairment, and depressive symptoms. The reported consequences were fractures and fear of falling again. **CONCLUSION:** As some factors associated with falls in older adults in Brazil are modifiable, fall prevention may reduce morbidity and mortality in this population. **KEYWORDS:** accidental falls; aged; Brazil; epidemiology.

RESUMO

OBJETIVO: Realizar revisão integrativa de literatura sobre epidemiologia de quedas entre idosos no Brasil, buscando identificar taxa de ocorrência, recorrência e fatores potencialmente modificáveis associados a esses episódios. **MÉTODO:** Foi efetuada revisão de literatura, consistindo na busca de artigos científicos das bases de dados Literatura Internacional em Ciências da Saúde (MEDLINE), *Scientific Electronic Library Online* (SciELO) e Centro Latino-Americano e do Caribe de Informação em Ciências da Saúde (LILACS) em 14 de novembro de 2017. Os artigos foram selecionados a partir das seguintes palavras-chave: “Acidentes por quedas” E/OU “Idoso” E/OU “Brasil”. Dados epidemiológicos foram extraídos dos estudos primários e comparados. **RESULTADOS:** Foram selecionados 35 artigos. A maioria dos estudos foi realizada nas regiões Sudeste (15) e Sul (11). A taxa de ocorrência de quedas variou entre 10,7 e 59,3%. O domicílio, no período diurno, é o cenário mais frequente de quedas. As circunstâncias mais comumente descritas são tropeço, escorregão, tontura e existência de desnível, ocasionando tombo da própria altura. Os fatores mais frequentemente associados às quedas foram sexo feminino, idade maior que 80 anos, déficit cognitivo e sintomas depressivos. As consequências identificadas foram fraturas e o medo de cair novamente. **CONCLUSÃO:** Alguns fatores associados aos tombos em idosos no Brasil são modificáveis e prevenir as quedas pode possibilitar a redução da morbimortalidade nessa população. **PALAVRAS-CHAVE:** acidentes por quedas; idoso; Brasil; epidemiologia.

^aGeriatric Service, Hospital Universitário Walter Cantídio, Universidade Federal do Ceará (UFC) – Fortaleza (CE), Brazil.

^bCentro Universitário Christus – Fortaleza (CE), Brazil.

^cSchool of Medicine, UFC – Fortaleza (CE), Brazil.

Correspondence data

Arnaldo Aires Peixoto Junior – Departamento de Medicina Clínica – Rua Professor Costa Mendes, 1.608, 4º andar – Rodolfo Teófilo, bloco didático da Faculdade de Medicina da UFC – CEP: 60430-140 – Fortaleza (CE), Brasil – E-mail: arnaldoapj@ufc.br

Received on: 06/06/2018. Accepted on: 08/02/2018

DOI: 10.5327/Z2447-211520181800030

INTRODUCTION

Falls have been found to be the main external cause of morbidity and mortality in older adults worldwide.¹ They are also considered an important indicator of poorer quality of life in this age group, as well as of poorer quality of health care services providing for them.²

The occurrence rate of falls in older people varies according to the method used for investigating the phenomenon.³ In 2011, a Brazilian study assessed prevalence, risk factors, and consequences of falls in older adults.⁴ Despite the nationwide nature of this study, regional investigations have reported different data regarding prevalence and other aspects of falls in older age.

Thus, the present study aims to present an integrative literature review of the epidemiology of falls in older adults in Brazil, including institutionalized patients, seeking to identify potentially modifiable factors associated with these events.

METHOD

This integrative review examined the published literature on epidemiology of falls in older adults in Brazil. The following steps were conducted to elaborate this review, according to the integrative method: reflecting and formulating guiding questions; selecting and searching for articles; defining data to be collected from the selected studies; critically assessing the selected studies; discussing the results; and presenting the integrative review.

Guiding questions

The first step was formulating the following guiding questions: “What is the prevalence of falls in older adults in Brazil?” “What are the circumstances of falls in older adults in Brazil?” and “Which factors are associated with falls in older adults in Brazil?”

Search strategy and article selection

Medical Literature Analysis and Retrieval System Online (MEDLINE), Scientific Electronic Library Online (SciELO), and Latin American and Caribbean Center on Health Sciences Information (LILACS) databases were searched for scientific articles on November 14, 2017. The following keywords indexed in Health Sciences Descriptors (DeCS) were used for finding articles: “accidental falls,” “elderly,” and “Brazil.” The Boolean operators “AND” and “OR” were used for searching all possible combinations of keywords. A reference management software (EndNote X7 for Windows, Thomson Reuters, 2013) was used for bibliographic search and screening.

Original articles in English and Portuguese were eligible for inclusion in the review.

Inclusion and exclusion criteria

After searching the databases according to the described strategy, original articles were selected using the following inclusion criteria:

- purpose of evaluating falls in older adults in Brazil;
- presence of quantitative data on prevalence or incidence, risk factors, and/or circumstances of falls.

Exclusion criteria were as follows:

- literature reviews;
- case reports;
- repeated studies on databases;
- failure to meet the inclusion criteria.

Collected data

The data collected from primary studies and included in this review were the following:

- number of older adults evaluated;
- age;
- sex;
- data collection method;
- prevalence of falls;
- recurrence of falls;
- Brazilian region where older adults lived;
- place of residence;
- place where they fell;
- time of falls;
- circumstances of falls;
- risk factors for falls;
- comorbidities, if present.

Critical assessment of selected studies

The original articles were read once for overall comprehension and identification of type of article and method used in the study. Then, in a second round of reading, relevant data from the studies were analyzed.

Chart 1 was designed to make data easier to understand and included the following: author, year of publication, study design, number of patients, mean age, sex, prevalence of falls in previous year, recurrence of falls, Brazilian region, place of residence, place of falls, time of falls, circumstances, and risk factors. These data are arranged in order of year of publication.

The studies assessing prevalence of falls in older adults living in Brazil are listed in Table 1. Other seven studies included samples of older adults in which all participants

Chart 1 Summary of the studies included in the present review on epidemiology of falls in older adults in Brazil. Population: older adults living in the community and in long-term care facilities. Fortaleza (CE), Brazil, 2017.

Study/design	n	Mean age	Sex (M/F) (%)	Prevalence in previous year (%)	Recurrence (%)	Region/place of residence	Place/time of falls	Circumstances	Risk factors/associated conditions
Chianca et al./cross-sectional ²	108	75.9	32.4/67.6	59.3	64.1	Belo Horizonte (MG)/community	Yard and bedroom	-	Cognitive impairment
Dellaroza et al./cross-sectional ³	1.269	69.5	40.4/59.6	28	-	São Paulo (SP)/community	-	-	Chronic pain for more than 2 years, hypertension, osteoarthritis, osteoporosis, urinary incontinence, cataract, and neuropsychiatric disease
Siqueira et al./cross-sectional ⁴	6.616	70.9	41.0/59.0	27.6	46.5	23 Brazilian states/community	-	-	Female sex, age greater than 80 years, obesity, living alone, and sedentary lifestyle
Pereira et al./cross-sectional ⁵	6.751	70.3	48.3/51.7	10.7	-	Rio Grande do Sul/community	-	-	Female sex, age greater than 80 years, obesity, use of orthosis, and low educational level
Coimbra et al./cross-sectional ⁶	2.209	70.6	39.7/60.3	35.0	8.7	Amparo (SP)/community	-	-	Female sex, age greater than 80 years, more than 8 associated diseases, previous hospitalization, depression, and hearing impairment
Perracini & Ramos/prospective cohort ⁷	1.415	-	-	30.9	10.8	São Paulo (SP)/community	-	-	Female sex, no partner, low educational level, previous fracture, visual impairment, and being partially dependent for BADLs
Álvares et al./cross-sectional ⁸	243	77.7	27.2/72.8	32.5	57.7	Pelotas (RS)/LTCF	Outdoors and bedroom/daytime	Slipping and dizziness	Psychotropic drugs
Araújo Neto et al./cross-sectional ⁹	45	79.8	37.8/62.2	66.7	-	João Pessoa (PB)/LTCF	20% in external areas	-	-
Antes et al./cross-sectional ¹¹	1.705	70.7	36.2/63.8	19.0	8.2	Florianópolis (SC)/community	43% at home, 25% in bedroom/daytime	While walking or tripping due to uneven floor	-
Carvalho et al./cross-sectional ²¹	195	79.8	31.5/68.5	33.5	-	Pelotas (RS)/LTCF	Bedroom, living room	-	White skin color and back pain
Gonçalves et al./cross-sectional ²²	180	80.2	25.0/75.0	38.3	-	Rio Grande (RS)/LTCF	Bedroom	-	White skin color, separated or divorced, depressive symptoms, and polypharmacy
Fhon et al./cross-sectional ¹²	240	73.5	37.1/62.9	33.3	-	Ribeirão Preto (SP)/community	Home – living room, bathroom, and kitchen	Imbalance, slippery or uneven flooring, change in floor level	Female sex and frailty
Nascimento et al./cross-sectional ¹⁴	1.188	-	39.9/60.1	29.0	-	São Paulo (SP)/community	59% at home	-	Female sex and noncommunicable diseases

Continue...

Chart 1 Continuation.

Study/design	n	Mean age	Sex (M/F) (%)	Prevalence in previous year (%)	Recurrence (%)	Region/place of residence	Place/time of falls	Circumstances	Risk factors/associated conditions
Cruz et al./cross-sectional ¹⁵	420	69.7	35.0/65.0	32.1	47.0	Juiz de Fora (MG)/community	Home	-	Female sex, older age, need for mobility aid, and osteoporosis
Silva et al./cross-sectional ¹⁶	205	69.9	29.1/70.9	47.8	-	São Paulo (SP)/community	Home	Slipping and tripping	Black race
Carneiro et al./cross-sectional ²⁰	683	70.9	35.1/64.9	28.3	-	Montes Claros (MG)/community	-	Slipping and tripping	Female sex, poor self-perceived health, and compromised functional mobility
Nascimento/cross-sectional ²³	1.190	-	39.9/60.1	29.0	-	São Paulo (SP)/community	-	-	Female sex and noncommunicable diseases
Stamm et al./cross-sectional ²⁴	368	71.8	35.1/64.9	53.0	-	Rio Grande do Sul/community	-	-	Inadequate domestic environment, female sex, and use of medications
Santos et al./cross-sectional ²⁵	280	71.6	31.8/68.2	53.6	27.8	Natal (RN)/community	-	-	Female sex and osteoarticular diseases
Pereira et al./cross-sectional ²⁶	689	72.1	31.1/68.8	14.4	11.9	Campinas (SP)/community	-	-	Female sex, age greater than 80 years, daytime napping, and depressive symptoms
Dantas et al./cross-sectional ²⁷	401	70.0	32.4/67.6	42.4	18.3	João Pessoa (PB)/community	-	-	Female sex, 60–69 years of age, and presence of caregiver
Motta et al./cross-sectional ²⁸	1.064	71.4	43.0/57.0	30.3	13.9	Engenheiro Paulo de Frontin (RJ)/community	-	-	Female sex, older age, living alone, being divorced, cognitive impairment, poor health condition, and poor functional capacity
Siqueira et al./cross-sectional ³⁰	4.003	73.9	39.0/61.0	34.8	45.0	7 Brazilian states/community	-	-	Older age, sedentary lifestyle, poor self-perceived health, and polypharmacy
Vieira et al./cross-sectional ³¹	601	74.3	33.8/66.2	28.0	-	Belo Horizonte (MG)/community	-	-	Frailty
Brito et al./cross-sectional ³²	94	86.1	40.4/59.6	27.7	-	Lafaiete Coutinho (BA)/community	-	-	Being dependent for BADLs
Lima et al./cross-sectional ³³	106	69.5	31.1/68.9	24.5	-	São Paulo (SP)/community	-	-	Alcohol consumption greater than 4 drinks per day
Prato et al./cross-sectional ³⁴	404	65.6	40.6/59.4	24.3	35.7	Rio Grande do Sul/community	-	-	Poor sleep quality and low muscle strength
Chaimowicz et al./case-control ³⁵	161	71.0	41.6/58.4	16.8	-	Campo Belo (MG)/community	-	-	Psychoactive drugs (benzodiazepines and antidepressants)

LTCF: long-term care facility for older adults; BADLs: basic activities of daily living.

had necessarily fell previously, in addition to living in Brazil. These are not listed in the table, but their findings are discussed in the present review. Studies including older adults living in the community or in long-term care facilities (LTCFs) were assessed.

RESULTS

Database search resulted in 88 articles from MEDLINE, 58 articles from SciELO, and 163 articles from LILACS, with a total of 309 articles published between 1997 and 2017. Manuscript titles and abstracts were analyzed in order to determine whether the studies were potentially eligible for inclusion.

Then, 274 articles were considered ineligible according to inclusion and exclusion criteria. The other 35 articles were thoroughly analyzed and included in this review (Figure 1).

Most studies included in this review were cross-sectional, two were case-control studies, and one was a prospective cohort study. The majority of studies were conducted in the Brazilian Southeast and South regions. Only five studies analyzed data exclusively from the North and Northeast regions. Female sex was predominant in most samples of the selected articles.

Place of residence

Of all studies selected for review, 30 included community-dwelling older adults, while five included institutionalized patients.

Occurrence rate of falls in older adults

Of the selected articles, 23 were based on cross-sectional studies of community-dwelling older adults, which allowed the identification of occurrence rate of falls in non-institutionalized

older adults. Possibly due to the use of different methods for data collection (face-to-face interview, telephone call, or consulting medical records), the occurrence of falls in community-dwelling older adults in the previous 12 months ranged from 10.7% in the state of Rio Grande do Sul (59 cities) to 59.3% in the city of Belo Horizonte (MG).^{2,5}

Regarding recurrence of falls, data variation is even greater, also because of differences in the methods used for calculating the percentages. In some studies, the calculation is based on the ratio between number of patients who fell twice or more and total number of older adults evaluated (index), while others divide the number of patients who fell twice or more by the total number of patients who fell (coefficient or rate). The recurrence of falls in community-dwelling older adults ranged from 8.7 to 64.1%.^{2,6} However, several articles do not specify the formula used for calculation, preventing an accurate analysis of these data.

In the single prospective cohort study of community-dwelling older adults addressing the Brazilian population and selected for review, the incidence of falls was 30.9%. Recurrence was 10.8%.⁷

In the studies of older patients living in LTCFs, all cross-sectional, the occurrence of falls ranged from 32.5 to 66.7%.^{8,9} Two or more recurrent falls were found in 57.7% in a study of institutionalized older people and in 80% in a study of older adults living in LTCFs who had already fell.^{8,10}

Place, time, and circumstances of falls in community-dwelling older adults

Two studies showed that the bedroom is where community-dwelling older adults most often fall.^{2,11} Other common places for falls include bathroom, yard, and other external areas.^{2,9,12} The home, therefore, is the primary setting for falls in community-dwelling older adults, indicating that it must as safe and equipped as possible to prevent such events.^{2,11-17}

Four studies that evaluated time of falls in community-dwelling older adults showed that they most often occur during daytime (morning and afternoon).^{11,17-19} Some studies also identified the circumstances associated with falls in this population. Tripping, slipping, change in floor level, and slippery or uneven flooring contributed to falling from one's own height while walking.^{11-13,16,17,20}

The bedroom was also the most commonly reported place for falls in institutionalized older adults, followed by yard (external area) and living room.^{8-10,21,22} Only one of these studies reported time of falls, which were more frequent during daytime. The same study was also the only one that investigated the circumstances of falls in this specific population, which were associated with slipping and dizziness.⁸

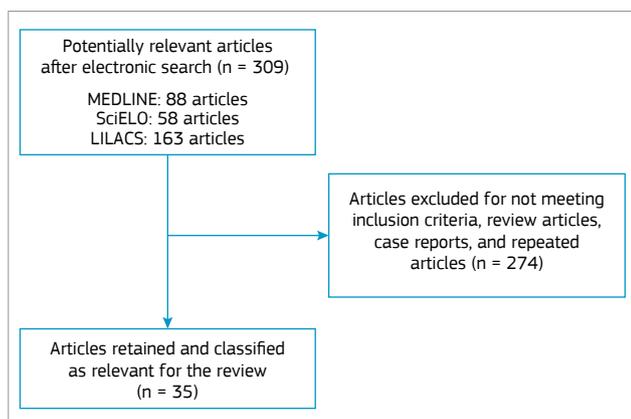


Figure 1 Flowchart showing the course of article selection. Fortaleza (CE), Brazil, 2017.

Risk factors and conditions associated with falls in older adults

Risk factors for falls in older Brazilians with strong scientific evidence

None of the selected articles showed that being male is a risk factor for falling. Nonetheless, 15 studies demonstrated that female sex is associated with falls in community-dwelling older adults.^{4-7,12,14,15,20,23-29} Other relevant risk associations for falls in older people living in the community are age greater than 80 years (7 articles),^{4-6,15,26,28,30} cognitive impairment (3 articles),^{2,3,28} and depressive symptoms (3 articles).^{3,6,26}

Risk factors for falls in older Brazilians with moderate or weak scientific evidence

The following characteristics were identified as risk factors for falls in only two of the 25 studies of community-dwelling older adults: not having a partner,^{7,28} living alone,^{4,28} osteoporosis,^{3,15} low educational level,^{5,7} frailty syndrome,^{12,31} sedentary lifestyle,^{4,30} use of mobility aids,^{5,15} poor self-perceived health,^{20,30} and being dependent for basic activities of daily living (BADLs).^{7,32}

The following clinical conditions were associated with falls in community-dwelling older adults in one study each: chronic pain for more than two years,³ osteoarthritis,³ osteoarticular diseases,²⁵ urinary incontinence,³ cataract,³ visual impairment,⁷ hearing impairment,⁶ daytime napping,²⁶ alcohol consumption greater than four drinks per day,³³ previous fracture,⁷ previous hospitalization,⁶ obesity,⁴ having more than eight associated diseases,⁶ being black,¹⁶ polypharmacy,³⁰ presence of caregiver,²⁷ winter season,²⁹ poor sleep quality,³⁴ low muscle strength,³⁴ and use of benzodiazepines and antidepressants.³⁵

In the studies of institutionalized older adults, the factors associated with falls differed considerably from those of the studies of older people living in the community. For instance, white skin color was associated with falls in two of the studies of patients living in LTCF.^{21,22} Other conditions associated with falls in this population were hypertension,⁹ back pain,²¹ use of psychotropic drugs,⁸ polypharmacy,²² depressive symptoms²², and being separated or divorced.²²

Consequences of falls in community-dwelling older adults

Falls are the main external cause of morbidity and mortality in older adults, while in younger people this is attributed to traffic accidents. Older adults who are younger and more active are more often involved in traffic accidents than in falls.¹⁷

In one study of community-dwelling older adults, fear of falling was reported by 70.4% as a consequence of having fallen.¹³ Another study reported that bone fractures occurred in 30.6% of community-dwelling older adults who fell.²⁹ In a study with similar characteristics, femur fracture occurred in 68.6%.¹³

A single selected study including a group of institutionalized older patients who fell evaluated bone fractures because of falls. It found an incidence of 40% of fractures secondary to these events.¹⁰

Antes et al.³⁶ related fear of recurrent falls, found in 57.1% of the study participants, with female sex, less interaction with friends, spine disease, and limitations for BADLs after falling. Falling depends on a number of factors, and since many of them are preventable or modifiable, relatively simple changes may reduce the risk of falls as well as morbidity and mortality in the older population.^{3,5,11}

DISCUSSION

Falling in older age is a public health issue that may lead to increased health expenses and reduced quality of life. To prevent it, a comprehensive epidemiological knowledge of the current context is important.

In the selected studies, the prevalence of falls was higher among women and those aged over 80 years.^{4-7,12,14,15,20,23-30} These data are consistent with the findings of another Brazilian study conducted by Pimentel et al.,³⁷ who found an association between falls and quality of life in community-dwelling older adults. Faller older adults had a lower mean score in the emotional domain of the 36-Item Short Form Health Survey (SF-36) quality of life measure, with development of negative feelings and fear of falling again.³⁷

Fear of falling may significantly reduce the functionality of older adults, who may remain bedbound and subjected to the onset of immobility syndrome. Such fear must be addressed by health professionals as part of the approach to fall prevention, with special attention to immobility and functional loss.^{13,36,37}

Investigating the history of falls as well as their risk factors and consequences must be included, therefore, in the anamnesis performed by Brazilian Family Health Program professionals and in the health care of older patients in any context because of the importance and prevalence of falls.⁶

The occurrence rate of falls ranged from 10.7 to 59.3% in older adults living in the community,^{2,5} and from 32.5 to 66.7% in older adults living in LTCF.^{8,9} The recurrence rate of falls in community-dwelling older adults ranged from 8.7 to 64.1%.^{2,6} However, the formula used for calculating the

recurrence rate is unclear in several articles, which may have influenced its significantly broad range.

When the present results are compared with those of the international literature, heterogeneous data emerge from different countries. Sandoval et al.³⁸ conducted a literature review on the occurrence of falls in community-dwelling older adults and included studies from Brazil, the United States, Spain, Italy, Nigeria, Turkey, and China. The occurrence rate ranged from 15.9 to 56.3%, with median of 28.5%.³⁸ Despite this great variation, falls in older adults were fairly common in different countries, with different social, economic, and cultural characteristics.

A systematic review of studies investigating falls in older adults in Southeast Asian countries found prevalence rates ranging from 10.4% in Thailand to 53.6% in the Philippines. Most risk factors identified in this review were similar to those of the Brazilian studies. However, unlike studies conducted in Brazil and other countries, this review identified as fall-related risk factors sedentary lifestyle and being dependent on family members in multigenerational environments.³⁹

A meta-analysis examined the incidence of fall-related injuries in older people in mainland China. A moderate incidence was found; overall incidence in those older than 60 years was 54.95 per 100,000 population, and women were more affected than men. In addition, the number of injuries increased proportionally to age.⁴⁰

Silva Gama et al.⁴¹ conducted another systematic review to identify incidence, risk factors, and consequences of falls in older adults in Spain. The reported annual incidence rate of falls was 30 to 35% in older adults living in the community, and 40% in those living in LTCF. Risk factors included antipsychotic drugs, benzodiazepines, comorbidities, decreased physical strength, female sex, and previous falls. The major

fall-related consequences were fractures and fear of falling. These findings were similar to those of Brazilian studies.

A limitation of the present study is the relative lack of data on falls in older adults from Brazilian North, Northeast, and Mid-west regions. Additionally, because of the predominance of cross-sectional studies, the heterogeneity of data collection methods, and the identification of a single prospective cohort study on the topic, determining the true risk factors for falls is a difficult task. Nonetheless, a comprehensive review of studies on falls in older adults in Brazil was conducted and allowed the identification of potentially modifiable risk factors in this population.

CONCLUSION

The occurrence of falls in older adults varied widely, being more common in institutionalized persons. Few studies have described the risk factors associated with this phenomenon in older adults living in LTCF.

For older adults living in the community, the most common setting for falls is the home during daytime. Fall-related circumstances include tripping, slipping, and change in floor level, resulting in falling from one's own height. Fractures and fear of falling again were identified as consequences and may lead to immobility syndrome.

Prevention is a key measure to manage falls in this population. In community-dwelling older people, several fall-associated factors are modifiable or preventable through simple interventions. Prospective studies will be useful to confirm the present results and evaluate potential interventions.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.

REFERENCES

- Dunn JE, Rudberg MA, Furner SE, Cassel CK. Mortality, disability, and falls in older persons: the role of underlying disease and disability. *Am J Public Health.* 1992;82(3):395-400.
- Chianca TCM, Andrade CR, Albuquerque J, Wenceslau LCC, Tadeu LFR, Macieira TGR, et al. Prevalência de quedas em idosos cadastrados em um Centro de Saúde de Belo Horizonte-MG. *Rev Bras Enferm.* 2013;66(2):234-40. <http://dx.doi.org/10.1590/S0034-71672013000200013>
- Dellaroza MSG, Pimenta CAM, Lebrão ML, Duarte YAO, Braga PE. Associação entre dor crônica e autorrelato de quedas: estudo populacional - SABE. *Cad Saúde Pública.* 2014;30(3):522-32. <http://dx.doi.org/10.1590/0102-311X00165412>
- Siqueira FV, Facchini LA, Silveira DS, Piccini RX, Tomasi E, Thumé E, et al. Prevalence of falls in elderly in Brazil: a countrywide analysis. *Cad Saúde Pública.* 2011;27(9):1819-26. <http://dx.doi.org/10.1590/S0102-311X2011000900015>
- Pereira GN, Morsch P, Lopes DGC, Trevisan MD, Ribeiro A, Navarro JHN, et al. Fatores socioambientais associados à ocorrência de quedas em idosos. *Ciênc Saúde Coletiva.* 2013;18(12):3507-14. <http://dx.doi.org/10.1590/S1413-81232013001200007>
- Coimbra AM, Ricci NA, Coimbra IB, Costallat LT. Falls in the elderly of the Family Health Program. *Arch Gerontol Geriatr.* 2010;51(3):317-22. <https://doi.org/10.1016/j.archger.2010.01.010>
- Perracini MR, Ramos LR. Fatores associados a quedas em uma coorte de idosos residentes na comunidade. *Rev Saúde Pública.* 2002;36(6):709-16. <http://dx.doi.org/10.1590/S0034-89102002000700008>
- Álvares LM, Lima RC, Silva RA. Ocorrência de quedas em idosos residentes em instituições de longa permanência em Pelotas, Rio Grande do Sul, Brasil. *Cad Saúde Pública.* 2010;26(1):31-40. <http://dx.doi.org/10.1590/S0102-311X2010000100004>

9. Araújo Neto AH, Patrício ACFA, Ferreira MAM, Rodrigues BFL, Santos TD, Rodrigues TDB, et al. Quedas em idosos institucionalizados: riscos, consequências e antecedentes. *Rev Bras Enferm*. 2017;70(4):719-25. <http://dx.doi.org/10.1590/0034-7167-2017-0107>
10. Alves AHC, Patrício ACFA, Albuquerque KF, Duarte MCS, Santos JS, Oliveira MS. Ocorrência de quedas entre idosos institucionalizados: prevalência, causas e consequências. *Rev Pesq Cuid Fundam*. 2016;8(2):4376-86. <http://dx.doi.org/10.9789/2175-5361.2016.v8i2.4376-4386>
11. Antes DL, D'Orsi E, Benedetti TRB. Circunstâncias e consequências das quedas em idosos de Florianópolis. *Epi Floripa Idoso 2009**. *Rev Bras Epidemiol*. 2013;16(2):469-81. <http://dx.doi.org/10.1590/S1415-790X2013000200021>
12. Fhon JRS, Rosset I, Freitas CP, Silva AO, Santos JLF, Rodrigues RAP. Prevalência de quedas de idosos em situação de fragilidade. *Rev Saúde Pública*. 2013;47(2):266-73. <http://dx.doi.org/10.1590/S0034-8910.2013047003468>
13. Coutinho ES, Bloch KV, Rodrigues LC. Characteristics and circumstances of falls leading to severe fractures in elderly people in Rio de Janeiro, Brazil. *Cad Saúde Pública*. 2009;25(2):455-59. <http://dx.doi.org/10.1590/S0102-311X2009000200024>
14. Nascimento CF, Duarte YA, Lebrão ML, Chiavegatto Filho AD. Individual and contextual characteristics of indoor and outdoor falls in older residents of São Paulo, Brazil. *Arch Gerontol Geriatr*. 2017;68:119-25. <https://doi.org/10.1016/j.archger.2016.10.004>
15. Cruz DT, Ribeiro LC, Vieira MT, Teixeira MTB, Bastos RR, Leite ICG. Prevalência de quedas e fatores associados em idosos. *Rev Saúde Pública*. 2012;46(1):138-46. <http://dx.doi.org/10.1590/S0034-89102011005000087>
16. Silva A, Faleiros HH, Shimizu WAL, Nogueira LM, Nhãn LL, Silva BMF, et al. Prevalência de quedas e de fatores associados em idosos segundo etnia. *Ciênc Saúde Coletiva*. 2012;17(8):2181-90. <http://dx.doi.org/10.1590/S1413-81232012000800028>
17. Freitas MG, Bonolo PF, Moraes EN, Machado CJ. Elderly patients attended in emergency health services in Brazil: a study for victims of falls and traffic accidents. *Ciênc Saúde Coletiva*. 2015;20(3):701-12. <http://dx.doi.org/10.1590/1415-790X201400010002ENG>
18. Meschial WC, Soares DFPP, Oliveira NLB, Nespollo AM, Silva WA, Santil FLP. Elderly victims of falls seen by prehospital care: gender differences. *Rev Bras Epidemiol*. 2014;17(1):3-16. <http://dx.doi.org/10.1590/1415-790X201400010002ENG>
19. Broska Jr. CA, Folchini AB, Ruediger RR. Estudo comparativo entre o trauma em idosos e não idosos atendidos em um Hospital Universitário de Curitiba. *Rev Col Bras Cir*. 2013;40(4):281-6. <http://dx.doi.org/10.1590/S0100-69912013000400005>
20. Carneiro JA, Ramos GCF, Barbosa ATF, Vieira EDS, Silva JSR, Caldeira AP. Falls among the non-institutionalized elderly in northern Minas Gerais, Brazil: prevalence and associated factors. *Rev Bras Geriatr Gerontol*. 2016;19(4):613-25. <http://dx.doi.org/10.1590/1809-98232016019150110>
21. Carvalho MP, Luckow ELT, Siqueira FV. Quedas e fatores associados em idosos institucionalizados no município de Pelotas (RS, Brasil). *Ciênc Saúde Coletiva*. 2011;16(6):2945-52. <http://dx.doi.org/10.1590/S1413-81232011000600032>
22. Gonçalves LG, Vieira ST, Siqueira FV, Hallal PC. Prevalência de quedas em idosos asilados do município de Rio Grande, RS. *Rev Saúde Pública*. 2008;42(5):938-45. <http://dx.doi.org/10.1590/S0034-89102008000500021>
23. Nascimento CF. Determinantes sociais da mobilidade funcional e quedas em idosos do município de São Paulo: uma análise multinível [dissertação]. São Paulo: Departamento de Epidemiologia, Faculdade de Saúde Pública, Universidade de São Paulo; 2016.
24. Stamm B, Leite MT, Hildebrandt LM, Kirchner RM, Menezes LP. Cair faz parte da vida: fatores de risco para quedas em idosos. *Rev Pesq Cuid Fundam*. 2016;8(4):5080-86. <http://dx.doi.org/10.9789/2175-5361.2016.v8i4.5080-5086>
25. Santos RKM, Maciel ACC, Britto HMJS, Lima JCC, Souza TO. Prevalência e fatores associados ao risco de quedas em idosos adscritos a uma Unidade Básica de Saúde do município de Natal, RN, Brasil. *Ciênc Saúde Coletiva*. 2015;20(12):3753-62. <http://dx.doi.org/10.1590/1413-812320152012.00662015>
26. Pereira AA, Ceolim MF, Neri AL. Associação entre sintomas de insônia, cochilo diurno e quedas em idosos da comunidade. *Cad Saúde Pública*. 2013;29(3):535-46. <http://dx.doi.org/10.1590/S0102-311X2013000300011>
27. Dantas EL, Brito GEG, Lobato IAF. Prevalência de quedas em idosos adscritos à estratégia de saúde da família do município de João Pessoa, Paraíba. *Rev APS*. 2012;15(1):67-75.
28. Motta LB, Aguiar AC, Coutinho ESF, Huf G. Prevalência e fatores associados a quedas em idosos em um município do Rio de Janeiro. *Rev Bras Geriatr Gerontol*. 2010;13(1):83-91. <http://dx.doi.org/10.1590/S1809-98232010000100009>
29. Caberlon IC, Bós AJG. Diferenças sazonais de quedas e fraturas em idosos gaúchos. *Ciênc Saúde Coletiva*. 2015;20(12):3743-52. <http://dx.doi.org/10.1590/1413-812320152012.2060201>
30. Siqueira FV, Facchini LA, Piccini RX, Tomasi E, Thumé E, Silveira DS, et al. Prevalência de quedas em idosos e fatores associados. *Rev Saúde Pública*. 2007;41(5):749-56. <http://dx.doi.org/10.1590/S0034-89102007000500009>
31. Vieira RA, Guerra RO, Giacomin KC, Vasconcelos KSS, Andrade ACS, Pereira LSM, et al. Prevalência de fragilidade e fatores associados em idosos comunitários de Belo Horizonte, Minas Gerais, Brasil: dados do estudo FIBRA. *Cad Saúde Pública*. 2013;29(8):1631-43. <http://dx.doi.org/10.1590/0102-311X00126312>
32. Brito TA, Fernandes MH, Coqueiro RS, Jesus CS. Falls and functional capacity in the oldest old dwelling in the community. *Texto contexto-enferm*. 2013;22(1):43-51. <http://dx.doi.org/10.1590/S0104-07072013000100006>
33. Lima MC, Simão MO, Oliveira JB, Cavariani MB, Tucci AM, Kerr-Correa F. Alcohol use and falls among the elderly in Metropolitan São Paulo, Brazil. *Cad Saúde Pública*. 2009;25(12):2603-11. <http://dx.doi.org/10.1590/S0102-311X2009001200007>
34. Prato SCF, Andrade SM, Cabrera MAS, Dip RM, Santos HGD, Dellaroza MSG, et al. Frequency and factors associated with falls in adults aged 55 years or more. *Rev Saúde Pública*. 2017;51(0):37. <https://doi.org/10.1590/S1518-8787.2017051005409>
35. Chaimowicz F, Ferreira TJXM, Miguel DFA. Use of psychoactive drugs and related falls among older people living in a community in Brazil. *Rev Saúde Pública*. 2000;34(6):631-5. <http://dx.doi.org/10.1590/S0034-89102000000600011>
36. Antes DL, Schneider IJC, Benedetti TRB, D'Orsi E. Medo de queda recorrente e fatores associados em idosos de Florianópolis, Santa Catarina, Brasil. *Cad Saúde Pública*. 2013;29(4):758-68. <http://dx.doi.org/10.1590/S0102-311X2013000400013>
37. Pimentel WRT, Pagotto V, Nakatani AYK, Pereira LV, Menezes RL. Quedas e qualidade de vida: associação com aspectos emocionais em idosos comunitários. *Geriatr Gerontol Aging*. 2015;9(2):42-8.
38. Sandoval RA, Sá ACAM, Menezes RL, Nakatani AYK, Bachion MM. Falls in the non-institutionalized elderly: a systematic literature review. *Rev Bras Geriatr Gerontol*. 2013;16(4). <http://dx.doi.org/10.1590/S1809-98232013000400019>
39. Romli MH, Tan MP, Mackenzie L, Lovarini M, Suttanon P, Clemson L. Falls amongst older people in Southeast Asia: a scoping review. *Public Health*. 2017;145:96-112. <https://doi.org/10.1016/j.puhe.2016.12.035>
40. Jiang J, Long J, Ling W, Huang G, Guo X, Su L. Incidence of fall-related injury among old people in mainland China. *Arch Gerontol Geriatr*. 2015;61(2):131-9. <https://doi.org/10.1016/j.archger.2015.06.003>
41. Silva Gama ZA, Gómez Conesa A, Sobral Ferreira M. [Epidemiology of falls in the elderly in Spain: a systematic review, 2007]. *Rev Esp Salud Publica*. 2008;82(1):43-55.