Temporal trend and epidemiological profile of mortality in the elderly due to falls in Pernambuco, Brazil, 2001-2015

Tendência temporal e perfil epidemiológico da mortalidade de idosos em decorrência de quedas em Pernambuco, Brasil, 2001-2015

Tendencia temporal y perfil epidemiológico de mortalidad en ancianos por caídas en Pernambuco, Brasil, 2001-2015

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RESUMO

Introdução: A ocorrência de quedas na população idosa representa um importante problema de saúde pública, tendo em vista as complicações funcionais e ampliação do risco de morte. **Objetivo**: Este trabalho objetivou descrever a tendência e o perfil epidemiológico da mortalidade de idosos em decorrência de quedas no estado de Pernambuco, Brasil, no período de 2001 a 2015. **Métodos**: Estudo observacional incluindo todos os óbitos de indivíduos com 60 anos ou mais em decorrência de quedas no estado de Pernambuco. Os dados foram obtidos do Sistema de Informações sobre Mortalidade (SIM). Foram analisadas variáveis epidemiológicas (faixa etária, sexo, raça/cor, escolaridade, estado civil, local de ocorrência, categoria do CID-10) e as taxas de mortalidade geral bruta e padronizada pela população mundial, além das taxas específicas segundo sexo e categoria do CID-10. Para as análises, foram utilizados o modelo de regressão por pontos de inflexão e a estatística descritiva. **Resultados**: Foram registrados 2080 óbitos no período estudado, com taxa de mortalidade média de 22,68/100 mil e tendência significativa de crescimento (4,5% ao ano). A taxa de mortalidade masculina (24,3/100 mil) foi superior à feminina (21,4/100 mil), embora em termos proporcionais, 54,7% dos óbitos foram de mulheres. Um percentual de 55,5% dos óbitos tinham 80 ou mais anos, 51,4% eram pardos e 50,5% possuíam baixa escolaridade (analfabeto ou até três anos de estudo). 34,6% dos óbitos foram em decorrência do código W18 (outras quedas do mesmo nível). **Conclusão**: A mortalidade de idosos em razão de quedas mostrou crescimento no estado de Pernambuco. O perfil observado mostra a importância de políticas públicas voltadas para a prevenção destes eventos.

Palavras-chaves: Acidentes por Quedas; Assistência a Idosos; Mortalidade.

ABSTRACT

Introduction: The occurrence of falls in the elderly population represents an important health problem, considering the functional complications and the increased risk of death. **Objective**: This study aimed to describe the trend and epidemiological profile of mortality in the elderly due to falls in the state of Pernambuco, Brazil, from 2001 to 2015. **Methods**: Observational study including all deaths of individuals aged 60 or over in due to falls in the state of Pernambuco. Data were obtained from the Mortality Information System (SIM). Epidemiological variables (age group, gender, race / color, education, marital status, place of occurrence, category of ICD-10) and the general gross and standardized mortality rates by the world population were analyzed, in addition to specific rates according to sex and category of ICD-10. For the analyzes, the inflection point regression model and descriptive statistics were used. **Results**: 2080 deaths were registered in the studied period, with an average mortality rate of 22.68 / 100 thousand and a significant growth trend (4.5% per year). The male mortality rate (24.3 / 100 thousand) was higher than that of women, although in proportional terms, 54.7% of deaths were women. A percentage of 55.5% of deaths were 80 years old or more, 51.4% were brown and 50.5% had low education (illiterate or up to 3 years of study). 34.6% of deaths were due to the W18 code (other falls at the same level). Conclusion: The mortality of elderly people due to falls showed an increase in the state of Pernambuco. The observed profile shows the importance of public policies aimed at preventing these events.

Keywords: Accidental Falls; Old Age Assistance; Mortality

RESUMEN

Introducción: la aparición de caídas en la población de edad avanzada representa un importante problema de salud, teniendo en cuenta las complicaciones funcionales y el mayor riesgo de muerte. **Objetivo**: Este estudio tuvo como objetivo describir la tendencia y el perfil epidemiológico de la mortalidad en los ancianos debido a caídas en el estado de Pernambuco, Brasil, de 2001 a 2015. **Métodos**: Estudio observacional que incluye todas las muertes de personas de 60 años o más en debido a caídas en el estado de Pernambuco. Los datos se obtuvieron del Sistema de Información de Mortalidad (SIM). Se analizaron las variables epidemiológicas (grupo de edad, sexo, raza/color, educación, estado civil, lugar de ocurrencia, categoría de ICD-10) y las tasas generales de mortalidad brutas y estandarizadas por la población mundial, además de tasas específicas según el sexo y la categoría. de la CIE-10. Para los análisis, se utilizó el modelo de regresión de puntos de inflexión y estadísticas descriptivas. **Resultados**: se registraron 2080 muertes en el período estudiado, con una tasa de mortalidad promedio de 22.68/100 mil y una tendencia de crecimiento significativa (4.5% por año). La tasa de mortalidad masculina (24.3/100 mil) fue mayor que la de las mujeres, aunque en términos proporcionales, el 54.7% de las muertes fueron mujeres. Un porcentaje del 55.5% de las muertes tenía 80 años o más, el 51.4% era marrón y el 50.5% tenía poca educación (analfabetos o hasta 3 años de estudio). El 34,6% de las muertes se debieron al código W18 (otras caídas en el mismo nivel). **Conclusión**: La mortalidad de las personas mayores por caídas mostró un

aumento en el estado de Pernambuco. El perfil observado muestra la importancia de las políticas públicas destinadas a prevenir estos eventos.

Palablas clave: Accidentes por Caídas; Asistencia a los Ancianos; MORTIALIDAD

INTRODUCTION

The continuous increase in the elderly population is known worldwide. According to the Pan American Health Organization - PAHO, the number of elderly people over 60 years of age will reach two billion by the year 2050[1]. Brazilian projections point out that in 2042, the country will have 24.5% of the population over 60 years old, accounting for 57 million elderly people, the fifth largest elderly population in the world [2].

With aging, physiological and pathological changes arise from functional decline, increasing the risk of cardiovascular diseases, sensory deficits (auditory and visual), cognitive and musculoskeletal disorders [3,4]. In this sense, the elderly population becomes increasingly vulnerable, thus interfering in their functionality, independence and autonomy, as well as in the performance of basic day-to-day activities[5].

Among the events that compromise functionality and increase the risk of early mortality, the exposure to falls stands out, a frequent event which has currently become a public health problem in this population [6,7]. It is estimated that on average 30% of people aged 65 years old have already experienced a fall episode [8]. In elderly people aged 70 years or over, this percentage rises to 40%, influencing the increase in morbidity and mortality in this population [8].

The concept of falling could be defined as a frequent and limiting event, which occurs unexpectedly and unintentionally, resulting in the individual's position changing to a lower level in relation to its initial position, with inability to correct it in a timely manner [7]. It is a result of the loss of postural balance and the inefficiency of the necessary mechanisms for maintaining postural control [7].

Between 1996 and 2012, there were 941,923 hospitalizations and 66,876 deaths in the elderly population due to falls in Brazil [8]. During this period, the mortality rate increased 200%, going from 1.25 to 3.75/10,000 elderly people, which characterizes an increase of 15% per year [8].

Based on the above, this study aimed to describe the temporal trend and the epidemiological profile of mortality in the elderly population due to falls in the state of Pernambuco, Brazil, from 2001 to 2015.

METHODS

Design, population and study period

This is an observational epidemiological study involving all deaths due to falls in the elderly population (individuals aged 60 or over) living in the state of Pernambuco from 2001 to 2015.

Study scenario

Pernambuco is one of the nine states in the Northeast region of Brazil, the state has an estimated population for 2019 of 9.5 million inhabitants, Human Development Index (HDI 0.673), occupying the 19th position among the Brazilian states [9]. In 2000, only 8.9% of the population of Pernambuco was 60 years old or more; em 2010, esse percentual alcançou 10,7% [9].

Study variables

In this study, epidemiological variables (age group, sex, race / color, education, marital status, place of occurrence, category of ICD-10) were included as well as the crude and standardized mortality rates by the world population, in addition to specific rates according to gender and ICD-10 category.

Data collection process

Data were extracted from the Mortality Information System (MIS), through the platform of the Informatics Department of the Brazilian Unified Health System (Datasus) (http://datasus.saude.gov.br/). For data collection, codes W00 to W19 of the International Classification of Diseases (ICD-10) were considered: W00- fall on same level involving ice and snow, W01- fall on same level due to slipping, tripping or false steps (kicks), W02- fall involving roller or ice skates, ski or wheel boards, W03- other falls on the same level by collision with or pushing by another person, W04- fall, while being carried or supported by another person (s), W05- fall involving a wheelchair, W06- fall from a bed, W07- fall from a chair, W08- fall from other type of furniture, W09- fall involving playground equipment, W10- fall on or from stairs or steps, W11- fall on or from ladders, W12- fall into or from a scaffold, W13- falling to or from buildings or other structures, W14- fall from a tree, W15- cliff fall, W16- trauma from diving or jumping into the water, W17- other falls from one level to another, W18- other falls at the same level, W19-

unspecified fall. In addition, the population data necessary to calculate mortality rates were obtained from the Brazilian Institute of Geography and Statistics (IBGE).

After data collection, rates were standardized using the direct method, considering the world population as standard as well as following age groups: 60-64 years, 65-69 years, 70-74 years, 75-79 years and 80 years or more.

Statistical treatment

Initially, the time trend of the specific mortality rate was analyzed using a inflection point regression model (joinpoint regression model). Trends were classified as increasing, decreasing or stationary. The annual percentage change (APC) and the average annual percentage change (AAPC) were calculated using a 95% confidence interval (95% CI) and a 5% statistical significance rate. Then, the epidemiological variables were subjected to simple descriptive analysis (absolute and relative frequencies).

The analyzes were performed using the Joinpoint regression software (version 4.6.0.0) and Statistical Package for the Social Sciences (SPSS-IBM version 22.0).

Ethical aspects

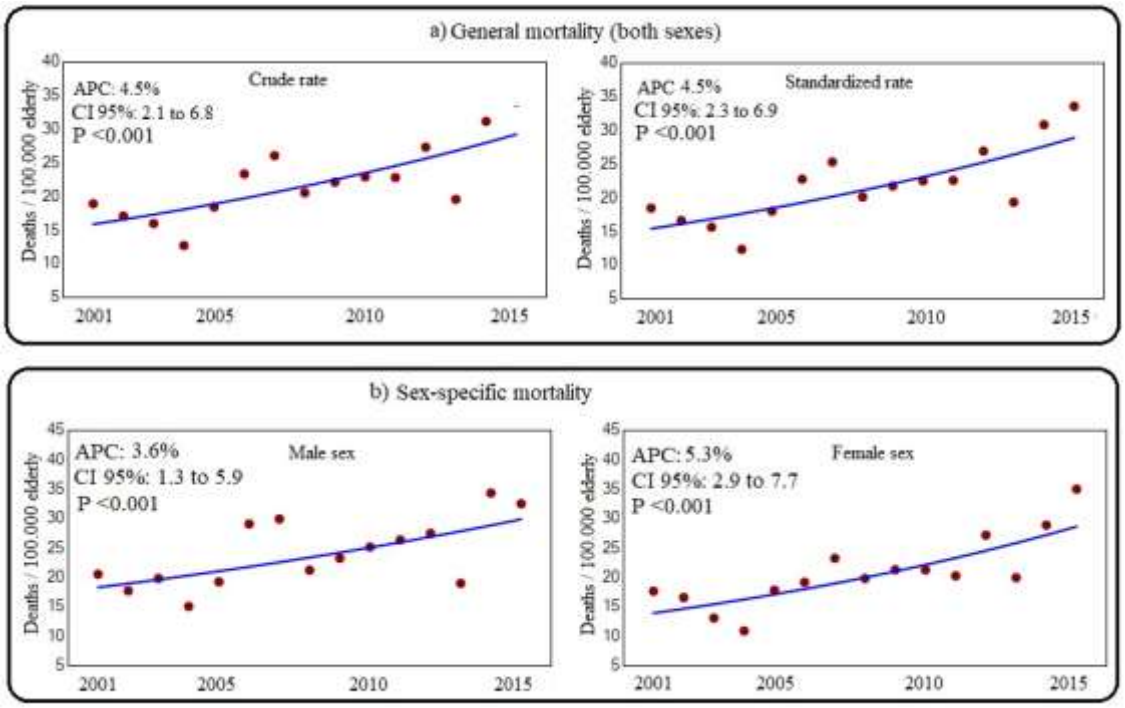
As we used secondary public domain data, this study was not necessary to be considered by the Research Ethics Committee.

RESULTS

From 2001 to 2015, 2080 deaths of elderly people were registered due to falls in the state of Pernambuco, with a crude mortality rate equals to 22.68 deaths / 100 thousand elderly people and a standardized mortality rate equals to 22.33 / 100 thousand. The mortality rate was higher in the male population (24.3 / 100 thousand) when compared to the female population (21.40 / 100 thousand). Throughout all the time series, general (crude and standardized) and sex-specific mortality rates showed an upward trend: in both sexes, the crude mortality rate went from 18.90 / 100 thousand in 2001 to 33.97 / 100 thousand in 2015 (annual increase of 4.5%), the standardized rate increased from 18.43 to 33.59 / 100 thousand (annual increase of 4.6%), male rate increased from 20.54 to

32.52 / 100 thousand (annual increase of 3.6%) and the female rate increased from 17.65 to 35.01 / 100 thousand (annual increase of 5.3%) (Figure 1).

Figure 1- Temporal evolution of elderly people specific mortality rate due to falls in Pernambuco, Brazil, 2001-2015.



*****APC: Annual percent change; CI 95%: Confidence interval of 95%.

A percentage of 55.5% (n = 1554) of deaths occurred in elderly people aged 80 years or over, 54.7% (n = 1531) were female, 51.4% (n = 1440) brown race, 61.2% (n = 1714) with up to seven years of schooling, 33.7% (n = 944) widowed and 81.7% (n = 2288) of the deaths occurred in the hospital environment **(Table 1)**.

Table 1- Epidemiological characterization of elderly deaths due to falls in Pernambuco, Brazil, 2001-2015.

Variable	**n**	**%**
Age range		
60 to 69 years	493	17.6
70 to 79 years	754	26.9
80 years or older	1554	55.5
Sex		
Male	1269	45.3
Female	1531	54.7
Ignored	1	<0.0

Race / color		
White	1193	42.6
Black	59	2.1
Asian	5	0.2
Brown	1440	51.4
Ignored	104	3.7
Schooling		
None	799	28.5
1 to 3 years	616	22.0
4 to 7 years	299	10.7
8 to 11 years	168	6.0
12 years or more	95	3.4
Ignored	824	29.4
Marital status		
Single	703	25.1
Married	871	31.1
Widowed	944	33.7
Legally separated	60	2.1
Other	20	0.7
Ignored	203	7.3
Place of fall occurrence		
Hospital	2288	81.7
Other health facility	49	1.7
Home	369	13.2
Public road	47	1.7
Others	44	1.6
Ignored	4	0.1
Total	***2801***	***100.0***

When stratifying deaths according to the ICD-10 category, mortality by code W18 (Other falls at the same level) stood out, corresponding to 34.6% of total deaths (n = 969) and a mortality rate of 7.85 / 100 thousand. It should be noted that deaths due to unspecified falls corresponded to 44.3% (n = 1240) of the total records **(Table 2)**.

Table 2- Number of deaths and specific mortality rate of elderly people due to falls, according to ICD-10, in Pernambuco, Brazil, 2001-2015.

ICD-10 category	N deaths	%	SMR/100 thousand
W01- fall on same level due to slipping, tripping or false steps (kicks)	145	5.2	1.17
W02- fall involving roller or ice skates, ski or wheel boards	2	0.1	0.02
W03- other falls on the same level by collision with or pushing by another person	1	0.0	0.01
W05- fall involving a wheelchair	3	0.1	0.02

W06- fall from a bed	114	4.1	0.92
W07- fall from a chair	36	1.3	0.29
W08- fall from other type of furniture	8	0.3	0.06
W09- fall involving playground equipment	1	0.0	0.01
W10- fall on or from stairs or steps	75	2.7	0.61
W11- fall on or from ladders	12	0.4	0.10
W12- fall into or from a scaffold	8	0.3	0.06
W13- falling to or from buildings or other structures	83	3.0	0.67
W14- fall from a tree	21	0.7	0.17
W15- cliff fall	7	0.2	0.06
W16- trauma from diving or jumping into the water	2	0.1	0.02
W17- other falls from one level to another	74	2.6	0.60
W18- other falls at the same level	969	34.6	7.85
W19- unspecified fall	1240	44.3	10.04
Total	***2801***	***100.0***	***22.68***

*****SMR- Specific Mortality Rate; No cases have been recorded for ICDs W00- fall on same level involving ice/ snow and W04- fall, while being carried or supported by other person (s).

DISCUSSION

Although the trend of annual percentage growth was higher observed in the female population, in this study, the average mortality rate in men was higher than the one observed in women. The general profile was characterized by elderly people over 80 years old, predominance of female deaths, low education, brown race, widowers and with death occurring in a hospital unit. Falls from the same level of height were the main cause of death.

The temporal behavior of mortality growth follows the global and national patterns[11-13]. In Brazil, death rate in the elderly population between 1997 and 2010 exceeded 30 / 100.00 inhabitants, and 0.61% of deaths were caused by falls [12]. The mortality rate of elderly people due to falls in Brazilian capitals increased 200% between 1996 and 2012, increasing from 1.25 to 3.75 / 10,000 elderly people, with an increase of 15% per year [14].

Studies carried out in Amparo - São Paulo and Pelotas - Minas Gerais found that 21.5% and 43.4% of the elderly assessed had frailty syndrome, respectively [15-17]. This is a condition associated with aging, which may be a precursor to disability and falls due to decreased muscle mass and strength, exhaustion, changes in gait and balance, dizziness, vertigo and changes in bone mineral density as well[15-17]. The older an individual is, the

greater its risk of frailty is, resulting in a greater occurence of falls and, consequently, hospitalization and death [15-17].

In addition, factors such as impaired neuromuscular function, previous history of falls, psychocognitive impairments, polypharmacy, use of benzodiazepines, presence of inadequate physical environment, functional disability and postural hypotension conspire to a greater risk of falls in the elderly population [18,19]. Once risk factors are identified early, falls can potentially be prevented [18,19].

Mortality rates in our study were higher for male individuals throughout the analyzed period. Brazil, the Federal District and other 20 federal capitals showed a tendency to increase mortality rates for men and women, according to a study by Abreu et al. [14]. Falls in males are associated with greater involvement of men in intense and dangerous physical activities, ignoring the limits of their own physical capacity [14-16].

Additionally, a study involving 1444 elderly people in pre-hospital care victims of falls in Maringá / Paraná, between 2006 and 2008, showed that the severity of trauma in men is greater than in women [20]. An investigation carried out in Bahia, using data from the Hospital Information System of the Unified Health System - SIH / SUS in 2014, revealed that 251 deaths were registered in elderly patients hospitalized due to falls, with the highest proportion of deaths being among men (55.4%) [21], data that corroborate our findings.

A study carried out in Natal / Rio Grande do Norte, found a predominance of the age group with the highest mortality was 80 years or more (62.86%) and race / brown color (58.62%). Regarding education, the percentage of highlight was for those who had none (36.36%), and 30.30% had one to three years of study. As for marital status, it was evidenced that 41.54% were married, and 29.23%, single or widowed [22]. This profile has been observed in most Brazilian studies and is in line with the findings observed in Pernambuco.

Corroborating with our findings, the survey for surveillance of accidents and violence (VIVA), carried out in Natal / Rio Grande do Norte, pointed out that falls in general occupied the percentage of 26.7% of recorded occurrences; as for the types of falls, those at the same level represented 50.3% of the records, as for falls from other levels, the percentage of 13.2% stands out [23]. Additionally, a study conducted in São Paulo pointed out that falls at the same level were responsible for the highest proportion of defined deaths (35%). We emphasize the importance of developing actions that can reduce these occurrences, considering that, for the most part, the episodes of falls take

place inside the home or in the immediate vicinity of the patient. In this sense, the importance of primary health care is highlighted, which, through the Family Health Strategy (ESF) and the Family Health Support Center (NASF), must know the local sociodemographic profile and develop strategies aimed at the unique needs of different age groups [25].

Among the limitations of this study, we highlight the high proportion of deaths whose nature of the fall has not been specified (44.3%). Similar percentage to that observed in Natal / RN, which proportion reached 48% [24]. The lack of detail about the information in the Mortality Information System represents a low quality of the used data [24], representing an important limitation of this study. Improvements in the quality of the records, investigation of deaths and adequate completion of the document can contribute to a better clarity of the etiology of falls and, thus, allow the development of actions that can prevent these occurrences.

CONCLUSION

During the study period, there was an increase in the mortality rate of the elderly due to falls in the state of Pernambuco, with the male rate being higher than the one observed in the female population, although the percentage of annual change was higher in this last population group. The epidemiological profile was characterized by the predominance of women, age group 80 years old or more, mixed race, low education level and death outcome occurring in the hospital. There was a predominance of falls from the same level of height.

The temporal trend and the predominant epidemiological profile indicate the seriousness of the problem in the state. Policies, plans and / or strategies must be developed in order to reduce the occurrence of falls in the elderly population, thus avoiding the occurrence of the death outcome.

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