Presence of home fall risk factors, fall perception, and fear of falling in older adults: a cross-sectional study

Presença de fatores de risco de queda domiciliar, percepção de queda e medo de cair em idosos: um estudo transversal

Caroline Rodrigues Lyra [1]
Eduardo Quadros da Silva [1]
Leidiane Aparecida Lima [1]
Eduarda Patrono dos Santos [1]
José Roberto Andrade do Nascimento Júnior [2]
Daniel Vicentini de Oliveira [1*]

[1] Universidade Cesumar (UniCesumar), Maringá, PR, Brazil
[2] Universidade Federal do Vale do São Francisco (UNIVASF), Petrolina, PE, Brazil

*Correspondence: d.vicentini@hotmail.com

Abstract

Introduction: Concerns regarding home falls, perceptions of falling, and associated fear are essential to understanding the challenges faced by older adults and to inform prevention and intervention strategies. **Objective:** To investigate the association of home fall risk factors with sociodemographic, health-related, perception of falls, and fear of falling variables in older adults. **Methods:** A cross-sectional study was conducted with 201 older adults of both sexes residing in South and Southeast of Brazil. A sociodemographic and health profile questionnaire, the Falls Risk Awareness Questionnaire (FRAQ-Brazil), a questionnaire on perception of home fall risk, and the Falls Efficacy Scale-International (FES-I-Brazil) were utilized. Data were analyzed using the chi-square test, binary logistic regression, and Hosmer-Lemeshow test (p < 0.05). **Results:** A higher proportion of older adults with lower levels of education, lower monthly income, and from the southern region of the country were noted to have more home fall risk factors (p < 0.05). A higher proportion of older adults with good perceived health engaged in physical exercise, and without reported osteoarthritis were highlighted to have fewer home fall risk factors (p < 0.05). A higher proportion of older adults with less fear of falling were evidenced to have fewer home fall risk factors (p < 0.05). Illiterate older adults, those with incomplete primary education, non-users or light users of medication, and those with higher income were found to have higher odds of having more than eight home fall risk factors. **Conclusion:** The results of this study emphasize the importance of education, income, and geographical location in identifying home fall risk factors among older adults.

Keywords: Accidental falls. Aging. Homebound patients.

Resumo

Introdução: *Preocupações com quedas domiciliares, percepções de queda e medo associado tornam-se essenciais para compreender os desafios enfrentados pelos idosos brasileiros e informar estratégias de prevenção e intervenção.* **Objetivo:** *Investigar a associação da presença de fatores de risco domiciliares com variáveis sociodemográficas, de saúde, percepção de quedas e medo de cair em pessoas idosas.* **Métodos:** *Trata-se de um estudo transversal realizado com 201 idosos de ambos os sexos, residentes no sul e sudeste do Brasil. Utilizou-se um questionário de perfil sociodemográfico e de saúde, o Falls Risk Awareness Questionnaire (FRAQ-Brasil), um questionário de percepção de risco dentro do domicílio e a Falls Efficacy Scale-International (FES-I-BRASIL). Os dados foram analisados pelo teste qui-quadrado, regressão logística binária e teste Hosmer-Lemeshow (p < 0,05).* **Resultados:** *Notou-se maior proporção de idosos com menor nível de escolaridade, menor renda mensal e da região sul do país com mais fatores de risco domiciliares (p < 0,05). Destacou-se maior proporção de idosos com percepção de saúde boa, que praticam exercício físico e que não reportaram ter osteoartrite com menos fatores de risco domiciliares (p < 0,05). Evidenciou-se maior proporção de idosos com menor medo de cair com menos fatores de risco domiciliares para quedas (p <0,05). Os idosos analfabetos, com ensino fundamental incompleto, que não utilizam ou utilizam um ou dois medicamentos e com maior renda apresentaram mais chances de possuírem mais de oito fatores de risco para quedas no domicílio.* **Conclusão:** *Os resultados deste estudo destacam a importância da educação, renda e localização geográfica na identificação dos fatores de risco de quedas em casa entre idosos.*

Palavras-chave: *Acidentes por quedas. Envelhecimento. Pacientes domiciliares.*

Introduction

Falls are characterized by the involuntary movement of the body toward lower levels from the initial position, resulting in either landing on the ground or requiring support during displacement, potentially causing harm to the individual.[1,2] There is a growing trend of falls in Brazil, with an annual increase rate of 5.45%, as well as in other countries. Moreover, the southern and south-eastern regions of Brazil exhibit higher rates of fall-related incidents in the country.[3,4]

Among the primary consequences of falls for older adults are bruises, fractures, especially in the femur and hip, lacerations, hematoma, pain or discomfort, trauma, anxiety, depression, and fear of falling again, which may result in physical disability or, in extreme cases, death.[5] The increase in hospitalizations and medical costs is significantly evident, as well as the significant impact on individuals' quality of life.[6]

Falls among the older adult population present a complexity stemming from various factors, classified as intrinsic and extrinsic. Intrinsic factors refer to physiological changes associated with the aging process, while extrinsic factors are related to the surrounding environment.[7] In the context of extrinsic factors, a range of elements play a crucial role in increasing the risk of falls. Inadequate lighting, slippery surfaces, challenging step heights or narrow widths, absence of handrails, improper arrangement of furniture, presence of objects or rugs, as well as irregular architecture of residences, and damaged or slippery sidewalks emerge as protagonists in this scenario.[7,8]

Several characteristics representing significant fall risk factors among older adults in the community have been identified.[3] These include the absence of a spouse, living alone, presence of osteoporosis, low educational level, manifestation of frailty syndrome, sedentary lifestyle, need for assistance with mobility, negative perception of one's health, and dependence on activities of daily living. Furthermore, it was observed that these risks are more pronounced in females.[9]

It is crucial to highlight that falls entail the subsequent fear of falling again, which directly influences the loss of independence and withdrawal from social relationships, as well as significantly impacting the frailty of the older person, resulting in mobility restriction and a notable reduction in quality of life.[10] The home environment emerges as a predominant factor in this scenario, triggering fear and generating additional vulnerability to falls.[11]

The relevance of this study is justified by the urgency to prevent falls among older adults in their homes, as it aligns with the National Health Promotion Policy[12] and is also based on the Sustainable Development Goals (SDGs)[12] aiming for better living conditions during aging. The focus is on early identification of circumstances or actions that influence, or could influence,

the occurrence of these incidents. This approach enables effective care planning, aiming not only for physical safety but also for the emotional and social well-being of older adults, thus contributing to elevated quality of life and maintenance of autonomy during aging.[12]

Thus, the present study aims to offer a detailed and contextualized analysis of the risk factors for falls at home, specific to elderly Brazilians. By doing so, it seeks to provide support for the formulation of more effective public policies adapted to the country's reality, contributing to the promotion of safer and healthier aging. This study aimed to investigate the association of the presence of home fall risk factors with sociodemographic, health, fall perception, and fear of falling variables in older adults.

Methods

This is a quantitative, observational, cross-sectional, and analytical study. The project was approved by the Research Ethics Committee of the University Cesumar (UniCesumar) under protocol Number 6,245,516/2023. The research followed the guidelines of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

Participants

The non-probabilistic sample was chosen unintentionally and for convenience, consisting of 201 older adults (aged 60 or older), of both sexes, residing in South and Southeast of Brazil, 2023. Only community-dwelling older adults, i.e., those who were not institutionalized or hospitalized, were included. The use of a non-probability convenience sample is justified by the difficulty of obtaining precise information about the total older population size across all regions of the country. In this method, participants are selected based on accessibility and availability, allowing for the quick and efficient inclusion of older individuals who meet the study criteria. This approach is especially useful when resources and time are limited and when the aim is to explore patterns or generate preliminary hypotheses. Although it does not allow for the generalization of results to the entire older population in Brazil, this method facilitates the collection of relevant data and preliminary insights that can guide more

comprehensive future studies and the development of targeted public policies.

Individuals who answered all questions in the provided instruments, whether or not they required assistance from others to use digital media where the questionnaires were embedded, were also included. Exclusion criteria comprised bedridden individuals, those with cognitive impairment, and those without internet access, as the questionnaires were answered through Google Forms.

Data collection instruments

For the assessment of sociodemographic and general health profiles, a questionnaire developed by the authors was used, with questions regarding age, sex, marital status, current and previous work (occupation), retirement or pensions, education, monthly income in minimum wages, residence (rural or urban), current health perception, medication use, presence of polypharmacy, physical exercise practice, and presence of non-communicable chronic diseases.

The Falls Risk Awareness Questionnaire (FRAQ-Brazil) assessed the level of perception and knowledge about falls in the elderly population, in its different dimensions, consisting of 25 closed-ended questions and a total of 32 points, with higher scores indicating a better perception of fall risks. For its analysis, a better level of knowledge about falls was considered when the respondent achieved a higher number of correct answers, reflecting, to some extent, a satisfactory score for this research, with no cutoff point established by the authors as an adequate level of perception.[13] As a result of the FRAQ-Brazil, the total points ranged from 13 to 30 out of 32, with a mean of 23.95 and a median of 25.0 – the value used to dichotomize the data (up to 25 points and > 25 points).

In addition to the FRAQ-Brazil questionnaire, a third data collection instrument, developed by the authors themselves, was applied to assess the perception of risk within the home, addressing household environmental and behavioral risk factors for falls, the subject of this study. The questionnaire consists of 20 questions with closed-ended responses of yes or no, with items related to household risk factors. The questionnaire was designed based on risk factors described in the literature as frequently associated with a higher chance of falls in older adults, such as lighting, safety bars,

slippery floors, furniture height, obstacles in the path, long clothing, and secure footwear.[14,15] The values ranged from 0 to 14 out of 20, with a mean of 7.2 and a median of 8, the value adopted to dichotomize the data (up to 8 risk factors and >8 risk factors).

To assess the fear of falling, the Falls Efficacy Scale-International (FES-I-BRAZIL) was used. The scale consists of 16 questions with response options ranging from "not at all concerned" (1), "a little concerned" (2), "very concerned" (3), to "extremely concerned" (4), generating a score between 16 (absence of concern) and 64 points (extreme concern). The higher the score, the greater the fear of falling.[16]

Data collection procedures

Data collection was conducted through an online form made available for free via Google Forms. Individuals who were interested in participating in the research accepted the Informed Consent Form on the online form. The link developed to host the electronic questionnaire for the study was made available online through the researchers' social media channels (Whats App, Instagram, Twitter, and Facebook). The online questionnaire remained open to receive responses for 60 days (from September to November 2023). Older adults who had difficulties accessing the internet and/or the questionnaire form were assisted by others.

Data analysis

Data were analyzed using SPSS software version 25.0. Descriptive and inferential statistics were used. Frequency and percentage were used as descriptive measures for categorical variables. The chi-square test was employed to compare the proportions of the pre-sence of home fall risk factors (up to 8 risk factors and > 8 risk factors) with sociodemographic, health, fall perception, and fear of falling variables. Binary logistic regression (crude and adjusted analysis) was used to examine the associations of sociodemographic and clinical variables (independent variables) with the presence of more than eight home fall risk factors (dependent variable). For regression analysis modeling, only variables with a significance level equal to or less than 0.20 for association with the presence of home fall risk factors in the chi-square test were considered. Model fit was assessed using the Hosmer-Lemeshow test. A significance level of $p < 0.05$ was considered.

Results

A total of 201 older adults participated in the research, comprising 128 women and 73 men, with ages ranging from 60 to 86 years (M = 68.20; SD = 6.10). According to Table 1, the prevalence of older adults was observed in the age group of 60 to 69 years (62.7%), with a partner (59.7%), and of white ethnicity (84.1%).

Table 1 - Sociodemographic profile of the older adults participants in the study

Variables	f (%)
Gender	
Male	73 (36.3)
Female	128 (63.7)
Age range	
60 to 69 years	126 (62.7)
70 to 79 anos	66 (32.8)
80 years or older	9 (4.5)
Marital status	
With a partner	120 (59.7)
Without a partner	81 (40.3)
Education level	
Illiterate	19 (9.5)
Incomplete primary education	51 (25.4)
Complete primary education	17 (8.5)
Complete secondary education	36 (17.9)
Higher education	78 (38.7)
Color skin	
White	169 (84.1)
Black/Brown	21 (10.4)
Yellow	11 (5.5)
Monthly income (minimum wage)	
1 to 2	94 (46.8)
2,1 to 3	36 (17.9)
More than 3	71 (35.3)
Retirement	
Yes	162 (80.6)
No	39 (19.4)
Region of the country	
South	137 (68.2)
Southeast	64 (31.8)
Housing	
Urban	193 (96.0)
Rural	8 (4.0)

Most participants had a monthly income of up to three minimum wages (64.7%), were retired (80.6%), originated from the southern region of the country (68.2%), resided in urban areas (96.0%), and had high school or higher education (56.6%) (Table 1).

Regarding the health profile of the older adults, it was found that the majority perceive themselves as having good health (53.2%), engage in physical exercise (56.2%), and use between one and four medications regularly (64.2%). Regarding the presence of diseases, there is a predominance of older adults with the absence of heart disease (87.6%), stroke (97.0%), diabetes (71.1%), cancer (96.0%), osteoarthritis (74.1%), lung disease (91.5%), depression (79.6%), and osteoporosis (74.6%), however, 56.2% of older adults reported having systemic arterial hypertension (SAH).

Table 2 presents the presence of home fall risk factors among the participating older adults in the research. Notably, the most prevalent home fall risk factors were as follows: getting up at night (81.6%), lights off at night (75.6%), and slippery floor (56.7%).

Table 2 - Presence of home fall risk factors among the older adults participating in the research

Variables	f (%)
Dimmed lights at night	152 (75.6)
Getting up at night	164 (81.6)
Slippery or unprotected bathroom	51 (25.4)
Absence of handrail on stairs	59 (29.4)
Objects out of reach	26 (12.9)
Dimmed lights in dark areas	102 (50.7)
Living alone or with another older adult	92 (45.8)
Seats without armrests or backrests	85 (42.3)
Uneven floors	98 (48.8)
Pets in the household	108 (53.7)
Obstacles along the pathway inside the house	55 (27.4)
Slippery floors	114 (56.7)
Unprotected hallway	67 (33.3)
Wearing excessively long clothing at home	3 (1.5)
Consuming alcohol	44 (21.9)
Room without a lamp	14 (7.0)
Children in the household during part of the day	44 (21.9)
Wearing inappropriate footwear	59 (29.4)
High mattress or bed	104 (51.7)
Inadequate toilet height	70 (34.8)

Table 3 presents the association of the presence of home fall risk factors with sociodemographic variables.

Table 3 - Association of the presence of home fall risk factors with sociodemographic variables

Variables	Risk factors - f (%)		X^2	p
	Up to 8	> 8		
Gender				
Male	45 (61.6)	28 (38.4)	0.629	0.428
Female	86 (67.2)	42 (32.8)		
Age group				
60 to 69 years	82 (65.1)	44 (34.9)		
70 to 79 years	43 (65.2)	23 (34.8)	0.004	0.948
≥ 80 years	6 (66.7)	3 (33.3)		
Marital status				
With partner	77 (64.2)	43 (35.8)	0.133	0.715
Without partner	54 (66.7)	27 (33.3)		
Education				
Illiterate	7 (36.8)	12 (63.2)		
IPE	23 (45.1)	28 (54.9)		
CPE	12 (70.6)	5 (29.4)	21.847	< 0.001*
CSE	28 (77.8)	8 (22.2)		
HE	61 (78.2)	17 (21.8)		
Race/Ethnicity				
White	110 (65.1)	59 (34.9)		
Black/Brown	14 (66.7)	7 (33.3)	0.001	0.994
Yellow	7 (63.6)	4 (36.4)		
Monthly income				
1 to 2 MW	48 (51.1)	46 (48.9)		
2.1 to 3 MW	29 (80.6)	7 (19.4)	11.896	0.001*
> 3 MW	54 (76.1)	17 (23.9)		
Retirement				
Yes	104 (64.2)	58 (35.8)	0.351	0.554
No	27 (69.2)	12 (30.8)		
Region				
South	81 (59.1)	56 (40.9)	6.939	0.008*
Southeast	50 (78.1)	14 (21.9)		
Housing				
Urban	126 (65.3)	67 (34.7)	0.026	0.571
Rural	5 (62.5)	3 (37.5)		

Note: up to 8 risk factors (n = 131); more than 8 risk factors (n = 70). IPE = incomplete primary education; CPE = complete primary education; CSE = complete secondary education; HE = higher education; MW = minimum wage. *Significant association - p < 0.05: chi-square test.

Significant associations were found between the presence of home fall risk factors and education level (p < 0.001), monthly income (p = 0.001), and region of the country (p = 0.008). A higher proportion of older adults with lower levels of education, lower monthly income, and from the southern region were observed to have more than eight home fall risk factors (Table 3).

Upon analyzing the association of home fall risk factors with health variables (Table 4), a significant association was found with health perception (p = 0.014), physical exercise practice (p < 0.001), and osteoarthritis (p = 0.046). It is noteworthy that a lower proportion of older adults with good health perception, who engage in physical exercise, and who did not report having osteoarthritis were associated with more home fall risk factors (above 8). A significant association was found between the presence of home fall risk factors and fear of falling (p = 0.047), highlighting a higher proportion of older adults with lower fear of falling (77.1%) having fewer home fall risk factors (up to 8) (Table 5).

Table 4 - Association of the presence of risk factors in the household with health variables

Variables		Presence of risk factors - f (%)		X^2	p
		Up to 8	> 8		
Health perception	Good	77 (72.0)	30 (28.0)		
	Fair	48 (60.0)	32 (40.0)	6.067	0.014*
	Poor	6 (42.9)	8 (57.1)		
Medication	Does not use	18 (51.4)	17 (48.6)		
	1 to 2	55 (65.5)	29 (34.5)	3.412	0.065
	3 to 4	31 (68.9)	14 (31.1)		
	More than 4	27 (73.0)	10 (27.0)		
Physical exercise practice	Yes	87 (77.0)	26 (23.0)	15.879	< 0.001*
	No	44 (50.0)	44 (50.0)		
Has or had heart disease	Yes	15 (60.0)	10 (40.0)	0.337	0.562
	No	116 (65.9)	60 (34.1)		
Hypertension	Yes	70 (61.9)	43 (38.1)	1.184	0.276
	No	61 (69.3)	27 (30.7)		
Cerebrovascular accident	Yes	5 (83.3)	1 (16.7)	0.899	0.667
	No	126 (64.6)	69 (35.4)		
Diabetes	Yes	36 (62.1)	22 (37.9)	0.346	0.556
	No	95 (66.4)	48 (33.6)		
Cancer	Yes	5 (62.5)	3 (37.5)	0.026	0.871
	No	126 (65.3)	67 (34.7)		
Osteoarthritis	Yes	28 (53.8)	24 (46.2)	3.966	0.046*
	No	103 (69.1)	46 (30.9)		
Pulmonary disease	Yes	11 (64.7)	6 (35.3)	0.002	0.966
	No	120 (65.2)	64 (34.8)		
Depression	Yes	23 (56.1)	18 (43.9)	1.870	0.172
	No	108 (67.5)	52 (32.5)		
Osteoporosis	Yes	28 (54.9)	23 (45.1)	3.177	0.075
	No	103 (68.7)	47 (31.3)		

Note: up to 8 risk factors (n = 131); more than 8 risk factors (n = 70). *Significant association - p < 0.05: chi-square test.

Table 5 - Association of the presence of risk factors in the household with the perception of falls and fear of falling

Variables	Risk factors - ƒ (%)		X²	p
	Up to 8	> 8		
Perception of falls				
Up to 25 points	57 (64.0)	32 (36.0)	0.090	0.765
> 25 points	74 (66.1)	38 (33.9)		
Fear of falling				
Less fear	37 (77.1)	11 (22.9)		
More fear	94 (61.4)	59 (38.6)	3.940	0.047*

Note: up to 8 risk factors (n = 131); more than 8 risk factors (n = 70).

*Significant association - p < 0.05: chi-square test.

For the regression analysis modeling, only variables that showed a significance level equal to or lower than 0.20 in the chi-square test were considered. Table 6 presents the factors associated with the presence of more than eight home fall risk factors. In the crude analysis, a significant association was found between the presence of more than eight home fall risk factors and education level (p < 0.001), monthly income (p = 0.001), region of the country (p = 0.010), health perception (p = 0.049), physical exercise practice (p < 0.001), and osteoarthritis (p = 0.048). When the analysis was adjusted for all variables in the model, a significant association (p < 0.005) was found between the presence of more than eight risk factors and education level, monthly income, medication use, and depression.

Table 6 - Factors associated with the presence of more than eight household risk factors

	Variables	OR crude	OR adjusted [CI 95%]
Education	Illiterate	6,151 [2,097 - 18,042]*	4,742 [1,086 - 20,695]*
	Incomplete elementary school	4,368 [2,022 - 9,436]*	4,079 [1,246 - 13,352]*
	Complete elementary school	1,495 [0,462 - 4,835]	1,047 [0,256 - 4,292]
	Complete high school	1	1
Monthly income (minimum wage)	1 to 2	3,044 [1,544 - 6,001]*	0,983 [0,362 - 2,664]
	2.1 to 3	0,767 [0,285 - 2,062]	0,267 [0,075-0,951]*
	More than 3	1	1
Region of the country	South	2,469 [1,246 - 4,891]*	1,173 [0,499 - 2,758]
	Southeast	1	1
Health perception	Good	0,292 [0,094 - 0,913]*	0,825 [0,161 - 4,239]
	Fair	0,500 [0,158 - 1,578]	0,618 [0,145 - 2,635]
	Poor	1	1
Medication	Does not use	2,550 [0,954 - 6,813]	14,968 [3,491 - 64,171]*
	1 to 2	1,424 [0,606 - 3,343]	3,506 [1,014 - 12,124]*
	3 to 4	1,219 [0,466 - 3,190]	2,684 [0,770 - 9,357]
	More than 4	1	1
Physical exercise practice	Yes	0,299 [0,163-0,547]*	0,544 [0,232 - 1,275]
	No	1	1
Osteoarthritis	Yes	1,919 [1,005 - 3,664]*	1,263 [0,545 - 2,927]
	No	1	1
Depression	Yes	1,625 [0,807 - 3,273]	3,081 [1,162 - 8,165]*
	No	1	1
Osteoporosis	Yes	1,800 [0,939 - 3,450]	1,307 [0,555 - 3,078]
	No	1	1
Fear of falling	Less fear	0,474 [0,224 - 1,001]	0,525 [0,213 - 1,293]
	More fear	1	1

Note: OR = odds ratio (adjusted for all variables); CI = confidence interval. *Significant association - p < 0.05: binary logistic regression.

It is noteworthy that illiterate older adults and those with incomplete elementary education presented, respectively, 4.742 (95% CI = 1.086 - 20.289) and 60.865 (95% CI = 8.047 - 458.335) times more chances of having more than eight home fall risk factors compared to older adults with higher education. Older adults who do not use medications and those who use one to two medications showed 14.968 (95% CI = 3.491-64.171) and 3.506 (95% CI = 1.014 - 12.124)] times more chances of having more than eight home fall risk factors compared to older adults who use more than four medications. Older adults who reported having depression showed 3.081 times (95% CI = 1.162 - 8.165) more chances of having more than eight home fall risk factors compared to older adults who did not report having depression. Lastly, monthly income emerged as a protective factor, indicating that older adults with higher monthly income (more than 3 minimum wages) have more chances of presenting more than eight home fall risk factors compared to older adults with incomes ranging from 2.1 to 3 minimum wages.

Discussion

Regarding the home fall risk factors that contribute most to falls, the act of getting up at night, the absence of adequate lighting during this period, and the presence of slippery floors stood out. Getting up at night may be related to the presence of nocturia due to the use of antihypertensive medication and/or weakness of the pelvic floor.[17] Lack of adequate lighting compromises visibility and depth perception in the environment, making it difficult to identify obstacles, steps, objects on the floor, and potential hazards. Additionally, aging brings a reduction in visual capacity and changes in balance since it depends on sensory information captured by vision.[8]

Moreover, slippery floors represent a significant risk of falling, compromising shoe traction on the ground. This scenario makes it especially challenging for older adults to maintain balance while walking, given that the decrease in muscle strength and elasticity, characteristic of aging, directly impacts bodily stability. Body balance is sustained by the harmonious integration of sensory information from vision, the vestibular system, and muscle strength; any alteration leads to body sway and less control in the upright position.[7]

As highlighted by Chehuen Neto et al.,[2] home fall risk factors include the absence of adequate lighting, the act of getting up at night, and the presence of slippery surfaces in the bathroom, which align with the results presented in this study. According to Leitão et al.,[9] falls at home during the daytime are the most frequent, and among the circumstances are stumbles, slips, and the presence of level differences.

We found a higher proportion of older adults with lower educational levels (illiterate or incomplete elementary education) who have more than eight home fall risk factors associated with falls. These factors are intrinsically linked to a lack of information and knowledge about associated risks, crucial conditions for implementing preventive actions to ensure a safer home environment. As indicated in the World Health Organization's global report on fall prevention in old age,[1] socioeconomic factors such as lower educational levels are considered significant risk elements for fall occurrences. Additionally, the level of education influences the spatial perception of older adults; that is, when performing visual search tasks, individuals with lower education levels need more time, make more errors, and achieve fewer goals than individuals with higher education.[18]

We identified that older adults from the southern region present more than eight home fall risk factors. Despite the broad distribution of online questionnaires, it was observed that most responses come from older adults residing in the south of Brazil. Additionally, it is notable that many studies on the epidemiology of falls mainly focus on the southern and southeastern regions of the country, as evidenced by Stamm et al.,[19] Prato et al.[20] and Gonçalves et al.[3] In an integrative literature review conducted by Leitão et al.,[9] a more significant prevalence of research on falls in older adults was found in the southeastern Brazilian region, followed by the southern region.

In the present study, older adults who perceive their health as good are those who have less than eight home fall risk factors. A positive perception of health has a significant impact on reducing the risk of falls, directly influencing self-protection mechanisms.[21] Poor health perception can affect confidence in balance and the ability to move safely, influencing accidents.[22,23] According to Mauritzson et al.,[24] presenting a better overall health status was associated with not taking preventive measures against falls.

We found that older adults who engage in physical exercise are those who have less than eight home fall risk factors. Regular physical exercise is directly related to reducing the risk of falls in older adults, as it improves balance, muscle strength, flexibility, coordination, and the ability to react to imbalances.[7,25] Multicomponent interventions, usually including exercises, can reduce the fall rate and risk compared to usual care, which can improve the quality of life.[26]

Older adults who did not report having osteoarthritis are those who have less than eight home fall risk factors. Osteoarthritis is a disabling condition that can significantly limit the ability to walk, coordinate movements, maintain balance, climb stairs, stand up, and perform other daily activities. This can increase the individual's functional dependence.[27] It is observed that knee osteoarthritis likely contributes to changes in balance, and gait, and an increase in the risk of falls in older adults.[28] The absence of intrinsic fall factors contributes to minimizing risks, mainly in aspects related to physical capacity.[2,6]

We found that older adults who have less fear of falling are also those who have fewer home fall risk factors. Awareness of fall risk factors not only drives the adoption of self-care practices but also motivates the implementation of environmental adaptations aimed at improving home safety. There is a significant relationship between home safety and the prevalence of falls, as well as fear of falling in older adults, as evidenced in studies such as Mortazavi et al.[29] It is important to note that individuals with a deeper understanding of fall risks appear to be less exposed to risk factors in their homes, suggesting a possible correlation between preventive knowledge and residential safety.[2] This connection underscores the importance of disseminating information about fall prevention among older adults, not only to reduce the incidence of accidents but also to cultivate a safe and reliable environment in their residences.

According to the results of this study, older adults who do not use medication or use one to two medications are more likely to have more than eight home fall risk factors compared to those who use more medications. Falls are a complex event, resulting from multiple factors, and proper medication management and treatment adherence are crucial aspects, as falls may or may not be directly related to medication and how it is administered.[8] Chianca et al.[30] express disagreement regarding the association between falls, medication use, and the occurrence of falls. This position suggests that, according to the findings of these researchers, there may be nuances or specific variables that contradict the commonly established conception of the direct influence of these factors on the propensity for falls in certain contexts or studied populations.[30]

Furthermore, the results of this research indicate that a portion of the older adults analyzed (56.2%) face challenges related to hypertension, thus increasing the risk of falls, especially among those who have or had depression (79.6%), who consequently use medication. Thus, the continuous use and improper administration of medication in these specific conditions can become aggravating factors, especially considering that medication classes such as psychotropics and antihypertensives are often associated with falls, as highlighted by Oliveira et al.[23] and Fountouki et al.[31] Souza et al.[32] showed that patients using antihypertensives had a worse perception and knowledge of the risk of falls than older adults who did not use these medications. However, some studies report that as the number of medications consumed by an individual increases, their vulnerability to falls also increases.[7,33] It is crucial to emphasize the importance of an individualized analysis of medications, considering the potential side effects and drug interactions that each of them may induce.

Another finding of this study pertains to older adults who reported having or having had depression, showing higher chances of having more than eight home fall risk factors. This can be explained by depression being frequently associated with reduced mobility, resulting in greater physical frailty and, consequently, increased vulnerability to falls. Moreover, the impacts of depression on cognitive function, including attention, focus, and balance, can further exacerbate the risk of accidents. The use of antidepressant medications also deserves attention, as it may be related to various adverse effects, such as dizziness and drowsiness, which can compromise stability and increase the propensity for falls.[31]

Additionally, heightened fear of falling, a common concern among depressive individuals, can trigger avoidance behaviors and reduced physical activity, contributing to frailty. All these factors lead to an increased risk of falls.[9,23] As evidenced by Amancio et al.,[34] depression is a known factor for decreasing functional capacity, exerting a significant influence on

the vulnerability score of older adults. Furthermore, studies such as those by Iaboni and Flint[35] and Schone et al.[36] emphasize the direct association between both depression and fear of falling with gait and balance impairment, crucial factors in fall prevention in older adults.

Finally, in this study, we found that older adults with higher monthly incomes are more likely to have more than eight home fall risk factors compared to those with lower incomes. Older adults with higher income may live in larger houses, which may have more accident-prone areas, and they also tend to have a greater quantity of furniture and objects, increasing the chance of falls and collisions. Thus, even though financial status allows for a more comfortable and spacious environment, preventive measures need to be taken to ensure the safety of older adults in their residences. The study by Souza et al.[32] showed that older adults with high fall risk had higher family income. In contrast to the results of this study, Lage et al.[22] pointed out that the lower the income, the higher the occurrence of falls. This highlights the complexity and multifactorial nature of the causes of falls in older adults.

Despite the significant findings, this study has limitations. The sample is not representative of the general older adult population, hindering the generalization of results. The information provided by participants may be inaccurate due to memory or comprehension issues with the questions. Participants may provide socially desirable responses instead of true answers, especially in sensitive questions. Several other variables influence the results besides those analyzed. Therefore, future research should analyze how falls risk factors vary between different age subgroups within the older population, providing more detailed insights into the needs of different age groups and improving targeted interventions. Furthermore, it becomes relevant to analyze the interaction between health variables, such as hypertension, and other fall risk factors. Moreover, the identification and quantification of home fall risk factors may not be accurate or comprehensive.

Conclusion

The results of this study highlight the importance of education, income, and geographical location in identifying home fall risk factors among older adults.

Those with lower educational attainment, higher monthly income, and residing in the southern region showed a higher prevalence of risk factors. On the other hand, it was observed that older adults with a positive health perception, who engage in physical exercise, and who did not report osteoarthritis had fewer home fall risk factors. Additionally, a relationship between lower fear of falling and the presence of fewer home fall risk factors was evidenced. Notably, older adults with lower educational attainment and those who use fewer medications were identified as higher-risk groups. Monthly income also emerged as a protective factor, suggesting that older adults with lower income have fewer home fall risk factors. These findings underscore the importance of multifaceted approaches in preventing falls among older adults, considering not only individual health aspects but also socioeconomic and environmental factors.

Authors' contributions

CRL, EQS, LAL and EPS participated in the conception, design, analysis and interpretation of data. JRANJ and DVO participated in the writing of the manuscript and its review. All authors approved the final version.

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