

FACTORS ASSOCIATED WITH THE RISK OF FALLS IN OLDER ADULTS: A CROSS-SECTIONAL STUDY

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Abstract

This study aimed to identify the risk of falls among older adults receiving care at a Primary Health Care Unit in the municipality of Campina Grande, Paraíba, Brazil. This was an observational, cross-sectional, descriptive, and analytical study with a quantitative approach, conducted in October 2023. The sample consisted of 99 participants. Three instruments were used for data collection: 1) a questionnaire for sample characterization; 2) the *Berg Balance Scale (BBS)*; and 3) the *Timed Up and Go Test (TUGT)*. Data were entered into *Microsoft Excel®* and exported to the *Statistical Package for the Social Sciences*. Fisher's exact test was applied. Categorical variables were presented as absolute and relative frequencies. A statistically significant association was observed between age group and fall-risk classification according to the TUGT ($p<0.001$) and BBS ($p=0.003$), as well as between income and fall risk according to the BBS ($p=0.006$). Among self-reported health conditions, diabetes *mellitus* was associated with fall-risk classification according to the TUGT ($p=0.041$), whereas low back pain was associated with fall-risk classification according to the BBS ($p<0.001$). Other health conditions were also associated with the TUGT ($p=0.025$) and BBS ($p=0.014$). It was concluded that sociodemographic characteristics and health conditions were associated with fall risk, reinforcing the importance of multidimensional assessment and preventive strategies targeting older adults in Primary Health Care.

Keywords: Accidental Falls, Aged, Risk Factors.

INTRODUCTION

Aging is a progressive process marked by biological, physical, psychological, social, and cultural changes (WHO, 2010). In Brazil, the demographic transition has brought about changes in the population's age structure, driven primarily by declining fertility and mortality rates. This process is evidenced by the 2022 Demographic Census, which recorded 32.1 million people aged 60 years or older, representing a 56.0% increase compared with 2010 (IBGE, 2023).

As people age, their care needs may intensify, particularly among those who develop some degree of functional dependence or disability. Several tools are available to assist professionals in conducting multidimensional assessments of older adults. These assessments make it possible to analyze factors that affect older adults' health and routine functional activities and that may compromise their mood, behavior, communication, cognition, and mobility (Mallmann et al., 2012).

Within this context, particularly regarding older adults' mobility, mobility impairment has become one of the main conditions leading to falls in old age. A fall is characterized by the unintentional displacement of the body to the ground, an event commonly described by older adults as "losing one's balance." For health professionals, however, the definition is broader because it encompasses specific internal and external factors (Montero-Odasso et al., 2022).

Intrinsic factors are related to conditions inherent to the individual, such as clinical diseases, cognitive changes, visual impairments, muscle weakness, and gait impairments, among others (Soares et al., 2014). Extrinsic factors, in turn, are associated with environmental conditions and situations of neglect involving the physical structure or safety of the spaces frequented by older adults, such as stairs without handrails, inappropriate footwear, the absence of non-slip flooring, wet surfaces, uneven surfaces, and steps. Although these factors may appear relatively unimportant to the general population, they may pose significant obstacles to older adults, substantially increasing the risk of falls and potentially serious or fatal consequences (Moraes et al., 2017; Paraná, 2017).

When falls do not result in death, they may cause several complications, including fractures of the upper and lower limbs, abrasions, urinary tract infection (UTI), traumatic brain injury, worsening osteoporosis, psychological changes, accumulation of pulmonary secretions, and stroke, among others (Mallmann et al., 2012; Paraná, 2017; Couto et al., 2012).

Most falls occur at home because older adults spend more time in this environment and place their trust in family members and caregivers. However, attention focused predominantly on older adults' individual needs may lead to the neglect of matters related to safety and the suitability of the home's

physical structure. The presence of obstacles and inadequate environmental conditions therefore contributes to falls at home, which are among the most recurrent events in this population (Mallmann et al., 2012; Moraes et al., 2017; Couto et al., 2012).

The Brazilian Society of Geriatrics and Gerontology (Sociedade Brasileira de Geriatria e Gerontologia—SBGG) emphasizes that approximately 30% to 40% of people over 65 years of age experience falls each year, and this figure is increasing. This prevalence therefore represents a public health problem (SBGG, 2021).

Accordingly, the importance of implementing interventions aimed at preventing and reducing falls among older adults is evident. These strategies contribute not only to improving postural stability and strengthening muscles, but also to increasing self-confidence, autonomy, and perceptions of safety in the different environments in which older adults live (SBGG, 2021; INTO, 2015).

Considering that falls among older adults are a public health problem, investigating the risk of their occurrence through specific assessment tools is essential. Accordingly, this study aimed to identify the risk of falls among older adults receiving care at a Primary Health Care Unit in the municipality of Campina Grande, Paraíba, Brazil.

METHODOLOGY

STUDY DESIGN

This was an observational, cross-sectional, descriptive, and analytical study with a quantitative approach. This approach enables the organization, quantification, and statistical analysis of the information collected, thereby facilitating the objective identification and description of the characteristics of the phenomenon under investigation (Vieira; Hossne, 2021).

RESEARCH SETTING

The study was conducted at the Maria de Lourdes Leôncio Primary Health Care Unit (Unidade Básica de Saúde—UBS), located in the municipality of Campina Grande, state of Paraíba, Brazil, in October 2023.

POPULATION, SAMPLE, AND ELIGIBILITY CRITERIA

The target population consisted of people aged 60 years or older who were registered within the designated catchment area of the unit under investigation. Nonprobability convenience sampling was adopted, and 100 participants were recruited. After data completeness was verified, one record was excluded because it contained incomplete information, resulting in a final analytical sample of 99 participants.

Individuals of both sexes who lived in Campina Grande, Paraíba, and were registered with the service were eligible. Those with cognitive impairment that prevented them from understanding and adequately responding to the data-collection instruments were excluded.

DATA-COLLECTION INSTRUMENTS

Three instruments were used for data collection: (1) a sociodemographic and clinical characterization questionnaire designed to obtain information on age, sex, occupation, marital status, educational attainment, individual income, the presence of morbidities, and household composition; (2) the Berg Balance Scale (BBS), used to assess functional balance; and (3) the Timed Up and Go Test (TUG), used to assess functional mobility.

The Berg Balance Scale (BBS) was used to assess functional balance through performance on 14 tasks involving different postural demands, including transfers, maintaining positions, functional reach, turning, and single-leg stance. Each item is scored on an ordinal scale from zero to four points according to specific performance criteria, yielding a total score ranging from zero to 56 points. Higher scores

indicate better functional balance performance, whereas scores below 21 points indicate a high risk of falls (Souza; Santos, 2012).

The Timed Up and Go Test (TUG) was used to assess functional mobility by measuring the time required for the participant to stand up from a chair, walk a distance of three meters, turn 180°, return to the starting point, and sit down again. Performance was measured in seconds, with shorter times indicating better functional mobility. For interpretation of the results, times below 10 seconds were considered compatible with preserved functional performance; times between 10 and 19 seconds indicated the need for monitoring and clinical assessment; and times equal to or greater than 20 seconds suggested greater functional mobility impairment and the need for a more comprehensive assessment. In addition, a cutoff point greater than 12.4 seconds was adopted as indicative of an increased risk of falls.

DATA-COLLECTION PROCEDURES

Data were collected on the premises of the aforementioned health care unit. Potential participants were initially approached in the waiting room, where they received information about the study's objectives, procedures, and relevance. This information was supplemented by educational material on fall prevention developed jointly by nursing and social work professionals.

Individuals who expressed an interest in participating were taken individually to a private setting to ensure privacy during the procedures. After the relevant explanations had been provided and consent had been formalized through the signing of an Informed Consent Form (Termo de Consentimento Livre e Esclarecido—TCLE), the sociodemographic and clinical characterization questionnaire was administered. The functional balance and mobility assessment instruments were then administered, namely the Berg Balance Scale (BBS) and the Timed Up and Go Test (TUG), respectively.

STATISTICAL ANALYSES

Data were initially entered into Microsoft Excel® and subsequently exported to the Statistical Package for the Social Sciences (SPSS) for processing and analysis. Categorical variables were presented as absolute and relative frequencies. Fall-risk classifications obtained using the Timed Up and Go Test (TUGT) and the Berg Balance Scale (BBS) were associated with sociodemographic characteristics and self-reported health conditions. Fisher's exact test was used to assess associations between categorical variables. A significance level of 5% ($\alpha=0.05$) was adopted, and p-values <0.05 were considered statistically significant.

ETHICAL CONSIDERATIONS

The study was conducted following authorization from the Campina Grande Municipal Health Department and consent from the participating unit. It was subsequently submitted for review to the Research Ethics Committee (Comitê de Ética em Pesquisa—CEP) of the UNIFACISA University Center and approved under approval No. 6,325,225. The confidentiality of participants' information, anonymity, and privacy were ensured by coding the data and replacing identifying information with numerical codes.

RESULTS

Among the 99 participants, women predominated ($n=53$; 53.5%), as did retirees ($n=97$; 98.0%), individuals with incomplete elementary education ($n=70$; 70.7%), and those with an income of one minimum wage ($n=74$; 74.7%). Regarding marital status, married participants accounted for the largest proportion ($n=41$; 41.4%), whereas, in terms of household composition, living with a spouse was the most common arrangement ($n=35$; 35.4%) (Table 1).

Table 1

Sociodemographic characteristics of the study participants (n=99). Campina Grande, Paraíba, Brazil, 2023.

Variables	N	%
Sex		
Female	53	53,5
Male	46	46,5
Total	99	100,0
Occupation		
Retired	97	98,0
Grocery store owner	2	2,0
Total	99	100,0
Marital status		
Married	41	41,4
Widowed	20	20,2
Single	16	16,2
Divorced	13	13,1
In a relationship	9	9,1
Total	99	100,0
Educational attainment		
Complete elementary education	27	27,3
Incomplete elementary education	70	70,7
Incomplete secondary education	1	1,0
Higher education	1	1,0
Total	99	100,0
Income		
One minimum wage	74	74,7
One and a half minimum wages	24	24,2
Two minimum wages	1	1,0
Total	99	100,0
Household composition		
Missing/not reported	19	19,2
Spouse	35	35,4
Spouse and children	12	12,1
Spouse and relatives	8	8,1
Child	8	8,1
Relatives	17	17,2
Total	99	100,0

Source: Study data.

Among the health conditions investigated, 38.4% (n=38) of the participants reported systemic arterial hypertension (SAH), 6.1% (n=6) osteoarthritis, 23.2% (n=23) low back pain, and 46.5% (n=46) diabetes mellitus (DM). In addition, 14.1% (n=14) reported other health conditions (Table 2).

Table 2

Self-reported health conditions of the study participants (n=99). Campina Grande, Paraíba, Brazil, 2023.

Variables	n	%
Systemic arterial hypertension		
Yes	38	38,4
No	61	61,6
Osteoarthritis		
Yes	6	6,1
No	93	93,9
Low back pain		
Yes	23	23,2
No	76	76,8
Diabetes mellitus		
Yes	46	46,5
No	53	53,5
Other conditions		
Yes	14	14,1
No	85	85,9

Source: Study data.

Analysis of the sociodemographic characteristics revealed a statistically significant association between age group and fall-risk classification according to the TUGT ($p<0.000$) and the BBS ($p=0.003$). According to the TUGT, participants aged 75 years or older had a higher proportion of high risk (21.4%) than those aged 60 to 74 years (3.5%). According to the BBS, a higher proportion of high risk was also observed among participants aged 75 years or older (14.3%), whereas no participant aged 60 to 74 years was classified in this category. Income was also significantly associated with risk classification according to the BBS ($p=0.006$) (Table 3).

Table 3

Association between sociodemographic characteristics and fall-risk classification according to the TUGT and BBS. Campina Grande, Paraíba, Brazil, 2023.

Variables	TUGT			EEB		
	Low Risk	High Risk	Moderate Risk	Low Risk	High Risk	Moderate Risk
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Age						
60 to 74 years	10 (17,5)	2 (3,5)	45 (78,9)	35 (61,4)	0 (0,0)	22 (38,6)
75 years or older	0 (0,0)	9 (21,4)	33 (78,6)	16 (38,1)	6 (14,3)	20 (47,6)
p-value		0,000*			0,003*	

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Sex						
Female	6 (11,3)	3 (11,3)	41 (77,4)	25 (47,2)	3 (5,7)	25 (47,2)
Male	4 (8,7)	5 (10,9)	37 (80,4)	26 (56,5)	3 (6,5)	17 (37,0)
p-value		0,936*			0,650*	
Occupation						
Retired	9 (9,3)	11 (11,3)	77 (79,4)	50 (51,5)	6 (6,2)	41 (42,3)
Grocery store owner	1 (50,0)	0 (0,0)	1 (50,0)	1 (50,0)	0 (0,0)	1 (50,0)
p-value		0,200*			0,873*	
Marital status						
Married	3 (7,3)	3 (7,3)	35 (85,4)	22 (53,7)	1 (2,4)	18 (43,9)
Widowed	4 (20,0)	2 (10,0)	14 (70,0)	12 (60,0)	3 (15,0)	5 (25,0)
Single	3 (18,8)	2 (12,5)	11 (68,8)	8 (50,0)	1 (6,3)	7 (43,8)
Divorced	0 (0,0)	2 (15,4)	11 (84,6)	5 (38,5)	1 (7,7)	7 (53,8)
In a relationship	0 (0,0)	2 (22,2)	7 (77,8)	4 (44,4)	0 (0,0)	5 (55,6)
p-value		0,396*			0,494*	
Educational attainment						
Complete elementary education	1 (3,7)	2 (7,4)	24 (88,9)	13 (48,1)	2 (7,4)	12 (44,4)
Incomplete elementary education	9 (12,9)	0 (12,9)	52 (74,3)	37 (52,9)	4 (5,7)	29 (41,4)
Incomplete secondary education	0 (0,0)	0 (0,0)	1 (100,0)	0 (0,0)	0 (0,0)	1 (100,0)
Higher education	0 (0,0)	0 (0,0)	1 (100,0)	1 (100,0)	0 (0,0)	1 (100,0)
p-value		0,577*			0,846*	
Income						
One minimum wage	5 (6,8)	8 (10,8)	61 (82,4)	36 (48,6)	2 (2,7)	36 (48,6)
One and a half minimum wages	5 (20,8)	3 (12,5)	16 (66,7)	15 (62,5)	3 (12,5)	6 (25,0)
Two minimum wages	0 (0,0)	0 (0,0)	1 (100,0)	0 (0,0)	1 (100,0)	0 (0,0)
p-value		0,326*			0,006*	
Household composition						
Did not respond	3 (15,8)	1 (5,3)	15 (78,9)	10 (52,6)	1 (5,3)	8 (42,1)
Spouse	3 (8,6)	5 (14,3)	27 (77,1)	19 (54,3)	1 (2,9)	15 (42,9)
Spouse and children	0 (0,0)	0 (0,0)	12 (100,0)	7 (58,3)	0 (0,0)	5 (41,7)
Spouse and relatives	0 (0,0)	2 (25,0)	6 (75,0)	3 (37,5)	2 (25,0)	3 (37,5)
Child	0 (0,0)	2 (25,0)	6 (75,0)	4 (50,0)	2 (25,0)	2 (25,0)
Relatives	4 (23,5)	1 (5,9)	12 (70,6)	8 (47,1)	0 (0,0)	9 (52,9)
p-value		0,292*			0,371*	

Source: Study data. Note: * Fisher's exact test.

Analysis of the self-reported health conditions revealed a statistically significant association between fall-risk classification according to the TUGT and the presence of DM ($p=0.041$) and other health conditions ($p=0.025$). Among participants with DM, a higher proportion were classified as being

at high risk (19.6%) compared with those without the condition (3.8%). Regarding the BBS, statistically significant associations were identified with the presence of low back pain ($p<0.000$) and other health conditions ($p=0.014$). Among participants with low back pain, 69.6% were at moderate risk, whereas the corresponding proportion among those without the condition was 34.2% (Table 4).

Table 4

Association between self-reported health conditions and fall-risk classification according to the TUGT and BBS. Campina Grande, Paraíba, Brazil, 2023.

Variables	TUGT			EEB		
	Low Risk	High Risk	Moderate Risk	Low Risk	High Risk	Moderate Risk
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
SAH						
No	6 (15,8)	2 (5,3)	30 (78,9)	23 (60,5)	1 (2,6)	14 (36,8)
Yes	4 (6,6)	9 (14,8)	48 (78,7)	28 (45,9)	5 (8,2)	28 (45,9)
p-value		0,178*			0,299*	
Osteoarthritis						
No	10 (10,8)	11 (11,8)	72 (77,4)	50 (53,8)	6 (6,5)	37 (39,8)
Yes	0 (0,0)	0 (0,0)	1 (100,0)	1 (16,7)	0 (0,0)	5 (83,3)
p-value		0,427 *			0,149*	
Low back pain						
No	10 (13,2)	7 (9,2)	59 (77,6)	47 (61,8)	3 (3,9)	26 (34,2)
Yes	0 (0,0)	4 (17,4)	19 (82,6)	4 (17,4)	3 (13,0)	16 (69,6)
p-value		0,101*			0,000*	
Diabetes mellitus						
No	6 (11,3)	2 (3,8)	45 (84,9)	32 (60,4)	1 (1,9)	20 (37,7)
Yes	4 (8,7)	9 (19,6)	33 (71,7)	19 (41,3)	5 (10,9)	22 (47,8)
p-value		0,041*			0,071*	
Other						
No	6 (7,1)	11 (12,9)	68 (80,0)	39 (45,9)	5 (5,9)	41 (48,2)
Yes	4 (28,6)	0 (0,0)	10 (71,4)	12 (85,7)	1 (7,1)	1 (7,1)
p-value		0,025*			0,014*	

Source: Study data. Note: * Fisher's exact test.

DISCUSSION

The results of this study demonstrated associations between fall-risk classification and age group, the presence of DM, and low back pain. Older adults aged 75 years or older had a higher proportion of high fall risk according to both instruments. In addition, diabetes mellitus was associated with risk

classification according to the TUGT, whereas low back pain was associated with classification according to the BBS.

Consistent with these findings, mobility-related changes are important factors associated with falls among older adults. Recent evidence shows that impairments in balance, gait, physical function, and strength, as well as abnormalities identified through clinical tests of balance and functional performance, are consistently associated with falls in this population. These findings reinforce the importance of multidimensional assessment of mobility and functioning to identify older adults who are more vulnerable to falls (Saunders et al., 2025).

In addition to the physiological changes resulting from aging, psychosocial factors may also affect older adults' functioning. Reduced social participation may intensify feelings of vulnerability, fear, and insecurity, with possible repercussions for the performance of daily activities. Within this context, emotional and functional changes may contribute to mobility limitations and consequently increase vulnerability to falls (Bezerra et al., 2021).

Although the literature describes differences between men and women in the occurrence of falls among older adults, no statistically significant association was observed in the present study between sex and fall-risk classification according to either the TUGT ($p=0.936$) or the BBS ($p=0.650$). Descriptively, the proportion of high risk according to the TUGT was similar among women (11.3%) and men (10.9%). According to the BBS, high risk accounted for 5.7% of women and 6.5% of men.

Although sex- and gender-related differences are frequently described in the literature regarding the risk factors, occurrence, and consequences of falls among older adults, the results of the present study do not support the conclusion that vulnerability to falls is greater on the basis of sex (Sebastiani et al., 2024).

Among the health conditions investigated, DM was significantly associated with fall-risk classification according to the TUGT ($p=0.041$), whereas low back pain was associated with classification according to the BBS ($p<0.001$). Among participants with DM, 19.6% were classified as being at high

risk according to the TUGT, compared with 3.8% of those without the condition. These findings reinforce the importance of considering chronic conditions when assessing fall risk among older adults.

Moreover, DM may be associated with several factors that contribute to greater vulnerability to falls among older adults. Evidence shows that older adults with type 2 DM are at greater risk of falls than those without the disease, with this risk being particularly high among those who use insulin (Freire et al., 2024). In addition, gait abnormalities, balance difficulties, reduced grip strength, impaired visual function, diabetic retinopathy, hypoglycemia, and diabetic peripheral neuropathy have been significantly associated with falls in this population (Liu et al., 2026).

In addition to the clinical conditions identified in the present study, the use of certain medications is another factor that should be considered when assessing fall risk among older adults. Evidence indicates a high prevalence of potentially inappropriate prescribing among individuals who have experienced falls. Sedatives/hypnotics, opioids, diuretics, and antidepressants are among the medications associated with fall risk (O'Reilly et al., 2025). In older adults with DM, factors such as impaired visual function, diabetic retinopathy, hypoglycemia, peripheral neuropathy, gait abnormalities, and balance difficulties have also been associated with falls. The coexistence of these factors reinforces the need for a multidimensional assessment of fall risk in this population (Liu et al., 2026).

The presence of low back pain was also significantly associated with fall-risk classification according to the BBS ($p < 0.001$). Among participants with this condition, 69.6% were classified as being at moderate risk, a proportion higher than the 34.2% observed among those without low back pain. This finding may be related to the effects of pain on functioning and postural control, because older adults with low back pain may have poorer balance performance than those without the condition. Such changes may compromise postural stability and contribute to greater vulnerability to falls (Ge et al., 2021).

Considering that limitations resulting from aging may restrict the performance of daily activities and foster functional dependence, it is important to adopt strategies designed to preserve autonomy and prevent falls. Within this context, physical exercise interventions constitute an important preventive

strategy for older adults. Recent evidence demonstrates the benefits of exercise programs in preventing falls, particularly supervised, long-term programs focused on balance and resistance training, as well as modalities such as Tai Chi (Pillay et al., 2024).

Fall-prevention strategies include interventions aimed at strengthening muscles, training balance, and maintaining mobility, as well as periodically reviewing medications and identifying potentially modifiable environmental factors. In the home environment, measures such as adequate lighting, the removal of obstacles from circulation areas, and the adaptation of surfaces may contribute to greater safety. Exercises targeting balance and strength, including modalities such as Tai Chi Chuan, may also be incorporated into fall-prevention programs according to the older adult's clinical and functional condition (Paraná, 2017; INTO, 2015).

The findings demonstrate that fall risk among older adults should be understood as a multifactorial phenomenon arising from the interaction among sociodemographic characteristics, clinical conditions, and functional factors. Accordingly, periodic assessments of functioning, mobility, balance, and health conditions are important for the early recognition of situations of vulnerability. Preventive strategies aimed at preserving autonomy, promoting physical activity, ensuring environmental safety, and appropriately managing chronic conditions may help prevent falls and their repercussions for older adults' independence and quality of life (Guirguis-Blake et al., 2024; Suen et al., 2023).

FINAL CONSIDERATIONS

The results of this study demonstrated associations between fall-risk classification and sociodemographic and clinical factors among the older adults investigated. Age group was associated with risk classification according to the TUGT and the BBS, with a higher proportion of high risk among participants aged 75 years or older. Among the health conditions investigated, diabetes mellitus was associated with risk classification according to the TUGT, whereas low back pain was associated with

classification according to the BBS. These findings reinforce the importance of considering sociodemographic, clinical, and functional characteristics when assessing fall risk among older adults.

Therefore, the early identification of these factors in health care settings is important for supporting preventive measures and individualized interventions aimed at preserving older adults' functioning, autonomy, and quality of life.

The findings of this study may therefore help guide health education initiatives targeting older adults and their families, facilitating the recognition of factors associated with fall risk and the adoption of individualized prevention strategies, including safety measures in the home environment and encouragement to preserve functioning.

A limitation of the study was that the investigation was conducted at a single Primary Health Care Unit and within a particular socio-territorial context, which may limit the generalizability of the findings. Furthermore, because this was a cross-sectional study, causal relationships between the factors identified and fall risk cannot be established. Longitudinal studies are therefore required to gain a better understanding of these relationships.

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