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Functional capacity and fall risk screening among older adults in a rural area of the Paraíba hinterland

Capacidade funcional e rastreio de quedas em idosos da zona rural no sertão paraibano
Capacidad funcional y detección del riesgo de caídas en personas mayores de la zona rural del sertón de Paraíba

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Abstract:
As population aging intensifies in Brazil, rural areas stand out for their number of older residents. Therefore, falls are presented as an important health problem, being linked to functional losses, loss of autonomy and increased morbidity and mortality. The current study aimed to evaluate the functional capacity and screen the risk of falls in elderly residents in the rural area of a municipality in the sertão of Paraiba. This was a descriptive field study with a quantitative approach. Elderly people aged 60 years or older participated, composing the sample of 10 individuals registered and accompanied by Basic Health Units of the rural area selected for convenience. For data collection, instruments were used for sociodemographic and clinical characterization, evaluation of functional capacity, cognitive and mental screening, pain measurement, as well as physical and functional tests to identify the risk of falls. The data were analyzed in IBM SPSS Statistics, version 25.0, using descriptive statistics, Fisher's exact test, Mann-Whitney test and univariate logistic regression. A significance level of 5% ($p < 0.05$) was adopted. The population presented functional independence, but physical and functional changes associated with vulnerability to falls.

Keywords:
Aged; Rural areas; Functional status, Primary health care.

Resumo:
Através da intensificação do envelhecimento populacional no Brasil, as zonas rurais ganham destaque para o número de pessoas idosas residentes. Diante disso, as quedas apresentam-se como um importante agravo à saúde, estando ligada a prejuízos funcionais, perda de

autonomia e aumento da morbimortalidade. O estudo atual objetivou avaliar a capacidade funcional e realizar o rastreio do risco de quedas em idosos residentes na zona rural de um município do sertão paraibano. Referiu-se a uma pesquisa de campo, de caráter descritivo, com abordagem quantitativa. Participaram pessoas idosas com idade igual ou superior a 60 anos, compondo a amostra por 10 indivíduos cadastrados e acompanhados por Unidades Básicas de Saúde da zona rural selecionados por conveniência. Para a coleta de dados utilizaram-se instrumentos para caracterização sociodemográfica e clínica, avaliação da capacidade funcional, rastreio cognitivo e mental, mensuração da dor, além de testes físicos e funcionais para identificação do risco de quedas. Os dados foram analisados no IBM SPSS Statistics, versão 25.0, utilizando estatística descritiva, teste exato de Fisher, teste de Mann–Whitney e regressão logística univariada. Adotou-se nível de significância de 5% ($p < 0,05$). A população apresentou independência funcional, porém alterações físicas e funcionais associadas à vulnerabilidade para quedas.

Palavras-chave:
Idoso; Zona Rural; Estado Funcional; Atenção Primária à Saúde.

Resumen:
A través de la intensificación del envejecimiento de la población en Brasil, las áreas rurales están ganando prominencia en términos del número de residentes de edad avanzada. Por tanto, las caídas son un importante problema de salud, relacionado con deterioro funcional, pérdida de autonomía y aumento de la morbilidad y mortalidad. El presente estudio tuvo como objetivo evaluar la capacidad funcional y detectar el riesgo de caídas en personas mayores que viven en el área rural de un municipio del interior de Paraíba. Se refirió a una investigación de campo, de carácter descriptivo, con enfoque cuantitativo. Participaron personas mayores de 60 años o más, que conformaron la muestra de 10 personas registradas y acompañadas en Unidades Básicas de Salud de zonas rurales seleccionadas por conveniencia. Para la recolección de datos se utilizaron instrumentos de caracterización sociodemográfica y clínica, evaluación de la capacidad funcional, screening cognitivo y mental, medición del dolor, además de pruebas físicas y funcionales para identificar el riesgo de caídas. Los datos se analizaron en IBM SPSS Statistics, versión 25.0, mediante estadística descriptiva, prueba exacta de Fisher, prueba de Mann-Whitney y regresión logística univariada. Se adoptó un nivel de significancia del 5% ($p < 0,05$). La población presentó independencia funcional, pero cambios físicos y funcionales asociados a vulnerabilidad a caídas.

Palabras clave:
Ancianos; Zona Rural; Estado Funcional; Atención Primaria de Salud.

1. Introduction

The aging process and the increase in the elderly population generate new challenges for health systems, although aging does not just mean getting sick, but individual physiological, cognitive and sensory changes occur in each individual, which can interfere with the ability to perform everyday tasks and maintain autonomy. Therefore, functionality has come to be recognized as one of the main indicators of health in old age, surpassing the simple presence or absence of diseases (Rowe; Kahn, 1997) (Ministry of Health, 2023).

The deficit in physical and functional performance is directly linked to the increased occurrence of adverse events, including falls in the elderly, which represents one of the main causes of disability, hospitalizations and mortality. Falls result in emotional and behavioral impacts, such as fear of falling, restriction of activities and social isolation, favoring progressive decline (Hackenhaar et al., 2023) (Pereira et al., 2025).

Early identification of factors associated with the risk of falls depends on comprehensive assessments, considering physical, cognitive, environmental, sociodemographic aspects and clinical conditions. The use of standardized instruments is recommended in order to standardize and recognize vulnerabilities, effectively directing preventive strategies in the care of the elderly population (Prestes et al., 2023) (Cândido et al., 2022) (Smith et al., 2017).

Important particularities arise when we observe the elderly population living in rural areas. Issues such as distance from health services, access barriers, environmental and socioeconomic conditions and characteristics can modify both exposure to risk and monitoring and prevention. Despite this, elderly people in rural areas are still less exposed to scientific research, thus limiting the production of specific data on functional condition and health risks (Curcio; Henao; Gomez, 2014) (Garbaccio et al., 2018) (Rangel et al., 2022).

Given this, the present study aimed to characterize functional capacity and the risk of falls, as well as explore factors associated with a higher risk of falls, in elderly people living in the rural area of a municipality in the Sertão Paraibano.

2 Theoretical Framework

2.1 Aging and Functionality

Aging is a process inherent to human life, characterized by progressive changes that occur heterogeneously among individuals. These transformations can follow different trajectories, which range from aging that occurs within expected patterns to situations in which physiological changes are intensified by the presence of diseases and injuries, directly interfering with the functionality and autonomy of the elderly person (Rowe; Kahn, 1997) (Ministry of Health, 2023). This classification helps to understand the different trajectories of aging and their impacts on the health and functionality of this population group.

With advancing age, changes become evident in multiple health domains, covering physical, cognitive and mental aspects. Such changes are not necessarily linked to pathological processes, but they can be enhanced when intrinsic capacity is compromised. Sensory changes,

such as reduced visual and auditory acuity, associated with changes in the functioning of the Central Nervous System (CNS), in addition to decreased muscle strength and mobility, have a negative impact on functional performance and the execution of appropriate motor responses (Cordeiro et al., 2014) (Tavares; Sacchelli, 2009).

In the context of advanced aging, there is a greater prevalence of chronic conditions and health problems, which tend to significantly impact functional capacity. These conditions favor limitations in carrying out daily and instrumental activities, increasing functional vulnerability and the risk of adverse events, especially falls, which are important markers of public health problems (Ministério da Saúde, 2023).

In the understanding of Prestes et al. (2023), maintaining functional independence stands out as one of the main objectives of caring for elderly people, especially within the scope of primary health care. Such independence depends on the efficient integration of different body systems and the continuous monitoring of functional conditions, aiming to promote active and healthy aging.

The World Health Organization (WHO) published the International Classification of Functioning (ICF) in order to unite the categories that describe the functionality and disability of individuals based on their health condition. Based on its domains that involve physical-functional performance, activity and participation, environmental factors, the ICF allows the standardized classification of the different factors that are associated with health in the biopsychosocial aspect (Cândido et al., 2022).

In this sense, the preservation of functional capacity and cognitive functions plays a central role in promoting quality of life, contributing to the autonomy and permanence of the elderly in their social and territorial context (Prestes et al., 2023) (Cândido et al., 2022).

2.2 Frequency of falls in the elderly

Falls in elderly people are highly relevant events in the context of public health, due to their high frequency and negative repercussions on functionality and autonomy. Currently, they are recognized as critical events in the aging process, exerting a direct influence on quality of life and being among the main causes of morbidity and mortality in this population. It is estimated that, annually, approximately 684,000 people die as a result of falls around the world, highlighting the magnitude of this health problem (Hackenhaar et al., 2023) (Pereira et al., 2025).

According to data from the Ministry of Health (2023), in Brazil, the prevalence of falls in the elderly population living in urban areas was 25%, in a survey carried out between 2019 and 2021. Santos et al. (2015), in their study carried out in a municipality in the Northeast region in an urban area, presented the result that the prevalence of at least one episode of falling was 53.6% of the participants and of these, the majority who fell were women, representing 74.6%.

The occurrence of falls is related to a multifactorial etiology, involving the interaction between different body systems and the individual's conditions. Changes in balance, muscle strength and postural control can compromise adequate motor response capacity, culminating in episodes of imbalance that result in falls. These events are associated with both intrinsic and extrinsic factors, related to the environment, which may or may not be modifiable (Siqueira et al., 2007) (Almeida et al., 2012).

In this context, early identification of the risk of falls through screening becomes a fundamental strategy for prevention. Risk assessment allows recognizing the presence and combination of predisposing factors, enabling the implementation of targeted preventive measures. This screening involves analyzing biological, cognitive, functional aspects, as well as sociodemographic and economic factors, which directly influence the mechanisms associated with the occurrence of falls (Smith et al., 2017); (Chini; Pereira; Nunes, 2017).

The consequences of falls can extend over time, resulting in prolonged hospitalizations, tissue injuries and fractures, especially femur fractures, which are often associated with high morbidity rates. In addition to the physical impacts, falls can trigger psychological repercussions, such as anxiety, depression and the fear of falling again. This fear contributes to reduced mobility, decreased physical activity and increased social isolation, significantly compromising quality of life. As a result, many elderly people are unable to return to their pre-event functional level, progressing to partial or total dependence (Pereira et al., 2025) (Smith et al., 2017) (Almeida et al., 2012).

2.3 Rural Area and Aging

The elderly population living in rural areas has specific characteristics that make it potentially more vulnerable, in addition to being poorly represented in scientific literature. The frequent exclusion of this population in epidemiological and health studies contributes to the scarcity of consistent data, making it difficult to understand the aging process in depth in this context. Evidence indicates that elderly people living in rural areas, especially older women

with a low level of education, have a higher prevalence of frailty, a condition associated with an increase in the occurrence of falls (Curcio; Henao; Gomez, 2014).

Compared to the urban environment, the rural context presents different epidemiological and health indicators, influenced by characteristics specific to the territory and lifestyle. The rural way of life has a direct impact on the aging process, and can represent as many challenges as it has potential. Among the challenges, issues related to security, transportation difficulties, limited access to health services and loneliness stand out. On the other hand, aspects such as greater community ties, contact with nature and more active lifestyle habits can contribute positively to the perception of health and quality of life of this population (Campos et al., 2024).

In Brazil, approximately 17% of the elderly population lives in rural areas, highlighting the relevance of this group in the national demographic scenario. Despite this, scientific production is still limited, which favors the construction of stigmatized concepts about aging in rural areas. These conceptions often disregard the differences that exist in relation to the urban context and neglect the way in which biological, social and economic factors interact and impact the health and functionality of elderly people living in these regions (Garbaccio et al., 2018) (Rangel et al., 2022).

2.4 Falls in the rural context

Investigating the risk of falls in elderly people living in rural areas presents specific challenges that may contribute to the underreporting of these events. Barriers related to access to health services, geographic distance and limited healthcare resources make timely screening difficult, especially in remote areas, compromising the early identification of risk factors (Peters; Lim; Naidoo, 2023).

Sukumar et al. (2016) investigated the influence of geographic location on the outcomes of injuries related to falls in the elderly and considered that residents of rural areas had a lower rate of hospitalizations, shorter length of stay in hospitals and fewer hospitalizations, however, a higher rate of readmission within 28 days after discharge and higher mortality within 30 days after hospitalization. Measuring the occurrence of falls in this context can be influenced by methodological aspects, such as survival bias, referring to individuals who survive and are able to report the event, and non-survival bias, related to those who die and are not included in the records, contributing to the underestimation of the magnitude of falls in the rural elderly population (Peters; Lim; Naidoo, 2023).

The rural population also has a higher prevalence of risk factors associated with lifestyle and socioeconomic conditions, which can increase the occurrence of falls and worsen their outcomes. Among these factors, malnutrition stands out, which compromises functional recovery after a fall and is associated with a greater occurrence of injuries resulting from these events (Eckert et al., 2023).

The routine implementation of effective falls prevention interventions in rural areas is a challenge, especially given the limitation of evidence-based practices adapted to the reality of Primary Health Care (PHC), which makes it difficult to adopt and maintain preventive strategies in the territory. In this context, it is essential to strengthen guidelines and guidelines aimed at PHC, aiming for a more strategic approach in screening, preventing and monitoring the risk of falls in elderly people living in rural areas, considering the specificities and needs of this population. At the same time, counseling and health promotion actions, due to their low cost and educational potential, should be incorporated into routine care, although there is still a significant gap in evidence specifically aimed at rural residents (Lidde et al., 2018) (Volz et al., 2025).

3. Material and Method

It consisted of a descriptive field study, with a quantitative approach, carried out with elderly people living in the rural area of a municipality in the Sertão Paraibano. Sample composed of 10 participants, selected for convenience, registered and monitored by Basic Health Units in rural areas. Included were individuals aged ≥60 years, who had sufficient cognitive conditions to understand and respond to the instruments and who signed the Informed Consent Form. Those with severe cognitive impairment and without a caregiver, bedridden and with severe physical limitations, severe or decompensated neurological diseases that interfered with mobility or unstable clinical condition were excluded.

After approval by the Research Ethics Committee of the Centro Universitário de Patos (UNIFIP), collection took place in the participants' homes, with the support of Community Health Agents. A sociodemographic and clinical questionnaire was applied, in addition to the Katz Index, Lawton Scale, Geriatric Depression Scale (GDS-15), 10-CS, Visual Analogue Scale (VAS), falls risk stratification algorithm, International Falls Efficacy Scale (FES-1 Brazil), Short Physical Performance Battery (SPPB), Timed Up and Go (TUG) and handgrip dynamometry. Finally, guidance was provided on preventing and managing the risk of falls.

The data were tabulated and analyzed using the IBM SPSS Statistics software, version 25.0. Initially, descriptive statistical analysis was carried out to characterize the participants and the variables investigated. For categorical variables, absolute (n) and relative frequencies (%) were calculated. For quantitative variables, measures of central tendency and dispersion were obtained, including mean, median, standard deviation, minimum and maximum values.

To verify the association between the participants' characteristics and the risk of falls, Fisher's exact test was used, considering the small sample size and the distribution of frequencies in the analyzed categories. The associations were expressed using the odds ratio (Odds Ratio – OR).

To compare quantitative variables between groups with lower and higher risk of falls, the non-parametric Mann–Whitney test was used, considering the variables age, weight, height, body mass index (BMI) and calf perimeter.

Univariate logistic regression was also performed, with the outcome variable being the fall risk classification, categorized as low/intermediate risk and high risk. Sociodemographic, anthropometric, functional and clinical variables were individually evaluated, with the results presented using odds ratios (OR) and respective p values.

In all inferential analyses, a significance level of 5% ($p < 0.05$) was adopted. Due to the small sample size ($n = 10$), the inferential results were interpreted in an exploratory manner, considering the possibility of instability in the estimates and limiting the generalization of the findings.

4. Results and Discussion

Ten elderly people living in the rural area of a municipality in the backlands of Paraíba participated in the study. The participants' ages ranged from 61 to 81 years, with a mean of 69.6±6.8 years and a median of 67.5 years. There was a predominance of males, with 6 participants (60.0%), while 4 (40.0%) were female. As for occupation, 08 (80.0%) were retired, while farmer and housewife each accounted for 01 (10.0%).

Regarding marital status, 06 (60.0%) were married, 03 (30.0%) were widowed and 01 (10.0%) were in a stable union. The educational profile revealed a significant low level of education: 09 (90.0%) had incomplete primary education and 01 (10.0%) were classified as illiterate. As for religion, 07 (70.0%) declared themselves Catholic and 03 (30.0%) Protestant. Family income was concentrated in the range of 1 to 3 minimum wages 08 (80.0%), while 02 (20.0%) had income below one minimum wage.

Regarding race/color, 04 (40.0%) were classified as mixed race, 04 (40.0%) as black and 02 (20.0%) as white. No indigenous or yellow categories were observed in the sample.

Table 1: Distribution of the main sociodemographic variables (n = 10).

Variable	**n**	**%**
Genre		
Male	06	60.0
Female	04	40.0
Occupation		
Retired	08	80.0
Farmer	01	10.0
housewife	01	10.0
Marital Status		
Married	06	60.0
Widower	03	30.0
Stable union	01	10.0
Education		
Incomplete elementary education	09	90.0
Not literate	01	10.0
Religion		
Catholic	07	70.0
Protestant	03	30.0
Family Income		
1–3 minimum wages	08	80.0
<1 minimum wage	02	20.0
Race		
Brown (pardo)	04	40.0
Black	04	40.0
White	02	20.0

Source: Authors' own.

Body weight had an average of 69.53±11.72 kg, with values between 46.60 and 90.10 kg. The average height was 1.59±0.09 m, ranging from 1.48 to 1.80 m. The body mass index,

calculated from weight and height, presented a mean of 27.47±5.50 kg/m² and a range of 17.76 to 36.09 kg/m². Calf perimetry (PP) had a mean of 33.90±3.13, ranging from 28.0 to 39.0.

Table 2: Anthropometric and clinical profile (n = 10).

Variable	Mean	Median	SD	Minimum	Maximum
Weight	69,53	69,85	11,72	46,60	90,10
Height	1,59	1,60	0,09	1,48	1,80
BMI	27,47	28,27	5,50	17,76	36,09
Calf Perimeter	33,90	33,25	3,13	28,00	39,00

Source: Authors' own.

In the assessment of clinical conditions, 02 (20.0%) had osteoarthritis, 03 (30.0%) had diabetes mellitus and 03 (30.0%) had systemic arterial hypertension. Osteoarthritis, cerebrovascular event and mental illness were recorded in 01 (10.0%) of the participants, respectively. In the field related to vision, cataracts corresponded to 05 (50.0%), glaucoma to 04 (40.0%) and macular degeneration to 01 (10.0%). The majority did not report hearing changes 09 (90.0%). With regard to polypharmacy, 8 participants (80.0%) did not present this condition, while 2 (20.0%) presented simultaneous use of multiple medications. Regarding the perception about food, half of the sample, corresponding to 05 participants (50.0%), was classified as satisfactory and the other 05 (50.0%) as unsatisfactory.

Table 3: Clinical conditions, health perception and habits (n = 10).

Variable	Categories	n	%
Clinical conditions, health perception and habits			
Osteoarthritis	No	08	80.0
	Yes	02	20.0
DM	No	07	70.0
	Yes	03	30.0
Systemic hypertension	No	07	70.0
	Yes	03	30.0
Osteoarthritis	No	09	90.0
	Yes	01	10.0
Ischemic stroke	No	09	90.0
	Yes	01	10.0

Variable	Categories	n	%
Mental Illness	No	09	90.0
	Yes	01	10.0
Vision	Cataract	05	50.0
	Glaucoma	04	40.0
	macular degeneration	01	10.0
Hearing	No	9	90.0
	Yes, don't use braces	1	10.0
Polypharmacy	Satisfactory	8	80.0
	Unsatisfactory	2	20.0
Food	Unsatisfactory	5	50.0
	Satisfactory	5	50.0

Source: Authors' own.

In the assessment of depressive symptoms, 09 (90.0%) were classified as having no depressive symptoms and 01 (10.0%) had severe depressive symptoms. In the assessment of functional capacity for instrumental activities of daily living, using the Lawton scale, 09 (90.0%) were classified as independent and 01 (10.0%) presented partial dependence. Using the Katz scale, all participants were classified as independent in basic activities of daily living. 10 (100.0%).

Regarding cognitive performance, 08 (80.0%) presented preserved cognitive performance and 02 (20.0%) were suspected of cognitive impairment. When assessing concern about falls using the FES-1 instrument, 9 participants were identified with valid information. Of these, 06 (66.7%) had low concern about falls, 01 (11.1%) had moderate concern and 02 (22.2%) had high concern about falls.

In the assessment of muscle strength by dynamometry, 06 (60.0%) of the participants had reduced muscle strength and 04 (40.0%) had preserved muscle strength. This result highlights the presence of reduced muscle strength in a significant portion of the studied population.

Regarding functional performance assessed by the Short Physical Performance Battery (SPPB), 05 (50.0%) of the participants had low functional capacity, while 05 (50.0%) had moderate functional capacity. Regarding the Timed Up and Go (TUG) test, it was clear that 05 (50.0%) of the sample had an increased risk for falls and 05 (50.0%) had a decreased risk.

In the general classification of the risk of falls using the stratification algorithm, valid information was obtained for 9 participants. Among these elderly people, 05 (55.6%) were classified as low risk, 01 (11.1%) as intermediate risk and 03 (33.3%) as high risk. Thus, approximately one third of the elderly with valid data presented a high risk of falls, while just over half were classified as low risk. The result demonstrates the coexistence, in the rural population investigated, of different levels of vulnerability related to falls.

Finally, when analyzing the variables related to pain, it was shown that 04 elderly people (40.0%) reported pain in the spine region, while 01 (10.0%) had knee pain, 01 (10.0%) had wrist pain and 01 (10.0%) had shoulder pain. The variable referring to the absence of pain indicated that 04 participants (40.0%) did not have pain at the time of the assessment. Thus, considering the variables recorded in the database, pain in the spine region was the most frequent musculoskeletal manifestation among the participants.

Table 4: Mental health, cognition and functionality indicators (n = 10).

Variable	n	%
GDS-15		
Absence of depressive symptoms	09	90.0
Severe depressive symptoms	01	10.0
LAWTON		
Independent	09	90.0
Partial dependence	01	10.0
KATZ		
Independent	10	100
10-CS		
Preserved cognitive performance	08	80.0
Suspected cognitive impairment	02	20.0
FES-1		
Low concern about falls	06	66.7
High concern about falls	02	22.2
Moderate concern about falls	01	11.1
Dynamometry		
Reduced muscle strength	06	60.0
Preserved muscle strength	04	40.0

Variable	n	%
SPPB		
Low functional capacity	05	50.0
Moderate functional capacity	05	50.0
TUG		
Increased risk for falls	05	50.0
Reduced risk for falls	05	50.0
Algorithm		
Low risk of falls	05	55,6
Intermediate risk of falls	01	11,1
High risk of falls	03	33,3
Location of Pain – EVA		
Spine	04	40,0
Knee	01	10,0
Wrist	01	10,0
Shoulder	01	10,0
Don't feel pain	04	40,0

Source: Authors' own.

Table 5 presents the relationship between some characteristics of the elderly and the greater risk of falls. In general, none of the characteristics evaluated showed a statistically significant association with the increased risk of falls, considering the significance level of 5% ($p < 0.05$).

Despite this, some results draw attention. Among elderly people aged 70 or over, the chances of having a higher risk of falling were four times greater than among those under 70 years old (OR = 4.00). However, this difference was not statistically significant ($p = 0.524$).

Two times more chances of increased risk of falls were also observed among elderly people with visual impairment, low functional capacity assessed by the SPPB and increased risk identified by the TUG (OR = 2.00). However, none of these associations showed statistical significance ($p = 1.000$).

Regarding gender, women were twice as likely to belong to the group with a higher risk of falls compared to men (OR = 2.00), but this difference was also not statistically significant

(p = 1.000). For diabetes mellitus and arterial hypertension, no difference was observed in the odds of increased risk of falls (OR = 1.00; p=1.000).

On the other hand, elderly people with reduced muscle strength were less likely to belong to the group at higher risk of falls (OR = 0.25). However, this result also did not show statistical significance (p = 0.524) and should therefore be interpreted with caution.

Thus, although some results indicate possible trends, it is not possible to say, based on this sample, that age, sex, diabetes, hypertension, visual changes, muscle strength, functional capacity or performance in the TUG may be associated with a greater risk of falls. These findings must be interpreted considering the exploratory nature of the research and the small sample size (n = 10).

Table 5: Association between elderly characteristics and increased risk of falls (n = 10).

Variable	**Comparison**	**OR**	**P(Fisher)**
Sex	Female vs. male	2,00	1,000
Age	≥70 vs. <70	4,00	0,524
Diabetes mellitus	Yes vs. No	1,00	1,000
Arterial hypertension	Yes vs. No	1,00	1,000
Visual change	Yes vs. No	2,00	1,000
Reduced muscle strength	Yes vs. No	0,25	0,524
Low functional capacity (SPPB)	Yes vs. No	2,00	1,000
Increased risk in TUG	Yes vs. No	2,00	1,000

Source: Authors' own. Caption: OR = odds ratio (Odds Ratio); SPPB = Short Physical Performance Battery; TUG = Timed Up and Go; FES-1 = Falls Efficacy Scale – International. OR values > 1 indicate greater chances of belonging to the group at higher risk of falls, while OR values < 1 indicate lower chances. Statistical significance was considered when p < 0.05. Fisher's exact test.

Table 6 presents the results related to the mental and cognitive aspects of the participants, considering the groups with the lowest and highest risk of falls. In general, the results indicate that some aspects evaluated showed differences between the groups, although none of the associations reached statistical significance at the 5% level.

Regarding cognitive capacity, among the participants who had preserved cognition, 06 were classified in the group with the lowest risk of falls and 01 in the highest risk group. The 2 participants who were suspected of having cognitive impairment were classified in the highest risk group. This result presented p = 0.083, indicating that the difference was not statistically

significant, but may represent a tendency towards a relationship between cognitive impairment and a greater risk of falls.

Regarding concern about falls, the 02 participants classified as having low or moderate concern were distributed between the lowest and highest risk groups. The participant classified as having high concerns about falls, in turn, was included in the highest risk group. Fisher's exact test showed p = 0.107, a result that was also not statistically significant, although it represents a finding that deserves attention.

Overall, the results suggest that cognitive impairment and greater concern about falls may be related to a greater risk of falls, especially because participants with suspected cognitive impairment and high concern about falls were classified in the highest risk group. However, due to the lack of statistical significance and the small number of participants, these results should be interpreted as trends observed in the sample, and not as confirmed associations.

Table 6: Mental and cognitive aspects according to the risk of falls (n = 10).

Variable	Category	Lower Risk	Greater Risk	OR	P(Fisher)
Cognition	Preserved	06	01	0,00†	0,083
	Suspected compromise	0	02	∞†	
GDS-15	Absence of symptoms	06	02	-	0,333
	Severe symptoms	0	01	∞†	
Lawton	Independent	06	02	-	0,33
	Partial dependence	0	01	∞†	
FES-1	Low/moderate concern	06	02	8,00	0,464
	High concern	0	01	∞†	

Source: Authors' own. Caption: OR = odds ratio (Odds Ratio); GDS-15 = Geriatric Depression Scale – 15 items; Lawton = Lawton Instrumental Activities of Daily Living Scale; FES-1 = Falls Efficacy Scale – International; Fisher = Fisher's exact test. P values < 0.05 indicate a statistically significant association. †

The presence of cells with a value equal to zero prevents stable conventional estimation of the odds ratio (OR).

When comparing physical characteristics and age between the group with the lowest risk and the highest risk of falls, no relevant differences were found. In other words, the age,

weight, height, body mass index (BMI) and calf measurements of both groups are very similar and the observed variations occurred by chance (Mann–Whitney test with p > 0.05).

Table 7: Comparison of quantitative variables according to the risk of falls (n = 10).

Variable	**Lower Risk**	**Greater Risk**	**Mann–Whitney**	**P**
Age	67.0 years	70.0 years	7,00	0,714
Weight	69.85kg	70.80kg	7,00	0,714
Height	1.61 m	1.62 m	9,00	1,000
BMI	28.92 kg/m²	30.27 kg/m²	7,00	0,714
Calf girth	33.25 cm	33.00 cm	10,00	0,895

Source: Authors' own. Caption: n: Total number of participants analyzed (n= 10); BMI: Body Mass Index; Mann–Whitney: Value of statistic U of the Mann–Whitney test; p: Level of statistical significance (p-value); Values of $p > 0.05$ indicate that there is no statistically significant difference between the groups.

In the analysis to identify whether certain characteristics increase the chances of a person being classified in the high-risk group for falls, no isolated factor showed a statistically significant association at the 5% level, since all p values were greater than 0.05. Despite this, it was observed that being 70 years of age or older increased the chances of the individual belonging to the high-risk group by four times, presenting an odds ratio (Odds Ratio) of 4.00.

Similarly, the presence of female gender, low functional capacity assessed by the SPPB test, increased risk in the TUG test and visual changes indicated, descriptively, twice the chance of high risk of falls, with a value of 2.00 for the odds ratio in all these factors.

On the other hand, reduced muscle strength had an odds ratio of 0.25. This finding, apparently contradictory to expectations, arises directly from the limitation resulting from the small size of the sample evaluated, in which the isolated response of just one or two individuals can strongly alter the meaning of the result. For this reason, the identified associations should be interpreted exclusively as exploratory findings.

Table 8: Univariate logistic regression (n = 10).

Predictor	**OR**	**P**
Age (per year)	1,011	0,915
Weight (per kg)	1,038	0,589
BMI (per kg/m²)	1,093	0,545

Predictor	**OR**	**P**
Calf girth (per cm)	1,088	0,727
Female	2,000	0,638
Reduced muscle strength	0,250	0,355
Low functional capacity – SPPB	2,000	0,638
Increased risk – TUG	2,000	0,638
Age ≥70 years	4,000	0,355
Visual change	2,000	0,638

Source: Authors' own. Caption: n represents the sample size of ten participants (n= 10).

OR refers to the Odds Ratio, in which values greater than 1.00 indicate a greater chance of the participant presenting a high risk of falls, values equal to 1.00 indicate no change in the chances and values below 1.00 indicate a lower apparent chance. The p value represents the level of statistical significance, where values greater than 0.05 indicate that the observed association was not statistically significant. The outcome variable analyzed divided participants into low or intermediate risk (value 0) and high risk of falls (value 1). BMI corresponds to Body Mass Index. SPPB refers to the Short Physical Performance Battery. TUG corresponds to the Timed Up and Go walking and mobility test.

The greater frequency of women in the highest risk group constitutes a descriptive convergence with the findings of Santos et al. (2015), who identified a higher occurrence of falls among elderly women. However, this approximation must be interpreted with caution, since, in the present study, the female sex did not show a statistically significant association with a higher risk of falls, making it not possible to establish an analytical confirmation of this relationship. The literature points out that the occurrence of falls results from the interaction of multiple factors, including sensory changes, reduced muscle strength, impaired mobility and functional capacity, which can intensify throughout aging (Cordeiro et al., 2014; Tavares; Sacchelli, 2009). Therefore, the findings reinforce the need to understand the risk of falls beyond isolated characteristics, considering the interaction between physical, functional, cognitive and environmental aspects. This perspective is particularly relevant in the rural context, in which territorial and socioeconomic characteristics, associated with difficulties in accessing health services, can influence the identification, monitoring and prevention of factors related to falls among elderly people (Curcio; Henao; Gomez, 2014; Campos et al., 2024).

The findings related to cognitive and psychological aspects reinforce the importance of a multidimensional assessment of the elderly person, considering that functionality is not restricted to physical performance, but also involves cognitive and mental dimensions that can impact autonomy and safety during daily activities (Cândido et al., 2022; Prestes et al., 2023). Although no statistically significant associations were identified, a concentration of participants with suspected cognitive impairment was observed in the highest risk group, as well as greater concern about falls among those classified in this group. This trend is consistent with Smith et al. (2017), who highlight the influence of cognitive and psychological factors on vulnerability to falls, especially because the fear of falling can trigger reduced mobility, restricted activities and social isolation, contributing to functional decline.

However, these findings must be understood with caution given the small number of participants and the occurrence of cells with zero frequency, which limits the stability of statistical estimates. On the other hand, the absence of significant differences in anthropometric characteristics between the groups suggests that, in this sample, the risk of falls was not isolatedly related to the body measurements assessed.

In the rural context, the interpretation of findings must consider that the risk of falls is embedded in a reality that goes beyond the individual characteristics of the elderly. Territorial particularities, socioeconomic conditions, transportation difficulties and limited access to health services can interfere both in exposure to risk factors and in the identification and monitoring of vulnerable situations (Curcio; Henao; Gomez, 2014; Campos et al., 2024; Garbaccio et al., 2018). In this sense, the multidimensional assessment used in this study is relevant, since instruments such as SPPB, TUG and FES-1 make it possible to recognize different components related to functionality and the risk of falls, contributing to more individualized care. This approach is especially relevant in Primary Health Care, considering its role in the early identification of changes and the implementation of preventive actions close to the territory of elderly people (Peters; Lim; Naido, 2023).

Thus, even though the results of this investigation did not allow establishing associations between the factors assessed and the increased risk of falls, they highlight the importance of considering the specificities of rural aging when planning health actions.

Final Considerations

The results of this study made it possible to characterize the functional capacity and risk of falls in elderly people living in the rural area of a municipality in the Sertão Paraibano,

highlighting different levels of physical, functional, cognitive and psychosocial vulnerability. Although all participants demonstrated independence in basic activities of daily living, relevant changes in muscle strength and functional performance were identified. A reduction in muscle strength was observed in 60.0% of the elderly, low functional capacity by SPPB in 50.0% and an increased risk of falls by TUG in 50.0%. Furthermore, 33.3% of participants with valid data were classified as being at high risk for falls. Higher risk trends were also observed among elderly people aged 70 years or over, females, visual changes and low functional capacity. However, none of these associations showed statistical significance.

Therefore, the findings reinforce that functional independence does not exclude the presence of factors that can compromise the safety and autonomy of the elderly, requiring a multidimensional assessment. Cognitive and psychological aspects also deserve attention, considering the tendency for greater risk among participants with suspected cognitive impairment and greater concern about falls. It should be noted, however, that the results must be interpreted with caution due to the small sample size and convenience selection, which limit the possibility of generalization. In this sense, the importance of Primary Health Care in the early identification of vulnerabilities and the implementation of preventive strategies stands out. It is recommended to strengthen actions aimed at promoting muscular strength, mobility, safety and autonomy. Future studies with larger samples may deepen the understanding of factors associated with falls in elderly people in rural areas.

And the production of local scientific evidence can contribute to the planning of more targeted preventive actions, strengthening the performance of PHC and promoting aging safely and independently for the elderly in rural areas.

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