Manual Therapy, Posturology & Rehabilitation Journal
ISSN: 2236-5435

RESEARCH ARTICLE

Prevalence of falls among older people physically independent: An analysis of occurrence in 12 months

Paula A. Gagliardi[1], Davi A. Alves[2], Fernanda B. O. Vasconcelos[2], Nathan B. Mazieri[1], Leonardo G. Ruivo[1], Juliana S. Revoredo[3], Fernando T. Yabushita[1], Márcio R. Oliveira[3]

[1] State University of Londrina (UEL), Londrina (PR), Brazil
[2] Rehabilitation Science Graduate Program, Pitágoras Unopar University (UNOPAR) associated with State University of Londrina (UEL), Londrina (PR), Brazil
[3] Physical Exercise in Health Promotion Graduate Program, Pitágoras Unopar University (UNOPAR), Londrina (PR), Brazil

Abstract

Background: Physically independent older adults are considered active in daily life activities. However, as age progresses, physiological changes increase the risk of falls. Thus, any obstacle requiring attention, balance, and/or reaction may result in a fall. **Objective:** To present the prevalence of falls among older adults 12 months after the assessment of overall strength and functional reach during the pandemic. **Methods:** This is a longitudinal and observational study involving 69 older adults of both sexes (age: 69 ± 7 years; body mass index: 27 ± 4 kg/m²). Participants answered a structured interview with questions about the occurrence of falls after 12 months. Additionally, data from handgrip strength and functional reach assessments contributed to understanding participants' functionality. **Results:** The majority of the studied population consisted of women (88%). Over the 12-month period, 80% of participants did not experience falls. Among those who fell, the main consequences were fractures (8%) and ankle sprains (8%), occurring predominantly in women. The most frequently reported fall locations were sidewalks (36%), homes (29%), streets (21%), and yards (14%). Tripping was the primary cause of falls, reported by 57% of participants. Finally, reduced handgrip strength was observed in 9% of men and 16% of women, while reduced functional reach was identified in 1% of men and 24% of women. **Conclusion:** The findings of this study indicate that the incidence of falls among older adults evaluated after 12 months was 20%, with no major consequences such as hospitalization or disabling injuries. Additionally, falls occurred predominantly in women and in public environments, especially on sidewalks.

Keywords: Elderly; falls; public health.

Corresponding author: Márcio R. Oliveira, PT, PhD

Email: marxroge@hotmail.com

Received: 14 Fev, 2025
Accepted: 08 May, 2025
Published: 15 Ago, 2025

Copyright © 2024. This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License which permits unrestricted non-commercial use, distribution, and reproduction in any medium provided article is properly cited.

BACKGROUND

Human aging is a complex phenomenon, resulting in both physiological and systemic changes. This phase of life brings with it limitations and frailties that can negatively impact the functionality and balance of elderly people, thus increasing their propensity to falls. Falls among the elderly are a factor of great social relevance for public health, considering that in the aging process, some intrinsic and extrinsic factors, such as loss of muscle mass, decreased balance, impairment from non-communicable chronic diseases, and polypharmacy, compromise health and increase the risk of this phenomenon occurring[1].

Physiological aging compromises the central nervous system's (CNS) ability to process vestibular, visual, and proprioceptive signals that play a crucial role in maintaining postural balance. Moreover, it also reduces the ability to adapt reflexes, thus affecting postural stability. Postural instability is one of the main factors that limit the lives of the elderly, where in most cases it cannot be attributed to a specific cause, but rather to a compromise of the postural control system as a whole[2]. Body instability increases with age, with falls being the most serious consequences of imbalance,

followed by fractures, hospitalization, psychological complications, fear of new falls, loss and reduction of independence, autonomy, and mortality[3].

Assessment of fall risk in the elderly is complex due to its multifactorial nature[4]. In fact, it is possible to identify studies in the literature that have raised the prevalence of falls among the elderly[5,6]. It was demonstrated that in Rio Grande do Sul state (BR) the prevalence of falls was 28.1% and the majority occurred in the person's own residence 56.4%[6]. On the other hand, in another state in the South of Brazil, Santa Catarina, it was reported that the prevalence of falls was 28.3%; and the place with the highest incidence was the elderly person's home at 49.3%[7]. However, data on the prevalence of falls in Paraná (BR) are still scarce, especially in light of the pandemic scenario in which, at times, elderly people remained in home isolation. Moreover, the findings of the study can contribute to the development and formulation of prevention and intervention strategies, as the main reasons that led the elderly person to fall can be identified and taken into account in professional practice.

In this way, the objective of the study was to present the prevalence of falls among elderly people after 12 months of the baseline assessment during the pandemic in the city of Londrina, Paraná State, southern Brazil. The hypothesis of the study is that falls occur in elderly people over a 12-month period and generate musculoskeletal consequences, mainly in women. The confirmation of the hypothesis can help guide public policies to allocate financial resources effectively to prevent falls in elderly people.

METHODS

Study design and participants

This is a cross-sectional study. The baseline data collection took place from April to May 2019, and the follow-up, from May to June 2020 (pandemic period). Therefore, upon completing 12 months since the initial assessment, contact was made via telephone with all participants to identify who experienced a fall during this period.

A total of 74 participants (mean age: 69±6, body mass index: 28±4Kg/m²) were voluntarily and conveniently recruited through personal contacts in basic health units and a school clinic; all accepted to participate in the initial assessments of the study. The eligibility criteria were a) being over 60 years old; b) being physically independent (classified at level 3 or 4 of the Functional Status Scale proposed by Spirduso et al.[8]; c) have good cognitive status (>18) according to the mini-mental state examination questionnaire[9]; d) present good general health; e) voluntarily agree to participate in the study and not have fallen within the 6-month period preceding the baseline assessment date. Exclusion criteria included inability to locate after three attempts by the interviewer following 12 months from the initial contact and, inability to perform the proposed tests/evaluation. This project was approved by the local ethics committee (CEP: 5.103.494) and all participants signed the informed consent form.

Evaluation procedures

All initial data were collected in the Functional Assessment and Human Motor Performance Laboratory with controlled lighting and temperature (± 22° C). The evaluation sessions lasted up to 1 hour per participant. The main questions related to falls were: a) have you had a fall in the last 12 months; b) consequences of the fall on physical health; c) reason for the fall; d) time of day the fall occurred; e) estimated time spent on the ground; f) fear of falling; g) medication use. These questions were formulated by the authors according to a previous published questionnaire[10]. According to the literature and the study's criteria, a fall was defined as an unintentional event that results in the individual's position changing to a lower level, in relation to their initial position, without sufficient time for correction and determined by multifactorial circumstances that compromise their stability[2].

Muscle strength

To evaluate the maximum voluntary isometric contraction (MVIC) of palmar grip (PG) with a hand dynamometer (JAMAR, hydraulic 0 – 90 kg), the participant remained seated in a chair with hips and knees at 90° flexion, shoulder in adduction, elbow flexed at 90°, forearm and wrist in a neutral position[11]. Three MVIC's were performed on the upper limb (left and right), with all attempts sustained for at least five seconds, with one-minute recovery intervals. The best result from the three repetitions was used for the analyses. The European working group on sarcopenia in older people recommends handgrip strength as the practical measure of generalized muscle strength for use in clinical practice[9]. With this, elderly females were classified as having normal PG strength with results ≥11 kgf and with decreased PG strength when the maximum strength was <11 kgf; for elderly males, those with maximum strength ≥14 kgf were classified as having normal PG strength and with decreased PP strength when the maximum strength was <14 kgf[4].

Functional scope (previous scope)

The participants remained in an upright position with their feet shoulder-width apart and their arms parallel to their bodies. A measuring tape was positioned on a stand at the acromion height of each participant. Next, the participant was asked to reach as far as possible without moving their feet or losing balance[12]. The functional reach test measures stability limits, the maximum distance a person can reach without changing their base of support. A systematic review study with meta-analysis described normative values of the test for community-dwelling elderly individuals as 26.6 cm (95% confidence interval: 25.1 to 28.0 cm)[13]. Therefore, we adopted the value of ≥ 26 cm as the reference for normal and values < 26 cm as reduced. The test is quick and easy to perform and requires little equipment. Each participant performed three attempts and the highest value was used in the analyses.

Statistical analysis

The data were presented through descriptive statistics with measures of central tendency (mean / standard deviation), absolute frequency (n), and relative frequency (%). After the interview, the data were organized and a database was created in an Excel spreadsheet. For the analysis, the database was imported from Excel to the Statistical Package for The Social Sciences (SPSS), version 25.0 software.

RESULTS

Five participants (9%) could not be located and were excluded from the results due to lack of contact. In total, 69 participants were evaluated (14 reported falls), among the elderly people who participated in the telephone interview, 88% were female and 12% were male. Regarding comorbidities, 70% of the participants who did not fall had hypertension and 7% had diabetes. On the other hand, among the participants who experienced falls, 57% had hypertension and none of the participants had a diagnosis of diabetes; other clinical characteristics are presented in Table 1.

The study indicated that 20% of the participants experienced at least one fall event within a 12 month period, and only one participant reported two fall events. In this case, all the falls occurred in female participants. Of these occurrences, the data indicate that: 8% had fractures (upper limb) and 8% had ankle sprains. Table 2 presents the context of the falls, it is possible to identify that the shift with the highest occurrence was in the morning, the most cited location was on the sidewalk, and the reported reason was tripping. Furthermore, regarding the time spent on the ground, it was observed that the largest portion of the sample remained for less than two minutes.

Table 1. Clinical and functional characteristics of the participants

Clinical and functional characteristics	Number (%)
Number of medications[1]	**Number**
Does not use medication	15 (22)
Up to two medications	40 (58)
Up to four medications	13 (19)
Five or more medications	1 (1)
Palmar grip strength[2]	
Normal men	6 (9)
Reduced men	2 (3)
Normal women	only
Reduced men	11 (16)
Functional Scope[3]	
Normal men	7 (10)
Reduced men	1 (1)
Normal women	only
Reduced women	only

Note: [1]Number of medications, [2]Palmar grip strength, [3]Functional Scope.

Table 2. Context of falls among study participants after initial assessment

Falls among study participants	Number (%)
Total falls	**Number**
None	55 (79,7)
One	14 (20,2)
Two	1 (0,1)
Shift of the fall	
Morning	10 (71)
Afternoon	4 (28)
Night	1 (1)
Place where the fall occurred	
Sidewalk	5 (36)
Domicile	4 (29)
Street	3 (21)
Backyard	2 (14)
Reason for the Fall	
Unbalanced	1 (7)
Slipped	5 (36)
Tripped	8 (57)
Time fallen on the floor	
Less than two minutes	9 (64)
Between two and five minutes	3 (22)
More the five minutes	2 (14)

DISCUSSION

This study aimed to present the occurrence of falls among elderly individuals 12 months after the baseline assessment during the pandemic. The results found demonstrated that 20% of the elderly people who participated in the study fell within the 12 month period, and women represented 100% of the fallers, corroborating the initial hypothesis of the study.

As reported, our findings showed a prevalence of falls of 20%. Regarding this percentage of falls, a previous study observed that, over 12 months, 24% of elderly people experienced falls[14], data close to what was found in this study. Moreover, another study identified that the occurrence of falls was 25.1%[5]. On the other hand, a systematic review demonstrated a prevalence of 28.1% in its findings[4]. It is worth noting that the occurrence of falls can increase with age, and elderly people who have already experienced a fall are at higher risk of falling in the following year. However, the rate of 15-25% of falls among elderly people who do not have a serious or permanent health condition can be considered as accidental falls[14,15]. The authors believe that these values are within the expected range due to the physically independent condition of the participants; it is possible to observe different data with higher percentages (ranging from 32% to 60%) in elderly individuals living in long-term care institutions[16].

Analyzing the global scenario regarding the prevalence of falls, a systematic review study with meta-analysis including 104 articles and a sample of 36,740, 590 participants, of these studies, 48 studies were conducted in Asia, 16 studies in Europe, 2 studies in Africa, 32 studies in America, and 6 studies in Oceania. According to the results of this study, the global prevalence of falls was 26.5% (95% confidence interval [CI] 23.4–29.8%)[17]. Furthermore, the highest prevalence of falls in elderly people was in Oceania with 34.4% (95% CI 29.2–40%) and in America with 27.9% (95% CI 22.4–34.2%)[17]. On the other hand, the lowest prevalence of falls was found in Europe at 23.4% (95% CI 15.8–33.2%). This global fall prevalence scenario is close to the values presented in the present study and the comparisons made previously[17].

Regarding the time the fall occurred, the shift reported with the highest incidence of falls was the morning, followed by the afternoon. For the authors, the morning shift encompasses an important part of the elderly person's day, during which it can be observed that this period is used to carry out their daily living activities (getting dressed and personal hygiene) and instrumental activities of daily living (maintaining household tasks). In this sense, other studies have also observed that the morning shift resulted in a higher occurrence of falls among elderly people[13,18], corroborating the findings of the present study. It was also observed that the location with the highest occurrence of falls in the present study was on the sidewalk, followed by the home, and the most reported cause was tripping. We can observe that these attributes are usually related to the performance of activities or tasks and, as such, require greater attention, better acuity of the visual and sensorimotor systems, and in the disorders and/or impairments of these requirements, the phenomenon of falling can occur.

After the moment of the fall, the period during which the person is on the ground, our study identified that the participants remained in this position for a short period (less than two minutes). Another study also identified that the majority of participants, upon falling, remained in this position for a short period (less than one minute)[18]. We emphasize that the agility in returning to the orthostatic position is related to the absence of fall severity and the independence of the elderly person, and that prolonged periods on the floor can present significant musculoskeletal injuries such as fractures.

Regarding medications, the largest portion of the sample uses up to two medications, followed by the consumption of up to four medications, and only one practices polypharmacy, which represents the consumption of five or more medications[19]. Overall, the medication consumption of the sample in this study is low when compared to elderly individuals who are cared for in long-term care facilities.

Although there is a study that did not find an association between medication use and falls[13], it is possible to identify that drug interaction can act systemically, providing the patient with drug toxicity, delirium, and falls more frequently accompanied by musculoskeletal injuries[20]. Therefore, this issue requires attention from healthcare professionals in order to avoid hospitalizations and higher care costs for patients and healthcare systems.

Regarding muscle strength, measurements indicate that frailty in the elderly is described when muscle strength in the handgrip test falls below 14 Kgf, and this factor may be related to falls[4]. Our results showed average values above the cutoff point (average: 23 Kgf). However, a small portion of men (n=2) and women (n=11) obtained results below 14 Kgf, which indicates a point of concern. The literature has shown that grip strength can be a useful indicator of overall health and that its reduction can cause various complications such as falls, hospitalization, and death[21,22], thus this marker should be monitored. It is worth noting that the aging process itself is responsible for a reduction in muscle strength of approximately 21% for ages between 70-79 years and 15% for ages between 60-69 years[18]. In this way, assessing muscle strength becomes essential to screen for possible muscle deficits and frailty in elderly people.

On the other hand, in the functional reach test, a systematic review study with meta-analysis indicates that the results considered satisfactory for elderly people are at the value of 26.6 cm[13]. These data are similar to the results found in the present study with an average of 26 cm. Specifically, 24% of the women in the present study obtained values below the described cutoff. This could demonstrate impairments in the postural mechanisms and strategies (anticipatory and compensatory) that are used to maintain or recover stability limits. Although the functional reach test evaluates the limits of body stability, the authors reveal in their systematic review study that the data collected by this test should not be considered absolutely predictive of falls[13].

Regarding the practical implications related to this study, it can be reported to healthcare professionals to conduct evaluations of clinical and functional aspects. Monitoring elderly individuals, especially women, becomes important to assess and detect falls and possible consequences generated by this phenomenon. The morning shift and tripping are elements that can be included in the fall prevention and rehabilitation program with guidance (patient education), sensorimotor training, and body awareness. The strong point of the study that can be highlighted is the presentation of data on falls from a sample of physically independent elderly people living in the community, obtaining the data amidst the pandemic scenario.

Some limitations may be presented as: evaluation by phone contact due to memory bias, however, the pandemic scenario made other evaluation resources difficult. However, this method applied has already been used to present the phenomenon of falls in other studies in the literature[23]. The use of a structured questionnaire with questions related to falls developed by the authors and not having assessed the participants' level of physical activity, although they considered themselves sedentary.

CONCLUSION

The results of this study showed that the prevalence of falls among the elderly evaluated after 12 months was 20%, without major consequences such as hospitalization or disabling injuries. Falls predominantly occurred in women, with sidewalks being the most frequent location and tripping the main reported cause. These data are from a population in the Londrina region, Paraná State, southern Brazil; perhaps other percentages can be found in different regions of the state and the country.

Acknowledgements: To the National Foundation for the Development of Private Higher Education – FUNADESP for the support and encouragement of research.

Author Contributions: P.G. - Conceptualization; Data curation; Supervision, writing – original draft, writing – review & editing; D.A - Formal analysis, investigation, methodology, visualization; F.V – Investigation, methodology, project, administration; N.M - Field support, methodological assistance, logistics; L.R - Data organization, implementation support, administrative assistance; J.R – Investigation, methodology, project, administration; F.Y - Methodological refinement, operational coordination; M.O – Conceptualization, data curation, methodology, writing – review & editing.

Financial Support: National Foundation for the Development of Private Higher Education – FUNADESP.

Conflict of interest: The authors declare that they have no conflict of interest.

REFERENCES

1 Giacomini SBL, Fhon JR, Rodrigues RAP. Frailty and risk of falling in the older adult living at home. Acta Paul Enferm. 2020;33:1-8.

2 Oliveira MR, Vieira ER, Gil AWO, Fernandes KBP, Teixeira DC, Amorim CF, et al. One-legged stance sway of older adults with and without falls. *PLoS One*. 2018;13(9):e0203887.

3 Bushatsky A, Alves LC, Duarte YAO, Lebrão ML. Factors associated with balance disorders of elderly living in the city of São Paulo in 2006: Evidence of the Health, Well-being and Aging (SABE) Study. *Rev Bras Epidemiol*. 2018;21(Suppl 2):e180016.

4 Vieira ER, Palmer RC, Chaves PHM. Prevention of falls in older people living in the community. BMJ. 2016;353:1-13.

5 Pimentel WRT, Pagotto V, Stopa SR, Hoffmann MCCL, Andrade FB de, Souza Junior PRB, Lima-Costa MF, Menezes RL de. Falls among Brazilian older adults living in urban areas: ELSI-Brazil. *Rev Saude Publica*. 2018;52(Suppl 2):12s.

6 Vieira LS, Gomes AP, Bierhals IO, Farías-Antúnez S, Ribeiro CG, Miranda VIA, Lutz BH, Barbosa-Silva TG, Lima NP, Bertoldi AD, Tomasi E. Falls among older adults in the South of Brazil: prevalence and determinants. *Rev Saude Publica*. 2018;52:22.

7 Gullich I, Cordova DDP. Queda em idosos: estudo de base populacional. Rev Soc Bras Clin Med. 2017;15(4):230-4.

8 Spirduso WW, Francis KL, MacRae PG. Physical Dimensions of Aging. 2ª ed. Champaign: Human Kinetics; 2005.

9 Cruz-Jentoft AJ, et al. Sarcopenia: European consensus on definition and diagnosis. Age Ageing. 2010;39(4):412-23.

10 Callis N. Falls prevention: Identification of predictive fall risk factors. Appl Nurs Res. 2016;29:53-8.

11 Macedo DO, Freitas LM, Scheicher ME. Handgrip and functional mobility in elderly with different levels of physical activity. Fisioter Pesqui. 2014;21:151-5.

12 Duncan PW, Weiner DK, Chandler J, Studenski S. Functional Reach: a new clinical measure of balance. *J Gerontol*. 1990;45(6):M192–7.

13 Rosa MV, Perracini MR, Ricci NA. Usefulness, assessment and normative data of the Functional Reach Test in older adults: a systematic review and meta-analysis. Arch Gerontol Geriatr. 2019;81:149-70.

14 De Sousa-Araújo IV, Gomes NC, Santos-Nascimento J, Ribeiro CCNR, Tavares DMS. Falls in older adults: predictors and space distribution. *Rev Salud Publica* (Bogotá). 2019;21(2):187–94.

15 Buksman S, Pereira SRM, Perracini M, Py L, Barreto KML, Leite VMM; Sociedade Brasileira de Geriatria e Gerontologia. Quedas em idosos: prevenção. *Soc Bras Geriatr Gerontol* (Projeto Diretrizes); 2008 [cited 2022 Apr 25].

16 Soares IGE, Rech V. Prevalência de quedas em idosos institucionalizados no Brasil: uma revisão integrativa. Rev Kairós Gerontol. 2015;18(4):47-61.

17 Salari N, Darvishi N, Ahmadipanah M, Shohaimi S, Mohammadi M. Global prevalence of falls in the older adults: a comprehensive systematic review and meta-analysis. *J Orthop Surg Res*. 2022;17:334.

18 Antes DL, D'Orsi E, Benedetti TRB. Circunstâncias e consequências das quedas em idosos de Florianópolis. Epi Floripa Idoso 2009. Rev Bras Epidemiol. 2013;16(2):469-81.

19 Marques PP, Assumpção D, Rezende R, Neri AL, Francisco PMSB. Polypharmacy in community-based older adults: results of the Fibra study. *Rev Bras Geriatr Gerontol*. 2019;22(5):e190118.

20 Hoel RW, Connolly RMG, Takahashi PY. Polypharmacy management in older patients. Mayo Clin Proc. 2021;96:242-56.

21 Bohannon R. Grip strength: an indispensable biomarker for older adults. Clin Interv Aging. 2019;14:1681-91.

22 Yazar T, Yazar HO. Prevalence of sarcopenia according to decade. Clin Nutr ESPEN. 2019;29:137-41.

23 Milat AJ, Watson WL, Monger C, Barr M, Giffin M, Reid M. Prevalence, circumstances and consequences of falls among community-dwelling older people: results of the 2009 NSW Falls Prevention Baseline Survey. NSW Public Health Bull. 2011;22(4):43–8.