









Original articles

Risk of home falls in community and non-community individuals after chronic stroke

Risco de quedas domiciliar em indivíduos comunitários após acidente vascular cerebral crônico

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ABSTRACT

Objective: To compare the risk of home falls between community and non-community individuals after chronic stroke. **Methods:** A cross-sectional study developed with individuals after chronic stroke, unilateral involvement and with the ability to walk independently. Walking speed was measured using the 10-meter Walking Test (10MWT) and individuals were classified into community walkers and non-community walkers. The risk of fall was assessed by the Home Falls and Accidents Screening Tool (HOME FAST - Brazil) questionnaire. The analysis between the variables was performed using the Student t test, assuming $\alpha=0.05$. **Results:** 46 individuals (22 men) with mean age of 56.8 ± 17.8 years and mean time after the onset of 82.1 ± 79.9 months were included. The 10MWT mean habitual and fast was 0.87 ± 0.47 m/s and 1.12 ± 0.65 m/s, respectively. 54.7% of the participants were classified as non-community walkers. The mean HOME FAST - Brazil score was 5.88 ± 2.53 points. Statistically significant differences were found between community and non-community walkers regarding risk of home falls (5.09 ± 2.10 vs 6.74 ± 2.78 ; MD 1.65 95%CI 0.12 to 3.17). **Final considerations:** Individuals after chronic stroke classified as non-community walkers present higher risk of falls at home compared to community walkers.

Keywords: Accidental Falls; Stroke; Walking speed; Home environment; Gait

RESUMO

Objetivo: Comparar o risco de quedas domiciliares entre indivíduos comunitários e não comunitários após acidente vascular cerebral (AVC) crônico. **Métodos:** Estudo transversal desenvolvido com indivíduos pós-AVC crônico, com acometimento unilateral e capacidade de deambular de forma independente. A velocidade de marcha foi medida por meio do Teste de Caminhada de 10 metros (TC10m) e os indivíduos foram classificados em deambuladores comunitários e deambuladores não comunitários. O risco de quedas foi avaliado pelo questionário Home Falls and Accidents Screening Tool (HOME FAST - Brasil). A análise entre as variáveis foi realizada por meio do teste t de Student, assumindo $\alpha=0,05$. **Resultados:** Foram

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incluídos 46 indivíduos (22 homens) com idade média de $56,8 \pm 17,8$ anos e tempo médio após o AVC de $82,1 \pm 79,9$ meses. O TC10m habitual e rápido foi de $0,87 \pm 0,47$ m/s e $1,12 \pm 0,65$ m/s, respectivamente. 54,7% dos participantes foram classificados como deambuladores não comunitários. A pontuação média do HOME FAST - Brasil foi de $5,88 \pm 2,53$ pontos. Foram encontradas diferenças estatisticamente significativas entre deambuladores comunitários e não comunitários em relação ao risco de quedas domiciliares ($5,09 \pm 2,10$ vs $6,74 \pm 2,78$; 1,65 IC95% 0,12 a 3,17). **Considerações finais:** Indivíduos após AVC crônico classificados como deambulador não comunitários apresentam maior risco de quedas no domicílio em comparação aos deambuladores comunitários.

Palavras-chave: Acidentes por Quedas; Acidente Vascular Cerebral; Velocidade de caminhada; Ambiente domiciliar; Marcha

INTRODUCTION

Individuals who suffered a stroke can present major sequelae, such as motor disabilities, which can result in considerable changes in walking ability and a possible decrease in walking speed¹. Walking speed is usually used to classify the individuals as community and non-community walkers, with 30% of individuals after chronic stroke being found with non-community characteristics². It is important to emphasize that community walkers can have a more complete social integration while non-community walkers, who present restrictions during daily activities outdoors, are limited to their household environment³.

This outcome, along with other disabling variables such as reduced strength in lower limbs, are considered risk factors for fall in individuals after a stroke⁴. In addition, household environment alterations, such as excessive objects and insufficient lighting in the house, can be considered as extrinsic risk factors for falls in this population⁵. Falling and limited mobility are considered common negative results that may each contribute to poor health outcomes after having a stroke⁶. The occurrence of post-stroke patients' falls is impacted directly by contextual factors and activity limitations, as home hazard environments, home safety surroundings, and confidence in doing tasks being important variables which influence the risk of these falls. The appropriate home arrangement, considering structural impairments and activity limitations of individuals after stroke, reduces the risk of falls in this context⁷.

In Brazil, there was an increase in hospitalizations and mortality caused by falls among the elderly between the years 1998 and 2015⁸. Between the years 2005 and 2010, the expenses in hospitalizations due to elderly falls by the Brazilian Unified Health System were approximately 80 million dollars⁹ and from January to October 2020, 105.993 hospitalizations due to falls were recorded in the country¹⁰, burdening the public health system and highlighting the need to know and prevent the risk of future falls.

Therefore, the interaction between individuals after a chronic stroke and the risk of falls at home must be analyzed, as falls can lead to physical injuries, functional decline, and



increased dependence⁵. While the home environment is where the studied individuals spend most of their time, there is a scarcity of research investigating related factors, particularly walking speed, in the post-stroke population. Thus, this study aims to compare the risk of falls at home between community and non-community individuals after chronic stroke.

MATERIALS AND METHODS

Study Design

This was a cross-sectional study with a probabilistic sample, approved by the Research Ethics Committee (CAAE: 3.555.916). Individuals with chronic stroke diagnosis (> 6 months), unilateral involvement, with the ability to walk independently, and who agreed to participate in the study by signing the informed consent term were included. Individuals with aphasia, hearing disorders, and those with cognitive deficits assessed through the Mini-Mental State Examination (MMSE) who did not reach the cutoff points established for Brazilian population, represented by scores <26 points for highly educated individuals and <13 points for illiterate individuals¹¹, were excluded from the study. Participants were recruited from the general community of XXX, and data collection occurred from March to November 2022. This study is in accordance with the ethical principles contained in the Declaration of Helsinki.

Outcomes

Clinical and demographic data such as age, sex, time of injury and the use of walking aids was collected for characterization purposes. After the initial assessment, MMSE were applied to assess cognitive function and the Home Falls and Accidents Screening Tool Brazil (HOME FAST - Brazil) for the risk of falls at home, in the respective order. Subsequently, a 10-meter walking test was performed to assess walking speed.

INSTRUMENTS

Walking speed

The walking speed (m/s) of the individuals was measured through the 10-meter walking test (10MWT), which analyzes usual and maximum walking speed in a 14 meters distance, where the central 10 meters are timed, and the test applicator presents verbal commands. Based on walking speed, individuals were classified into community walkers (walking speed ≥ 0.8 m/s) and non-community walkers (walking speed <0.8 m/s)¹². This

assessment tool presents appropriate measurement properties to evaluate walking speed in the investigated population¹³.

Risk of home falls

The risk of home falls was assessed using the HOME FAST - Brazil questionnaire, a screening instrument that examines household risks through the interaction of individuals and their home environment when performing activities that may put them at risk of falls¹⁴. The questionnaire has 25 items that refer to floors, furniture, lighting, bathroom, stairs/steps, considering safety, functions and mobility factors on the environment. Each item must be answered with "yes", "no" or, in some cases, "not applicable". The score is calculated by counting and totalling the "no" answer, where each answer contributed 1 point. The score range is from 0 to 25, with the closer to 25 points, the greater the risk of falls for individuals at home. This tool was developed in Australia¹⁵, but was adapted cross-culturally, being reliable and valid for assessing the risk of falls at home in the general population of Brazil. Thus, a score ≥ 8 was considered a high risk of falls in the home environment¹⁶.

Data analysis

The sample size calculation took into account the total number of at least 45 individuals to conduct the research, considering a significant level of 0.05, medium effect size ($d=0.6$), and a power of 0.8. All analyzes were performed using the statistical software Statistical Package for the Social Sciences (SPSS) version 17.0 for Windows, with a significance level of 5%. Categorical variables (gender, type of stroke, use of assistive device) were described using absolute and percentage frequencies and continuous variables (age, time of stroke, number of falls, walking speed, risk of falls) were presented as mean \pm standard deviation. Student's t test was used to compare the mean values obtained in HOME FAST - Brazil between the community and non-community walker groups.

RESULTS

A total of 46 individuals were included in this study, 22 (47.8%) of which were men. The average age of the individuals was 56.8 ± 17.8 years and the mean time since the injury was 82.1 ± 79.9 months. Sample characterization is summarized in Table 1.

Table 2 summarizes the results found in the 10MWT and in the HOME FAST - Brazil questionnaire. The study experienced a sample loss of four individuals: one was unable to perform the maximum walking speed test, and three did not respond correctly to the HOME FAST-Brazil questionnaire. Therefore, they were not included in Table 3.



Table 1 – Sample characterization (n=46)

Variable	n = 46
Age (years), mean (SD)	56.8 (17.8)
Gender (men), n (%)	22 (47.8%)
Type of stroke (Ischemic), n (%)	31 (67.4%)
Stroke time onset (months), n (%)	82.1 (79.9)
Use walking aids	
Don't use	20 (43.5%)
Walking stick	13 (28.2%)
Walker	2 (4.34%)
Canadian crutch	5 (10.87%)
Falls in the last 6 months, mean (SD)	0.72 (1.57)

n: number; SD: standard deviation

Table 2 – 10MWT and HOME FAST - Brazil

Variable	Mean (SD)
Walking speed (habitual), n = 46	0.87 (0.47)
Walking speed (maximum), n = 45	1.12 (0.65)
HOME FAST - Brazil score, n = 43	5.88 (2.53)

n: number; SD: standard deviation

Statistically significant differences ($p=0.03$) were found in the mean score of HOME FAST - Brazil between community ambulators and non-community ambulators. Non-community walkers' group (41.3%) demonstrated mean scores of 6.74 ± 2.78 in HOME FAST - Brazil. The community walkers' group obtained a mean score of 5.09 ± 2.10 on HOME FAST - Brazil. Table 3 shows the mean HOME FAST - Brazil score obtained by each group, according to their walking speed classification.

Table 3 – HOME FAST - Brazil score according to walking speed classification

Variable	n (%)	HOME FAST - Brazil, mean (SD)	Mean difference (95%CI)	p-value
Non-community walker	19 (41.3%)	6.74 (2.78)	1.65 (0.12 to 3.17)	0.03
Community walker	23 (50%)	5.09 (2.10)		

N: number; SD: Standard Deviation; CI: confidence interval of 95%

DISCUSSION AND FINAL CONSIDERATIONS

This study compared the risk of home falls between community and non-community individuals after a stroke. Non-community individuals showed a higher risk of falls than the community after having a stroke. Stroke survivors classified as non-community walkers, through the 10MWT, had a higher score in the HOME FAST - Brazil test than the community walkers.

Motor disabilities in the population after stroke, associated with an inappropriate household environment may justify the significant number of home falls^{4,5}. Motor disabilities, such as balance impairment can increase the risks of falls and can aggravate their activity limitations and participation restrictions¹⁷. The results demonstrated that non-community individuals after stroke had a higher risk of falls when compared to individuals of community in the same population, being 32% higher in the group of non-community walkers.

The present study used a simple, accessible and easy questionnaire in clinical practice to compare the risk of falls in the home environment in individuals after chronic stroke. The cutoff score of 8 points on the HOME FAST questionnaire was established based on validation studies that considered the instrument's sensitivity and specificity^{15,16}. In the Brazilian context, Ferreira et al. reviewed and validated the self-reported version of HOME FAST - Brazil, emphasizing the effectiveness of the 8-point cutoff score across diverse population contexts, thereby reinforcing the robustness of the instrument¹⁸.

The risk of falls in stroke survivors is a significant concern due to its potentially serious consequences. The scientific literature provides several tools to assess the risk of falls in different populations, including after stroke. Among these questionnaires, the Self-Rated Fall Risk Questionnaire (FRQ), Postural Assessment Scale for Stroke Patients (SwePASS), and the Berg Balance Scale (BBS) stand out. The FRQ serves as a fall risk screening tool, where a score of 4 or more indicates that the patient is at risk. In the study by Chen et al. (2017), post-stroke individuals were divided into three groups based on their fear of falling, and all scored greater than 4 on the FRQ, indicating a high risk of falls¹⁹. The study by Persson et al. (2017) used the SwePASS, a standardized 12-item scale that has been shown to be a moderate predictor of falls during the first year after a stroke. SwePASS scores were significantly associated with the risk of falls during hospitalization and were shown to have an equal ability to the BBS to predict the risk of falls during the first year after a stroke²⁰.

According to Salbach et al., a considerable difference in gait speed in individuals after chronic stroke was evidenced using 10MWT assessment tool²¹. When analyzing walking speed, we observed that the values found in this study for average habitual and fast walking

speeds were 0.87 ± 0.47 m/s and 1.12 ± 0.65 m/s, respectively. These results are comparable to those reported by Ricci et al. (2015), who found a normal walking speed of 0.72 ± 0.28 m/s and a fast walking speed of 1.00 ± 0.40 m/s²². Similarly, Silva et al. reported a habitual walking speed of 0.80 ± 0.34 m/s and a fast walking speed of 1.00 ± 0.42 m/s²³. These data highlight the significant impact that a stroke has, resulting in sequelae that affect patients' walking and contribute to an increased risk of falls.

This study showed that 50% of individuals after chronic stroke were classified as community walkers and, consequently, presents the home environment as the most frequented place. The household context then becomes a high-risk environment for the occurrence of falls, given that individuals spend the majority of the time at home. Stroke is considered a risk factor for the occurrence of falls, which are common during recovery²⁴, being related to intrinsic factors, such as deficits in walking capacity and extrinsic factors like inadequate lighting, slippery carpets, corridors with objects¹⁷.

In addition, a recent study by Abdollahi et al. demonstrated that falls in individuals after stroke can have several consequences for the individual's health, such as bruises, abrasions and fractures¹⁷. The repercussions related to fear of falling involve greater costs spent on public health⁹, use of anxiolytic drugs²⁵, restrictions in range of motion²⁶, decline in postural control and proprioception, increased risk of falls²⁷, predisposition to depressive symptoms²⁸ and disabilities. Some studies have associated fear of falling with environmental factors and highlight the importance of intervening in the environment to reduce fear of falling. The environment has an important influence on the behavior of the older adults and can directly impact the greater risk of fear of falling²⁹.

Regarding the use of walking aids, approximately 43.41% of the study sample reported using assistance devices to move around. According to the studies, people who use walking aids have a higher risk of falls, lower community participation, lower self-confidence and greater fear of falling, compared to those who walk without any walking assistance¹⁷. However, these devices increase the ability to walk in community environments, providing greater stability and may contribute to the prevention of falls³⁰.

The findings of this study may contribute to the development of strategies aimed at preventing falls in adults following chronic stroke and their respective consequences. Therefore, investigating the home environment of these individuals should be adopted as an effective strategy, in conjunction with a multifactorial clinical approach. This approach should include assessments of gait and balance, strength and balance exercises, environmental modifications, and medication reviews. Such knowledge is essential for implementing

preventive strategies in physiotherapy for individuals after chronic stroke, enabling the identification of potentially hazardous areas and the adoption of safer alternatives.

The present study was carried out considering individuals after chronic stroke, therefore, the results have limitations to be considered to other populations, such as individuals after stroke in acute and subacute phases. In addition, the results are limited to be extrapolated for healthy individuals or individuals with other neurological conditions. Another possible study limitation is the convenience recruited sample, which can reduce the reliability of the findings when expanded to the general scope of the population, so this sample may not be representative of the entire population after individual stroke.

The main findings of this study suggest that individuals after chronic stroke classified as non-community walkers had a higher risk of home falls compared to community walkers in the same population. It is notable that the gait speed of individuals after chronic stroke should be assessed and consequently treated in clinical practice, pursuing management of disabilities and primarily the risk of falls in this population.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Availability of research data and other materials

Research data and other materials can be obtained by contacting the authors.

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