

Clinical and functional characteristics of women after stroke, fallers and non-fallers: a longitudinal study

Características clínicas e funcionais de mulheres após AVC, caidoras e não caidoras: um estudo longitudinal

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ABSTRACT | BACKGROUND: Occurrence of falls is among the most frequent complications presented by the elderly and individuals with neurological diseases. It is known that in the elderly, there is a greater frequency of falls in women. However, in individuals after stroke, this relationship is not established. The purpose of this study was to differentiate the clinical and functional characteristics of fallers and non-fallers women after stroke and to verify the association between functional mobility and functional capacity in these women. **DESIGN AND SETTING:** This is a longitudinal prospective study conducted in Salvador, Bahia, Brazil. **METHODS:** Women with independent gait assisted in a reference outpatient clinic were included. Sociodemographic and clinical data were collected, and the National Institutes of Health Stroke Scale, Modified Barthel Index, Timed Up and Go (TUG), and European quality of life were applied. The level of significance was set at 5%. **RESULTS:** A total of 68 women with a mean age of 56 (± 13.7) years were selected; 51% of the women fell in the follow-up, the latter was younger than 55 years (± 13.4), with greater severity of the stroke. Impairment in the posterior vascular territory was more evident among falling women ($P = 0.009$), but all falling and non-falling women presented impaired functional mobility (TUG = 15seconds). However, the total sample was classified as totally independent or with slight dependence on the activities of daily living (ADLs) (MBI = 49). The correlation between TUG time and MBI was negative and significant ($R = -0.702$, $P \leq 0.001$). **CONCLUSIONS:** The involvement of posterior circulation is an important predictor of falls, an important indicator in the monitoring of women after stroke. It also emphasizes that the lower functional mobility impacted women's functional capacity.

KEYWORDS: Stroke. Women. Accidental falls. Mobility limitation.

RESUMO | INTRODUÇÃO: A ocorrência de quedas está entre as complicações mais frequentes apresentadas por idosos e portadores de doenças neurológicas. Sabe-se que em idosos há maior frequência de quedas em mulheres. Em indivíduos após AVC, essa relação não é estabelecida. **OBJETIVO:** Diferenciar as características clínicas e funcionais de mulheres caidoras e não caidoras após AVC e verificar a associação entre mobilidade funcional e capacidade funcional nessas mulheres. **DESENHO DE ESTUDO E LOCAL:** Trata-se de um estudo prospectivo longitudinal realizado em Salvador (BA). **MÉTODOS:** Foram incluídas mulheres com marcha independente atendidas em ambulatório de referência. Foram coletados dados sociodemográficos e clínicos e aplicados a Escala do National Institutes of Health Stroke, o Índice de Barthel modificado, o Timed Up and Go (TUG) e a qualidade de vida europeia. O nível de significância adotado foi de 5%. **RESULTADOS:** Foram selecionadas 68 mulheres com média de idade de 56 ($\pm 13,7$) anos, 51% das mulheres caíram no seguimento, esta última tinha menos de 55 anos ($\pm 13,4$), com maior gravidade do AVC. O comprometimento do território vascular posterior foi mais evidente entre as mulheres que caíram ($P = 0,009$), mas todas, as que caíram e as que não caíram, apresentaram mobilidade funcional prejudicada (TUG = 15 segundos). No entanto, a amostra total foi classificada como totalmente independente ou com leve dependência das atividades de vida diária (AVDs) (MBI = 49). A correlação entre o tempo de TUG e MBI foi negativa e significativa ($R = -0,702$, $P \leq 0,001$). **CONCLUSÕES:** O envolvimento da circulação posterior é um importante preditor de quedas, sendo um importante indicador no acompanhamento de mulheres após AVC. Também enfatiza que a menor mobilidade funcional impactou a capacidade funcional da mulher.

PALAVRAS-CHAVE (termos MeSH): Golpe. Mulheres. Quedas acidentais. Limitação de mobilidade.

Introduction

Stroke is recognized as one of the chronic diseases with the greatest impact on the health of survivors. It is estimated that by 2030 that 72 million people under 65 years old will have a stroke, with the highest prevalence in women.¹ As a consequence, individuals after stroke can present various impairments such as sensorimotor disorders, cognitive deficits, hemiplegia, muscular weakness, physical deconditioning, balance changes, depression, and falls.²⁻⁵ These elements directly influence mobility, independence, and quality of life.⁴

Falls are among the most frequent complications presented by these individuals, and the damages resulting from them are a significant burden on the rehabilitation process and a higher cost in health care.⁵⁻⁹ The fall was defined as "inadvertently staying on the ground or a lower level, excluding intentional changes of position to lean on furniture, walls or other objects."¹⁰ It is well known that almost half of stroke survivors fall, especially in the first two months after discharge from the hospital.⁸ However, few studies have related distinct characteristics between the sexes as a predictive factor for falls.^{7,11}

Studies in the geriatric population confirm a higher frequency of falls in women and present specific predictors for this population.¹⁰⁻¹⁵ However, predictive factors for falls in the elderly may not have the same meaning in the population with stroke⁷, especially considering the challenge faced by health teams in diagnosis and treatment, with an increase in the number of stroke cases in young adults.¹⁶

The elucidation of questions about the occurrence of falls in this population, considering the demographic differences of sex and age, may enable the development of actions and the adoption of preventive measures essential to the maintenance of functional capacity in this population. Thus, the objective of this study was to differentiate the clinical and functional characteristics of fallers and non-fallers women after stroke and to verify the association between functional mobility and the functional capacity of these women residing in the community.

Methods

This is a longitudinal prospective study developed as part of a previous study that investigated predictors of falls.¹⁷ The original cohort consisted of 150 individuals presenting with clinical and radiological diagnosis of ischemic or hemorrhagic stroke, the mean follow-up was 21 +/- 6 months, and 134 individuals completed the follow-up, with 68 women. Post-stroke individuals were recruited from a teaching outpatient clinic, independently of the number of events, and presented independent gait. Patients are referred from stroke units or family health clinics of the public health system in Salvador (Bahia), Brazil, to investigate the stroke mechanism and define long-term treatment strategies (Ethical approval number 694/2004; process number 25000.002675/2004-56).

We excluded patients with other diagnoses, such as those with vestibular disorders, Parkinson's disease, or other neurological or orthopedic diseases that could affect the balance. We also excluded individuals who are unable to understand test instructions or perform requested tasks due to deficits (understanding aphasia or dementia) in a formal evaluation by a certified neurologist.

A questionnaire was applied containing sociodemographic data, such as age in years and clinical information such as the affected cerebral hemisphere, time of a stroke, compromised vascular territory, medications in use, use of orthoses or walking aid. After entry into the cohort, subjects were prospectively followed for two years to verify the occurrence of self-reported falls as the study's primary outcome. This analysis considered the occurrence of the first fall, being those women classified as fallers.

The National Institutes of Health Stroke Scale (NIHSS) was used to assess the severity of the stroke^{18,19}, provides a quantitative assessment of the degree of neurological disability through assessment of level of consciousness, language, neglect, visual field loss, extraocular movements, muscle strength, ataxia, dysarthria, and sensory loss. The Modified Barthel Index (MBI) to assess functional capacity in daily activities ranks individuals in total dependence (10

points or less), severe dependence (11 to 30 points), moderate dependence (31 to 45 points), slight dependence (46 to 49 points) and total independence (50 points).¹⁹

The Timed Up and Go (TUG), verified at home, is a tool that assesses functional mobility. It quantifies the time in seconds that the individual takes to lift from a standardized chair, walk three meters, return and sit. The individual is instructed to walk at his usual gait, with or without the use of orthoses.²⁰ The cutoff point of > 14 represents impaired functional mobility and risk of falls.²¹ European quality of life-5 dimensions (EQ-5D) is an instrument that evaluates the quality of life, and the sum of the five dimensions results in a score ranging from 0 to 1²², considering a score lower than 0.78 an altered quality of life for this population.²³

During follow-up, data were collected quarterly at outpatient visits or by telephone interviews if a participant did not go to the scheduled appointment to verify the recorded information. Spouses or caregivers were identified as potential informants if the patient could not answer the call. The researcher exercised a standardized questionnaire for interviews about the occurrence of falls. The follow-up examiner remained blinded to the patient's initial assessment data. All patients and caregivers had a diary to record fall to avoid recall bias and loss of information. The local ethics committee approved this project, and all individuals or caregivers participating in the study signed the consent form.

Statistical analysis was performed using the Statistical Package for Social Sciences version 17.0 (SPSS Inc., Chicago, United States of America). Descriptive statistics included means and standard deviations for normally distributed continuous variables, the median and interquartile range for non-normally distributed continuous variables, and proportions for categorical variables.

For this study, a univariate analysis was performed using the Chi-square test or Fisher's Exact test for categorical variables and the Student's or Mann-Whitney T-test for continuous variables. In addition, the Pearson test was used for correlation analysis between functional mobility presented and functional capacity. The level of significance was set at 5% ($p < 0.05$).

Results

This analysis included 68 adult women with a diagnosis of stroke, and 51% of those were classified as fallers. As shown in Table 1, cesarean women were three years younger, had a higher score on the stroke severity scale (NIHSS), had shorter stroke time, more frequent lesions in the right cerebral hemisphere, and greater use of hypotensive drugs. However, in the univariate analysis, only a lesion in the posterior vascular territory represented a statistical difference between fallers and non-fallers women (Table 1).

It was also possible to verify that the fallers and non-fallers women were similar in functional capacity, being classified as slightly dependent in aid gait and functional mobility. Even with superior time in the execution of the TUG between the fallers, we did not find the difference between the groups. In addition, considering the cut-off point of the EQ-5D scale, all participants in the study had a compromised quality of life, with the women who had a lower score on the EQ-5D scale, but no statistically significant difference (Table 1).

There was a negative and statistically significant correlation between functional mobility and functional capacity in the total sample of women after stroke ($r = -0.702$, $P \leq 001$), showing that the lower the time spent to perform the TUG, the better performance in the capacity functional characteristics of these women (Figure 1).

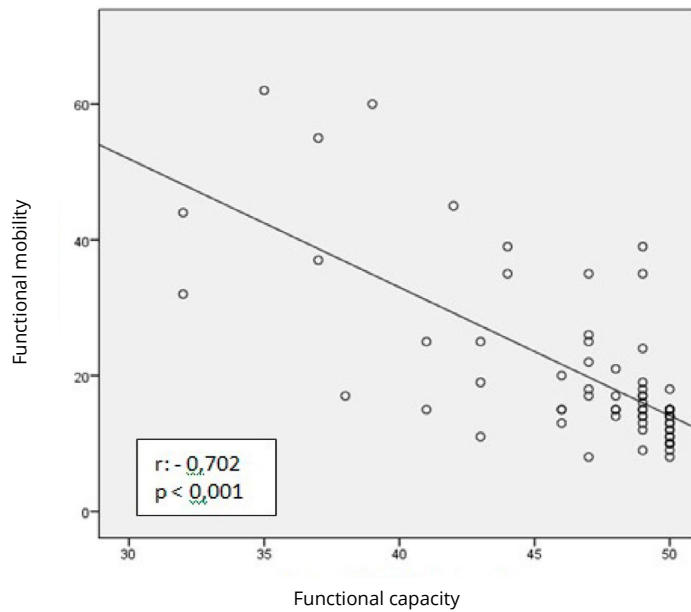
Table 1. Differences between the clinical and demographic characteristics of fallers and non-fallers women after stroke, living in the community and assisted in a reference outpatient clinic in the city of Salvador (BA), Brazil, 2012

Variables	Total (n = 68)	Non-fallers (n = 33)	Fallers (n = 35)	P-value
Age , mean (SD)	56 (13.7)	58 (14.1)	55 (13.4)	0.359*
Ischemic stroke , n (%)	40 (59)	22 (66)	18 (51)	0.652**
Stroke time (months) , median (IQ)	10 (4-29)	11 (5-39)	8 (4-27)	0.528***
Severity of stroke (NIHSS) , median (IQ)	2 (1-5)	1.5 (0-5)	3 (1-5)	0.138***
Territorial injury vascular posterior , n (%)	16 (23)	3 (9)	13 (37)	0.009**
Right hemisphere injury , n (%)	39 (57)	16 (48)	23 (65)	0.603**
Use of medicines , n (%)				
Hypotensors	57 (84)	28 (84)	29 (82)	0.736**
B-blockers	17 (25)	9 (27)	8 (22)	0.780**
Diuretics	29 (42)	15 (45)	14 (40)	0.627**
Vasodilators	13 (19)	3 (9)	10 (28)	0.067**
Sedatives	9 (13)	4 (12)	5 (14)	1.000**
Anticonvulsants	11 (16)	6 (18)	5 (14)	0.748**
Aid gait , n (%)	9 (13)	5 (15)	4 (11)	0.730**
Functional capacity (MBI) , median (IQ)	49 (46-50)	49 (46-50)	48 (43-49)	0.120***
Functional mobility (TUG seconds) , median (IQ)	15 (11-42)	13 (10-35)	14 (11-40)	0.123***
Quality of life (EQ-5D) , median (IQ)	0.60 (0.18-0.76)	0.69 (0.17-0.84)	0.51 (0.18-0.69)	0.080***

*T Student test; **Fisher's Exact test; ***Mann-Whitney test.

SD = standard deviation; IQ = interquartile; NIHSS = National Institutes of Health Stroke Scale; MBI = Modified Barthel Index; TUG = Timed Up and Go.

Figure 1. Correlation between functional mobility (Timed Up and Go) and functional capacity (Modified Barthel Index)



Discussion

In the present study, impairment of the posterior circulation was identified as the predictor of falls in women after stroke in the community. It was also verified that lower functional mobility represented a lower functional capacity among the women in the study, with a significant difference. It did not identify a difference between fallers and non-fallers women concerning the affected cerebral hemisphere. The lesions located in the posterior vascular territory have individual characteristics such as ataxia, dizziness, visual dysfunctions, sensory alterations that may predispose to falls.²⁴ Deficits related to impaired posterior circulation may be more disabling than those related to anterior circulation.²⁵ Previous studies confirm this finding^{17,26}, with the complete data from the original cohort that derived this study, a scale was proposed for predicting falls in people following stroke, which brings functional mobility, posterior circulation, and female sex as the main predictors¹⁷, which indicates the importance of identifying these factors for possible falls prevention.

In previous studies, a statistically significant difference was not found in the performance of daily life activities among patients who had involvement in the anterior vascular territory and those who had lesions in the posterior circulation. However, these studies did not aim to investigate the association between impaired circulation and falls.^{25,27,28} In the present study, it was also verified that lower functional mobility represented a lower functional capacity among the women in the study, with a significant difference. The reduction of functional mobility favoring a greater fear of falling may justify reducing functional capacity in this population.²⁹

The predictive factors already identified for falls in elderly women, such as decreased hormonal levels¹², urinary incontinence¹⁰, lower bone density, reduced muscle strength, osteoporosis^{12,13}, fear of falling, and depression, may not be representative as predictors of falls for the population after stroke^{13,14}, since the primary neurological deficits are quite variable and need to be considered when analyzing the impact of stroke and the occurrence of falls, understanding its context and multifactorial nature.^{26,30} In our population composed of adult women, age did not represent a difference between groups, although fallers women were younger and had a higher severity of stroke.

The present study did not identify a difference between fallers and non-fallers women in relation to the affected cerebral hemisphere, as was reported in a study with the population after stroke.²³ In disagreement with this finding, studies reveal that people with involvement in the right cerebral hemisphere are at increased risk of falls.^{17,31} This difference can be justified in the present study since the faller's women had a shorter time after the stroke episode.

This study used clinical and functional data collected from a representative cohort of adult women, favoring the extension of this specific knowledge. However, when women with a first fall event are considered fallers, they may have limited the investigation of the differences between the groups. We also refer to the selection bias, noting that the clinic's population may not reflect the entire reality of patients residing in the community.

Conclusion

The present study results affirm that the impairment of the posterior circulation was the predictor of falls in women after stroke in the community. In addition, impaired functional mobility negatively impacted functional capacity in these women.

Authors' contributions

All authors participated in all stages of the research, report writing, and approved the final version of the paper.

Competing interests

No financial, legal, or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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