

FACTORS RELATED TO RISK OF FALLS AMONG OLDER POST-STROKE PATIENTS

Tran Viet Luc^{1,2,✉}, Nguyen Trung Anh^{1,2}, Nguyen Thi Thu Huong^{1,2}

¹Hanoi Medical University

²National Geriatric Hospital

This study was conducted to identify factors related to fall risk among older post-stroke patients. A cross-sectional study was conducted on 107 post-stroke patients aged ≥ 60 years old treated at the National Geriatric Hospital. Fall risk was assessed using the 21-item Fall Risk Index. The percentage of participants with a high risk of falling was 69.2%. There were significant differences between the high risk of falls and the levels of disability, depression, and instrumental activities of daily living. The multivariate logistic regression model showed that mild to severe disability after stroke (OR=4.005) and patients with impairment of instrumental activities of daily living (OR=3.844) were significantly associated with an increased risk of falls in elderly post-stroke patients. This study showed two in three participants have a high risk of falls. Disability levels, instrumental activities of daily living, and depression were associated with a high risk of falls.

Keywords: Related factors, Risk of fall, Post-stroke, Elderly.

I. INTRODUCTION

Stroke is a common problem and is one of the leading causes of mortality and disability around the world. According to the Global Burden of Disease (GBD) Study 2016, stroke is the leading cause of disability and the second cause of death worldwide. There are more than 13.6 million new strokes and more than 5.5 million stroke deaths every year. According to the statistics in 2016, the number of disability-adjusted life year (DALYs) people caused by stroke reached 116.4 million people.¹ The increase in stroke rates in the world is related to population growth and aging population. Stroke accounts for a large proportion of the elderly. 60% of stroke patients have permanent disabilities and limitations in mobility, vision, voice, speech, swallowing, and sexual function.²

Stroke patients were found to have difficulty due to lack of mobility and were unable to perform basic functional activities such as walking and feeding, which led to sudden dependence on their families for basic and daily self-care activities.³

Fall is a common complication of the stroke recovery process. The prevalence of stroke in people with at least one fall on admission varies from 14% to 65%. There are 37% to 73% of post-stroke patients who have fallen in the first 6 months after being discharged home.⁴ The number of people who fall within the first 13 months post-stroke is 1.77 times higher than those of the same age group who do not have a stroke.⁵ Falls can cause serious bone fractures, functional impairment, reduced activity, and reduced quality of life.⁶

Fall is a clinical complication that causes many difficulties and dangers for older post-stroke patients. The consequences of stroke combined with features of advanced age such

Corresponding author: Tran Viet Luc

Hanoi Medical University

Email: tranvietluc@hmu.edu.vn

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as the presence of geriatric syndromes may be associated with an increased risk of falls. Falls can be prevented if risk factors of fall risk are identified and managed. However, published studies on factors related to fall risk among older post-stroke patients in Vietnam were limited. Thus, we conducted this research to identify factors related to fall risk among older post-stroke patients at the National Geriatric Hospital.

II. SUBJECTS AND METHODS

1. Study subject

Post-stroke patients aged from 60 years and older treated at the National Hospital Geriatrics from July to November 2021.

Inclusion criteria:

(1) patients aged 60 years and older diagnosed with stroke according to clinical symptoms and diagnostic imaging⁷;

(2) post-stroke duration was greater than or equal to 2 weeks.

Exclusion criteria:

(1) the patient was diagnosed with Transient ischemic attack (TIA) or suffered from brain trauma before this time;

(2) the patient had a severe condition like respiratory failure, using a ventilator;

(3) patients with an inability to communicate.

2. Methods

The study was a cross-sectional study. The sample was selected according to the entire sampling method. The sample size was calculated using a single population proportion formula:

$$n = Z_{1-\alpha/2}^2 * [p*(1-p)/d^2]$$

- With n = the required sample size,

- $Z_{1-\alpha/2} = 1.96$ (with $\alpha = 0.05$ and 95% confidence interval)

- and d = precision (assumed as 0.1). With $p = 0.5$ (according to the rate of fall risk in post-stroke patients according to Schmid's study).⁸ From the formula, the estimated sample size is $n = 96$ elderly post-stroke patients. The number of elderly post-stroke patients in our study was 107. Data were collected by using a unified research record.

Variables:

- General information: age, gender, occupation.

- Stroke characteristics: stroke type (ischemic or hemorrhage stroke), hemiplegia.

- Level of disability: the modified Rankin Scale (mRS) is an ordinal, rank scale that classifies patients according to 7 global levels of disability. The ranks are from 0 (no symptoms) to 5 (severe disability) and 6 (death).

- Risk of falls: using the 21-item Fall Risk Index questionnaire by Toba, Kikuchi.⁹ The Fall Risk Index questionnaire consists of 21 yes-no questions. Each "Yes" answer is worth 1 point. Maximum total score: 21 points. If the result of the questionnaire is ≥ 10 points: high risk of falls.

- Geriatric syndromes:

+ Nutrition status was assessed using the Mini Nutritional Assessment short-form (MNA-SF) with 8-11 points indicating the person is at risk of malnutrition; 0-7 points indicating the person is malnourished.

+ Functional status: The Instrumental Activities of Daily Living (IADL) scale measures the ability to perform everyday tasks which includes 8 items: the ability to use the telephone, shop, food preparation, housekeeping, laundry, mode of transportation, responsibility for own medication and ability to handle finances. The total score ranks from 0 (low function, dependent) to 8 (high function, independent).

The Barthel index is a scale that measures the dependence on daily activities of stroke patients: feeding, bathing, personal hygiene (grooming), dressing, bowel control, bladder control, toilet use, transfers (bed to chair and back), immobile, and stair climbing. The maximum score on this scale is 100 (dependent). The minimum score is 0 (independent).

+ Depression: Patient Health Questionnaire 9 (PHQ-9) is a set of 9 questions intended to screen patients for the presence and severity of depression. It is done by interviewing the patient directly about how emotional difficulties or problems have affected work, home life, or relationships with others in the past 2 weeks. This questionnaire is scored by adding the total score of all patient responses in the questionnaire (not at all = 0, several days = 1, more than half the days = 2, and nearly every day = 3). A total score of 0-4 is considered non-minimal depression; 5-9 indicates mild depression; 10-27 indicates moderate to severe depression.

+ Polypharmacy: the total number of drugs (prescribed and non-prescribed) taken by the patient concurrently is greater than or equal to 5.

3. Data processing and data analysis

The process of data coding, entry, and analysis was done by using SPSS software (version 22.0). Descriptive statistics were adopted to examine characteristic data: frequency, percentage, and mean. Comparisons between groups were assessed using Chi-square tests for categorical variables. The multivariate logistic regression model was used to explore factors related to the high risk of falls. Statistical significance was accepted with a p-value <0.05.

4. Ethical consideration

The study subjects were explained clearly

the purpose of the study, and they were willing to participate in the study. Collected data was used for research. The results of the study were proposed for improving the health of the community, not for other purposes

III. RESULTS

1. General characteristics

The mean age of the participants was 75.0 ± 8.2 (years), with a maximum age of 94 years and a minimum age of 60 years. Patients from 70 to 79 years old accounted for the largest percentage with 42.1%. There were 54 male patients, accounting for 50.5% and 53 female patients accounting for 49.5%, participating in this study. The female/male ratio was 1.02.

2. Prevalence of high fall risk among older post-stroke patients

21-item Fall Index (n = 107)

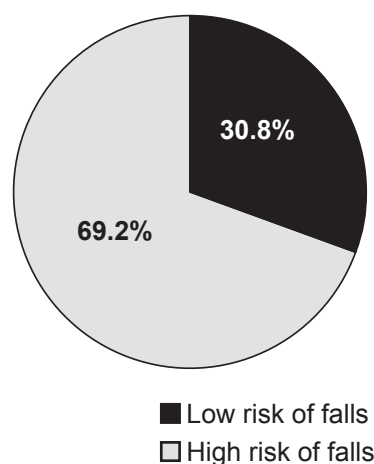


Figure 1. The risk of falls in the study subjects

The results of the 21-item Fall Risk Index showed that the percentage of patients with a high risk of falling was 69.2%, and low risk of falling was 30.8%.

3. Factors related to high risk of falls among older post-stroke patients

Table 1. Association between risk of falls and disability level

Disability level	High risk of falls (n = 74)		Low risk of falls (n = 33)		p
	n	%	n	%	
No symptoms	3	4.1	7	21.2	
mRS Minimal and slight disability	36	48.6	17	51.5	< 0.05
Moderate and severe disability	35	47.3	9	27.3	

The level of disability in older post-stroke patients was significantly associated with the risk of falls ($p < 0.05$). The percentage of

patients with moderate and severe disability in the group with high risk of falls was significantly higher than the low risk of falls group.

Table 2. Association between risk of falls and some geriatric characteristics

Geriatric characteristics	High risk of falls (n = 74)		Low risk of falls (n = 33)		p	
	n	%	n	%		
Barthel Index	Severe dependence	35	47.3	12	36.4	> 0.05
	Mild dependence	30	40.5	14	42.4	
	Independence	9	12.2	7	21.2	
IADL	Impairment	67	90.5	19	57.6	< 0.05
	Normal	7	9.5	14	42.4	
Depression	Mild to severe depression	58	78.4	19	57.6	< 0.05
	Normal	16	21.6	14	42.4	
Nutrition status	Malnourished	19	25.7	7	21.2	> 0.05
	Risk of malnutrition	33	44.6	11	33.3	
	Normal	22	29.7	15	45.5	
Poly-pharmacy	≥ 5 types	50	67.6	25	75.8	> 0.05
	< 5 types	24	32.4	8	24.2	

The results showed that patients with IADL impairment or mild to severe depression had a

statistically significant association with a high risk of falls.

Table 3. Multivariable regression models on some factors related to the risk of falls in older post-stroke patients

Factors	High risk of falls			p
	OR	95% CI		
		Lower	Upper	
Age \geq 70 years	1.851	0.649	5.281	0.250
Retirement	2.602	0.887	7.628	0.081
Hemiplegia	0.681	0.167	2.779	0.593
Ischemic stroke	1.694	0.612	4.689	0.310
Slight to severe disability (mRS)	4.005	1.038	15.455	0.044
IADL impairment	3.844	1.116	13.240	0.033
Depression	1.839	0.645	5.244	0.254

The result showed factors associated with the risk of falls in elderly post-stroke patients were patients with mild to severe disability after stroke (OR=4.005) and patients with IADL impairment (OR=3.844).

IV. DISCUSSION

The study was conducted at National Geriatric Hospital in post-stroke patients 60 years old and over. The result of statistical analysis indicated a high prevalence of participants with a high risk of falls and its associated factors.

The level of disability after stroke in this study was statistically significant with the risk of falls ($p < 0.05$). Patients without symptoms of disability have a much lower risk of falling than patients who are disabled after a stroke. The modified Rankin Scale is used to assess the degree of disability after stroke. In this study, minimal disability accounted for the largest proportion in the study with 29%. Severe disability accounts for the smallest proportion after mortality with 6.5%. This result was similar to the research results of Wei et al in 2019.¹⁰

Multivariable logistic regression models showed the associated factors of fall risk in older post-stroke patients were levels of disability from mild to severe (OR 4.005, 95% CI: 1.038 – 15.455). Therefore, rehabilitation after stroke and assessing the level of disability in older post-stroke patients is necessary. It helps us to come up with more effective fall prevention measures.

Disability after stroke and stroke rehabilitation outcomes are usually assessed by formalized observation and scoring of the Barthel index and instrumental activities of daily living. 85% of the total study subjects were dependent on daily activities. There were 80.4% of patients experiencing impairment in daily functional activities with one or more items in the Instrument activities of daily living (IADL). This rate is higher than the previous study by Badaru et al. (2013): the proportion of dependent patients accounted for 65% and independent patients accounted for 35%.¹¹ The reason may be because the subjects of the study are the elderly. The decline in daily functional activities was greater than in younger

subjects. Our results show that the group of older post-stroke patients with IADL impairment was significantly associated with an increased risk of falling (OR=3,844). The risk of falls in patients with impaired IADL is similar to patients with post-stroke disability. In addition to assessing the level of disability after stroke, we should further assess the degree of IADL impairment in older post-stroke patients.

The association between depression and the risk of falling in elderly patients after stroke was statistically significant. According to a study by Ugur et al., the rate of falls increases as the level of depression increases.¹² The depression status of the patients was assessed by the PHQ-9 scale. In this study, the percentage of patients with symptoms of depression in this study was 72%. The proportion of depression observed in this study was higher than that in Santos' research: the proportion in older stroke patients was 27.7%.¹³ Depression is common in older adults and is associated with poor outcomes following an illness. In the elderly after stroke, motor paralysis, functional limitations, caregiver dependence, and inadequate nutrition may increase the incidence of depression. Depression and falls have a significant bidirectional relationship. Excessive fear of falling, which is frequently associated with depression, also increases the risk of falls. Both depression and fear of falling are associated with impairment of gait and balance, an association that is mediated through cognitive, sensory, and motor pathways.

V. CONCLUSION

This study highlighted a high prevalence of participants with a high risk of falls. Mild to severe disability after stroke, IADL impairment, and depression were statistically significantly associated with the risk of falls.

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