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CURRENT STATUS OF BALANCE IMPAIRMENT IN POST-STROKE PATIENTS

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ABSTRACT

Objective: To investigate the current status of balance impairment in post-stroke patients.

Methods: This study included 32 post-stroke patients who met all inclusion criteria and were undergoing treatment at Hai Duong Rehabilitation Hospital from January 2024 to July 2024. Participants were assessed by using the Berg Balance Test and clinical features (static and dynamic sitting balance, static and dynamic standing balance, range of motion, muscle tone).

Results: Mostpost-stroke patients experienced balance issues with varying rates of: 53.1% high-level balance impairment, 40.6% moderate impairment, and only 6.3% intact balance. The primary impairment included standing balance, with 46.9% of participants presenting poor performance in both dynamic and static standing. Otherwise, sitting balance was less affected, with over 50% demonstrating normal or good balance.

Conclusion: Balance should be assessed in all post-stroke patients. Early intervention for balance status to improve mobility and quality of life for stroke survivors significantly.

Keywords: Balance, rehabilitation, quality of life, stroke.

1. INTRODUCTION

A stroke, also known as a cerebrovascular accident (CVA), is a global health challenge, causing 16 million incidents and approximately 6 million deaths yearly. Balance impairment is a common complication after stroke, with an increased rate from 16.7% to 83% [1]. Balance is considered a fundamental role in all movement activities, including walking to more complex movements [2]. When balance is affected, patients experience difficulty in movement, leading to high risk factors of falls, limitations in activities of daily living, and can lead to further disability. Given the importance of balance in mobility and quality of life, this study was conducted to investigate the current status of balance impairment in post-stroke patients.

2. SUBJECTS AND RESEARCH METHODS

2.1 Study Design

Cross-sectional descriptive study.

2.2. Location and research time

The study was conducted at the Stroke Department, Hai Duong Rehabilitation Hospital, from January 2024 to July 2024.

2.3. Participants

- Inclusion Criteria:

+ Patients with cerebral stroke undergoing treatment at the Stroke Unit, Hai Duong Rehabilitation Hospital.

+ Agreed to participate in the study.

- Exclusion criteria:

+ Patients unable to cooperate.

+ Patients previously diagnosed with visual or visual field disorders.

+ Patients with limb deficiencies.

2.4. Sample Size

Convenience sample, including all eligible patients.

2.5. Data Collection

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- Medical records

- Balance assessments (static sitting balance, dynamic sitting balance, static standing balance, dynamic standing balance) will be evaluated clinically as the body's reaction to maintain posture during daily activities.

- Berg Balance Scale to assess the patient's balance ability.

- Muscle tone (normal, abnormal) and range of motion (regular, reduced active range of motion).

2.6. Research Procedure

- Step 1: Select participants who met the inclusion criteria

- Step 2: Collect medical history, conduct clinical examination, and assess balance using the Berg Balance Scale.

- Step 3: Analyze and synthesize the data.

2.7. Data Analysis

Data were analyzed using SPSS 20.0 software. The normal distribution of continuous variables was analyzed using the Kolmogorov–Smirnov test. Continuous variables were described by mean and standard deviation, and ordinal variables by count and standard deviation. Differences before and after intervention were analyzed using the Wilcoxon Signed Ranks Test. Results were considered statistically significant with $p \leq 0,05$.

2.8. Research Ethics

The study received approval from Hai Duong Rehabilitation Hospital and was approved by the Scientific Council of Hai Duong Medical Technical University. All the information collected was based on the voluntary cooperation of patients and investigators. Collected data was kept confidential and encoded on a computer.

3. RESEARCH RESULTS

3.1. General Characteristics of the participants

Table 1. Some general characteristics of post-stroke patients

Characteristic		Frequency (n=32)	Percentage (%)
Gender	Male	11	34.4
	Female	21	65.6
Age	32-45	3	9.4
	46-55	4	12.5
	56-65	4	12.5
	66-75	15	46.9
	76-86	6	18.8
	Average Age (years) $\bar{X} \pm SD$	65,78 ± 12,48	

Female gender constituted the majority in the studied stroke patient group, with 21 out of 32 patients being female (65.6%), compared to only 11 male patients (34.4%). The age range of patients varied widely, with an average age of 65.78 ± 12.48 years. The 66-75 age group accounted for the most significant proportion, with 15 patients (46.9%). This is consistent with the epidemiological characteristics of stroke, which is more common in older adults. Other age groups had lower proportions: the 76-86 age group accounted for 18.8%. The 32-45, 46-55, and 56-65 age groups accounted for relatively small proportions (9.4% and 12.5% for each group).

Table 2. Patient's condition

Condition		Frequency (n=32)	Percentage (%)
Affected Hemiplegic Side	Left	11	34.4
	Right	15	46.9
	Both sides	6	18.8
Type of Stroke	Cerebral hemorrhage	12	38.8
	Cerebral infarction	20	61.2
Number of Strokes	1 time	26	81.3
	2 or more times	6	18.7

Based on the data in the table, it is observed that among post-stroke patients, the right side of the body was most affected, accounting for the highest proportion with 15 patients (46.9%). The left side of the body was affected in 11 patients (34.4%). Six patients (18.8%) had both sides affected, which often indicates more extensive or complex brain damage. Cerebral infarction was the more common type of stroke in this study group, accounting for 20 patients (61.2%). Cerebral hemorrhage accounted for 12 patients (38.8%). This reflects the general trend in stroke epidemiology, where cerebral infarction is more common than cerebral

hemorrhage. The majority of patients (81.3%) had only one stroke, with 26 patients. Only six patients (18.7%) had two or more strokes. This indicates that most of the study subjects were individuals who had experienced their first stroke event or had not relapsed.

Table 3. Patient's motor capacities

Motor Capacities of Upper and Lower Extremities		Decreased Active Range of Motion (AROM)	
		Yes	No
Upper Extremity	Shoulder joint	28(87.5)	4(12.5)
	Elbow joint	26(81.3)	6(18.8)
	Wrist joint	28(87.5)	4(12.5)
	Finger joint	28(87.5)	4(12.5)
Lower Extremity	Hip joint	25(78.1)	7(21.9)
	Knee joint	25(78.1)	7(21.9)
	Ankle joint	25(78.1)	7(21.9)

Based on Table 3 regarding the motor ability of post-stroke patients, a very high percentage of patients experienced decreased range of motion in both upper and lower limbs, a common sequela of neurological damage. Decreased AROM in the upper limbs was very common: the shoulder, wrist, and finger joints were all affected in 87.5% of patients (28/32 patients). This indicates severely limited mobility of essential joints in the hand and shoulder, affecting daily activities such as dressing, eating, and grasping objects. The elbow joint was also affected in a very high proportion, 81.3% (26/32 patients). Overall, over 80% of patients had reduced ROM in all surveyed upper limb joints. Decreased AROM in the lower limbs: Hip, knee, and ankle joints all showed reduced ROM in 78.1% of patients (25/32 patients). Although this percentage was slightly lower than that of the upper limbs, it was still very significant, indicating that nearly 80% of patients experienced difficulty in moving major leg joints. This directly affects the ability to stand, walk, and maintain balance.

Table 4. Muscle tone of patients

Muscle Tone		Frequency (n=32)	Percentage (%)
Upper Extremity	Normal	8	25
	Abnormal	24	75
Lower Extremity	Normal	14	43.8
	Abnormal	18	56.3

This table provides information on the muscle tone status of the upper and lower limbs in the study patient group. Upper limb muscle tone: The majority of patients had an abnormal upper limb muscle tone (75%), equivalent to 24 out of 32 patients. Only 25% of patients had a normal upper limb muscle tone. This high percentage indicates that muscle tone disorders, especially spasticity or flaccidity, are serious problems in the upper limbs, affecting the ability to control movement and perform daily activities of the hands and arms. Lower limb muscle tone: More than half of the patients (56.3%) had abnormal lower limb muscle tone, equivalent to 18 out of 32 patients. Nearly half (43.8%) had a normal lower limb muscle tone. Although the abnormal rate in the lower limbs was lower than in the upper limbs, it was still a significant number, indicating that lower limb muscle tone disorders are still pervasive, affecting the ability to stand, walk, and maintain balance.

3.2. Current status of balance impairment in post-stroke patients

Table 5. Patient's balance capacities

Types of Balance			
Normal	Good	Fair	Poor
Static sitting balance			
8(25)	19(59,4)	3(9,4)	2(6,3)
Dynamic sitting balance			
4(12,5)	20(62,5)	4(12,5)	4(12,5)
Static standing balance			
5(15,6)	9(28.1)	3(9.4)	15(46.9)
Dynamic standing balance			
3(9.4)	5(15.6)	9(28.1)	15(46.9)

According to the data in the table, the majority of patients had "Normal" or "Good" sitting balance. Specifically, for static sitting balance, up to 84.4% of patients achieved "Normal" (25%) or "Good" (59.4%). Only a small portion (6.3%) had "Poor" static sitting balance. For dynamic sitting balance, similarly, 75% of patients achieved "Normal" (12.5%) or "Good" (62.5%). The "Poor" level accounted for 12.5%. This indicates that the ability to maintain stability while sitting and perform activities in a sitting posture is relatively preserved in post-stroke patients.

In contrast to the sitting balance, standing balance was severely impaired in a large proportion of patients. For static standing balance, most patients (46.9%) had "Poor" static standing balance. Only 43.7% achieved "Normal" (15.6%) or "Good" (28.1%). For dynamic standing balance, similarly, 46.9% of patients had "Poor" dynamic standing balance. Only 25% achieved "Normal" (9.4%) or "Good" (15.6%).

Table 6. Berg Balance Scale Score

Score Range	Frequency (n=32)	Percentage (%)
41-56 (Independent mobility)	2	6.3
21-40 (Moderate fall risk/can move with a cane or crutches)	13	40.6
0-20 (High fall risk/ wheelchair bound)	17	53.1

Based on the Berg Balance Scale (BBS) score data of 32 post-stroke patients, the group with high fall risk/wheelchair-bound (scores 0-20) accounted for the most significant proportion, with 17 patients (53.1%). This indicates that more than half of the patients in the study had inferior balance, were highly dependent on wheelchairs, or required significant assistance with mobility and faced an extremely high risk of falls. The group with moderate fall risk / able to move with a cane or crutches (scores 21-40): This group included 13 patients (40.6%). These patients could move but still required assistive devices such as canes or crutches and had a moderate risk of falling. They needed monitoring and intervention to improve balance. The independent mobility group (scores 41-56): Only two patients (6.3%) achieved this score. This very low number confirms that only a tiny percentage of post-stroke patients in your study group could move completely independently without assistance and had a low risk of falls.

4. DISCUSSION

4.1. General characteristics of the participants

The study revealed that females constituted the majority (65.6%) of the surveyed stroke patients. This finding aligns with certain international studies, such as those by Gidey and Olufemi O. Desalu [3]. Still, it contrasts with others that reported a higher prevalence of male patients by Fekadu and Vu Thi Tam [5]. Such differences may be attributed to geographic, cultural, or lifestyle variations among the study populations.

In terms of age, the mean age of participants was 65.78 ± 12.48 years, with the 66–75 age group representing the most significant proportion (46.9%). This is consistent with the general trend of stroke being more prevalent among older adults, although some studies have noted an increasing incidence in younger populations (under 45 years).

Regarding the side of the body affected, right-sided hemiparesis was more common (46.9%) than left-sided (34.4%). This finding contrasts with other studies by Vu Thi Tam [5] and Khan [6], which often report a higher prevalence of left-sided hemiplegia. The discrepancy may be due to the relatively small sample size in this study.

The majority of patients exhibited a reduced active range of motion (AROM) and muscle tone abnormalities in both upper and lower limbs. Specifically, 87.5% of patients had reduced AROM in the shoulder, wrist, and finger joints, while 81.3% had reduced elbow joint mobility. In the lower limbs, 78.1% of patients demonstrated reduced AROM in the hip, knee, and ankle joints. Muscle tone abnormalities were also common, affecting 75% of patients in the upper limbs and 56.3% in the lower limbs. These findings are in line with the study by Person C.U., which reported increased muscle tone in patients with ischemic stroke. Overall, these clinical characteristics provide a comprehensive understanding of the physical impairments in the study population, serving as a foundation for further analysis of balance dysfunction and rehabilitation outcomes.

4.2. Current status of balance impairment in post-stroke patients

The Berg Balance Scale (BBS) is a widely used tool for assessing balance in stroke rehabilitation. In this study, the BBS results revealed that more than half of the patients (53.1%) scored between 0 and 20, indicating a very high risk of falls and a likely need for wheelchair assistance. An additional 40.6% scored 21–40, suggesting a moderate fall risk and possible dependence on assistive devices such as canes or crutches. Only 6.3% of patients achieved scores of 41–56, reflecting independent mobility. These findings are comparable to those reported by Kossi O., with scores of 0–20 being observed in 42.59% of patients, 21–40 in 33.33%, and 41–56 in 27.07% [1]. These results emphasize the high prevalence of balance impairment among post-stroke patients.

The sitting balance, both static and dynamic, was generally well preserved. For static sitting balance, 84.4% of patients were rated as either "Normal" (25%) or "Good" (59.4%), with only 6.3% categorized as "Poor." Similarly, in terms of dynamic

sitting balance, 75% of patients achieved either "Normal" (12.5%) or "Good" (62.5%). These outcomes indicate that most patients retained relatively good postural stability while seated.

In contrast, standing balance showed significant impairment. For static standing balance, 46.9% of patients were rated as "Poor," while only 43.7% achieved "Normal" or "Good" ratings. Dynamic standing balance was similarly affected, with 46.9% classified as "Poor" and only 25% as "Normal" or "Good." These findings suggest that maintaining posture and performing movements in a standing position pose substantial challenges for this patient group. This observation is consistent with the study by Khan F., which reported a 48.1% prevalence of balance loss among post-stroke individuals.

5. CONCLUSION

Balance impairment is a common and serious problem in post-stroke patients, particularly focusing on standing balance. These results are consistent with other studies, emphasizing the necessity of rehabilitation interventions focused on standing balance to improve mobility and safety for patients.

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