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Clinical Evaluation of Balance Impairments and Associated Risk of Falling in Post-Stroke Patients: A Cross-Sectional Study

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Abstract

Background

Nursing care of critical patients with stroke is an ongoing theme in the literature specifically, on the level of balance and risk of falling outcomes. Measurement the level of balance by nursing are beneficial for patients' health outcomes as they successfully managed and lived with their condition. This study assessed the level of balance and risk of falling in patients having stroke.

Methods

A cross-sectional survey conducted among (131) stroke patients in neurology teaching hospitals in Baghdad, Iraq. Data collection was utilized a non-probability purposive method from November 2024 to April 2025. The "Berg Balance Scale" was used to measure the level of stroke patients' balance and reflecting 3 main domains: wheelchair bound, walking with assistance, and independent. A descriptive and inferential data analysis plus Chi-square were used to analyze data.

Results

Participants low level of balance with a minority of them shows their ability to balance independently. The level of balance was the lowest when patients stood on one foot (61.8%), retrieving object from ground (47.3%), placing alternate foot on stool (46.6%), and reaching forward with outstretched arms (43.5%). Finally, the total mean of score for the level of independency among patients with stroke was (M ± SD = 1.44±.64) with 64.1% of the sample were needed wheelchair bound and 27.5% of them were unable to walk unless with assistant.

Conclusion

Patients with stroke in this study show relatively low level of balance with increasing risk of falling. Hence, to achieve and sustain balance improvement, periodic nurse-led reevaluation of risk-of-falling is essential by earlier patient referral for rehabilitation intervention.

Contributions to the Literature

Text box 1. Contributions to the Literature

- Post-stroke patients in Iraq show poor balance and limited independence, with high fall risk, highlighting need for targeted rehabilitation and fall-prevention strategies.
- Balance impairments in post-stroke patients limit independence, signalling a public health priority for targeted interventions and support services
- Functional independence is limited and most stroke patients require a wheelchair and walking assistance.
- The study results highlight a high fall risk in post-stroke patients.
- Prioritizing and intensify early referral to rehabilitation interventions might improve post-stroke balance deficits.

Background

Stroke is a serious health issue and a leading cause of mortalities in both national and international countries, with an incidence rate of 38,000 strokes occurs every day [1]. The prevalence of mortality due to stroke was increased dramatically to 26.3% in the United State (US) in 2023 and ranging from 128,932 to 162,890 deaths/daily [2]. A previous study reported that 10 millions individuals worldwide die and permanently disabled due to stroke; with a annual prevalent of 15 millions suffer from the disease, which burdening families and society [3].

Stroke alter the brain ability to regulate balance, leaving the patients feel unsteady or uncoordinated. The absolute number of strokes is continuing to increase due to the aging of the population [4]. These difficulties may cause a number of stroke-related disorders, including limb weakness, numbness, or paralysis, communication difficulties, vision difficulties, and one-sided neglect [5]. Care transitions are the term used to describe the movement of patients across the care continuum, such as from nursing unit to nursing unit, facility to facility, or facility to home [6]. There are some other causes of balance problems, and treating an underlying condition can help improve balance. Falls are among the most frequent issues experienced by stroke patients with an incidence ranging from 7% in the first week following a stroke to 73% in the first year following hospital discharge [7].

The risk of falls in stroke patients ranging from 14% to 65%. The prevalence of balance problems following a stroke has been the subject of several reports to date, with figures ranging from 16.7% to as high as 83% [8]. Along with stroke severity, the literature examines other characteristics that affect balance, such as gender, handedness, location, and side of lesion [9]. Fall risk is elevated in all post-stroke stages for stroke survivors [10]. Falls may have detrimental effects on one's physical and mental health. Hip fractures are more common in stroke patients, and following one, they are less likely to regain independent movement [11]. Furthermore, a common fall-related consequence is fear of falling, which can ultimately profound sense of helplessness and subjugation and inactivity as well as social impairment [12]. Balance deficits and gait are serious risk-related factors for falling [13]. However, stroke is also known to cause physical harm, including paralysis, weakness, decreased poor coordination of posture, grief, mental tiredness, and cognitive impairment [14].

One of the many crucial tasks that nurses play in providing effective and efficient stroke care is advocating for the appropriate care, at the appropriate time, in the appropriate place [15]. This is the fact for patients with stroke throughout the care trajectory to maximise outcomes for the stroke survivor and family unit [16]. Determining the level of balance in stroke patients is more useful in directing clinical therapy. Identifying the level of balance status of stroke patients and bolstering comprehensive therapies will be a potential method to break the cycle, reduce anxiety, encourage community reintegration, and enhance quality of life [17]. Determining the frequency of post-stroke balance impairments has become even more challenging due to the conspicuous dearth of data on stroke incidence and prevalence in Iraq. Given the significance of balance evaluation and related factors, it is crucial to conduct a study for nursing research. Thus, this study aimed to quantify the prevalence of balance impairment and identify associated factors in patients with stroke.

Methods

Study Design and Setting

A cross-sectional descriptive study was conducted in three Neurological Teaching Hospitals in the capital of Iraq, Baghdad between November 14th, 2024 and the April 15th, 2025. Potential volunteers were informed about the study through via informational flyers and posts put in busy hospital areas such staff portals, critical care units, elevators, rest rooms, and notice boards. There were no incentives provided, and participation was completely voluntary.

Study Sample and Sampling

A non-probability (purposive) sampling of (131) patients with stroke from Neurology Central Hospital, neurology wards at Al-Kazmiah Teaching Hospital and Neurological Sciences Hospital in Baghdad was considered eligible for the study. The study recruited stroke patients aged eighteen years and older who had been clinically diagnosed with stroke by a physician, were of either sex, and provided informed consent to participate. 192 patients were considered as total sample size, which calculated to detect a moderate effect size at a 5% level of significance ($\alpha = 0.05$) with a statistical power of 0.80. Of these, 131 patients completed the questionnaire.

Data Collection and Study Instruments

During the hospital visits, the researchers explained to the nurse managers the objectives and methods of the study. They were instructed to act as mediators in order to deliver the study instructions through website link group for critical care units, which comprised all of the nurses working in these units. Each patient was interviewed individually for 25-45 minutes on by the principal research and another nurse with critical care unit experience. A structured questionnaire was used with the following: (a) demographic and occupational characteristics which included age, gender, employment status, level of education, accommodation status, marital status, smoking, duration of the disease, and number of fallings. (b) The Berg Balance Scale “BBS” [**18**]. The BBS is a generic tool used to assess the level of

patients' balance. It is composed of 14 items measured on a five-point Likert scale (0 = lowest level of function to 4 = highest level of function), reflecting 3 main domains with scoring: wheelchair bound (0-20), walking with assistance (21-40), and independent (41-56). The Berg Balance Scale [**19**] yields total scores ranging from 0 to 56 and demonstrates strong measurement properties. The scale demonstrates very high reliability, with inter-rater agreement estimated at 0.97 (95% CI: 0.96–0.98) and intra-rater consistency reported at 0.98 (95% CI: 0.97–0.99) [**20**]. The absolute reliability of the scale varies across score ranges, with the minimal detectable change at the 95% confidence level ranging from 2.8 to 6.6 points out of 56.

Ethical Considerations

Ethical approval for this study was conducted by the Ethics Committee of the Research Department at the College of Nursing, University of Baghdad (Issue No. CON.UOB 60 on 17-9-2024). The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. All participants were informed about the purpose of the study, assured of confidentiality, and provided written consent prior to participation. Participation was voluntary, and respondents could withdraw at any time without consequence.

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics for IOS, version 26.0 (IBM Corp., Armonk, NY, USA). Categorical variables (sex, marital status, and education level) were expressed as frequencies and percentages, while continuous variables (e.g., age) were presented as means ± standard deviations. Total balance and domain-specific scores were also reported as means ± standard deviations. The comparison of BBS scores in relation to different sociodemographic and clinical variables were carried out using Chi-Square. All the tests were carried out at 5% level of significance. Inferential data analysis was performed through the determination of mean of score to assess the level of balance by five grades (lowest function level, low function level, moderate function level, high function level, highest function level) which were calculated according to the five-level scale which were scored as (lowest function level, low function level, moderate function level, high function level, highest function level). For each level respectively so the cut of point was as calculated as wheelchair bound= (0-20), walking with assistance = (21-40), and independent = (41-56). Statistical significance was set at $\alpha = 0.05$ for comparisons of balance levels across demographic and clinical variables. Each balance item was ranked according to the following scale as follow: lowest function level = 0, low function level = 1, moderate function level = 2, high function level =3, highest function level = 4).

Results

The study findings shows that 53.4% of patients with stroke were female, with a mean of age 55.75 years, 63.4% of them were unemployed, 62.6% were married and 67.9% were live with their spouse/husband. Regarding the clinical characteristics, 52.7% of the participants were non-smokers, their disease duration was with mean of 2.44 years, and the mean of number of falling was 2.88 times.

In addition, the results shows that the level of balance for patients with stroke, and indicates that they have the lowest level of balance when they stood on one foot (61.8%), retrieving object from ground (47.3%), placing alternate foot on stool (46.6%), and reaching forward with outstretched arms (43.5%). Overall, participants in this study have a low level of balance with a minority of them shows their ability to balance independently.

Finally, the study results indicates that the total mean of score for the level of independency among patients with stroke was (M ± SD = 1.44±.64) with 64.1% of the sample were needed wheelchair bound and 27.5% of them were unable to walk unless with assistant.

Discussion

Falls are a leading cause of injury-related mortality among older adults [21]. Stroke-related impairments in postural control and responses to balance perturbations significantly increase fall risk, making stroke a major contributor to falls in this population [22]. Although most individuals with stroke regain ambulation and are discharged home, persistent deficits in balance and gait are common [23, 24].

The study's data analysis revealed that the majority of stroke patients had a mean age of 55.75 years, more than half of them were female, and most of them being married. Also, the clinical data reveals that nearly half of the participants were non-smokers, their disease duration was with 2 years and a half, and the number of falling was almost 3 times in their disease journey. These findings align with those of Cattaneo et al. [25] who observed that participants had a mean age of 58.4 (13.1) years, with females representing slightly over half of the sample (48 out of 95, 50.5%). Furthermore, another study from Nigeria indicated that the stroke survivors had an average stroke duration of 18.8 months (22.6 months), and their mean age was 51.4 (13.5) years (range: 28–85 years). 51% of the population was male, while the majority (72%) were married. The stroke survivors' average scale score was 5.07 (0.99) [26]. A cross-sectional study among patients with stroke found that the mean age of them was 72 years and 48.6% were women. Male, cohabitant and younger participants scored significantly better on the BBS compared with females, those living alone and older participants [27]. In line with the present study, previous research reported that stroke patients had a mean age of 58.37(12.42) years, with males comprising 68.5% of the cohort [28].

The study findings of current study reveal that stroke patients experience imbalance in the lowest level when they tried to stood up on one foot, picked up objects from the ground, feel difficulty to placing alternative foot on one other, and reaching forward with outstretched arms. The minority of the participants showed their ability to balance independently with an overall low level of balance. These findings are similar to those from the study conducted by Paulina et al. [29] found that patients with stroke experience difficulties in transferring from sitting to standing and its considered a significant predictive for independency. The authors suggested that several movement variables, including the angular displacements of the trunk and lower limbs, the distribution of weight bearing, and the pattern of muscle activation, have been linked to this transfer in healthy participants. Another study stated that the

level of balance was the lowest and stroke had a greater impact on patients' capacity to maintain balance and postural control [25]. In contrast, Vincent-Onabajo, Joseph [30] cross-sectional study indicated that 73.2% of stroke patients were experienced high level of balance. Furthermore, walking speed has been found to be significantly influenced by balance performance, which can also have an impact on stroke patients' functional mobility [31]. Walking is a tough task that involves several steps in which the centre of gravity is moved outside of the boundaries of stability, hence walking speed is strongly dependent on balance management. The attainment of functional independence following a stroke is strongly associated with adequate balance, independent of the patient's age, sex, or duration since the stroke event [32]. A cross-sectional study in Benin reported a mean Berg Balance Scale score of 36.87 ± 14.34, ranging from 10 to 56, with 13 participants (24.07%) exhibiting balance impairments (BBS ≤ 20) [28]. The findings indicated that reduced balance performance was significantly related to the length of time since stroke onset, the severity of functional disability, and the frequency of physiotherapy sessions.

In regards to the level of independency with movement of stroke patients, the study highlighted that the level of independency among patients with stroke was low and they were needed wheelchair bound as well as they were unable to walk unless with assistant. These results supported by Cattaneo, Gervasoni [25] argued that balance impairments were linked to limitations in participation, but showed no association with gait speed. Another study reported that approximately 20% of stroke survivors remain wheelchair-dependent, while around 70% experience reduced gait speed and endurance that significantly affects daily life [33]. Additionally, 14–31% of survivors face severe functional impairments, remaining reliant on assistance for mobility and activities of daily living despite undergoing rehabilitation [34]. This is may be because the fact that the main reason for returning post-stroke patients in a state of recovery to a wheelchair is their urgent need to perform some important activities during the day. Therefore, the largest percentage of them depend on a wheelchair. Patients must be of old age or have diseases associated with stroke. They are in greater need. To help another person go to the toilet or move, and this shows the difference in the small percentage of the patient's dependence on someone for help compared to the large percentages of patients' dependence on the wheelchair.

Additionally, lower Berg Balance Scale scores were associated with reduced muscle strength and functional capacity [35]. Moreover, Shao, Wang [36] found that patients with strokes began to exhibit deterioration in their activities of daily living and reliance. They found that few factors have been linked to a decline in activities of daily living such as post-stroke depression, low BBS at discharge, vascular risk factors, and ageing. Additionally, functional impairment of the lower extremities is one of the most common complications in stroke patients, with reduced functional movement and muscle strengthening [37]. The significant low in the independency over time can be attributed to participating lack of rehabilitation training program to improve their ability to maintain stability while standing. Studies have shown that practicing balance and walking exercises can help prevent falls. The utilisation of wearable sensors for training has demonstrated efficacy by offering prompt and precise feedback [38].

Research indicates that cognitive deficits, functional limitations, and impaired balance are linked to fall incidence in individuals with acute (up to one month post-stroke) and subacute stroke [39]. In contrast, the factors contributing to falls in chronic stroke patients remain less well understood [40]. To date, only a limited number of studies have investigated falls in this population, with measures such as balance, motor function, cognition and mood, muscle strength, vision, and activities of daily living being used to predict fall risk. This study asserts that stroke patients in a developing country like Iraq are vulnerable for falling due to impaired balance, putting them at risk for post-stroke complications and potentially death.

Study limitation and implications for nursing practice

Given that participation was voluntary and met the inclusion criteria, the diversity of patient characteristics may be limited, which may limit the generalisability of the results. the study population was limited to stroke patients in the capital Province of Iraq, Baghdad. Therefore, it is recommended that larger studies designed and conducted in other regions of Iraq to compare data and assess the level of balance and risk of falling variables. The study supports using standardized measurement of balance and risk of falling like BBS to enhance the accuracy and effectiveness of patient safety measures, which is crucial in minimizing physical injuries and improving patient safety outcomes. Given the effectiveness of the BBS in evaluating patient balance and risk of falling, the study suggests that periodic reassessment is essential to attaining and sustaining improvements in balance deficits-related stroke, and early referral for rehabilitation programs.

Conclusions

The level of balance of patients with stroke in this study was low in most out-of-bed activities and needed wheelchair bound or walk with assistance, and a minority of them shows their ability to balance independently. The study suggests using of BBS as has criterion-related validity and established as its applicability to other balance-related conditions in older adults. The study emphasizes the importance of early referral to rehabilitation interventions aimed at improving post-stroke balance deficits, as well as the need for periodic reassessment by neurology nurses to sustain these improvements.

Abbreviations

α = alfa

BBS = Berg Balance Scale

CON= College of Nursing

NY= NewYork

SPSS= Statistical Package for Social Sciences

UOB= University of Baghdad

US = United State

Declarations

Acknowledgment

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Author contributions

The author contributions were: concept (AHA, HMM, AMM), design (AHJ, HMM, AHA, TRM), literature search (AHA, HMM, AMM, AHJ, MAN), experimental study (AHA, HMM, AMM, AHJ), data acquisition (AHA, HMM, AMM, AHJ, AMN), data analysis (AHA, HMM, MS), statistical analysis (AHA, HMM, AMM, AHJ, MS), manuscript preparation (AHA, HMM, AMM, AHJ), and manuscript review and editing (AHA, HMM, AMM, AHJ).

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Data availability

The data are available upon a reasonable request from the corresponding author.

Ethical approval and consent to participate

Ethical approval for this study was conducted by the Ethics Committee of the Research Department at the College of Nursing, University of Baghdad (Issue No. CON.UOB 60 on 17-9-2024). The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. All participants were informed about the purpose of the study, assured of confidentiality, and provided written consent prior to participation. Participation was voluntary, and respondents could withdraw at any time without consequence.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Tables

Table 1. Sociodemographic Characteristics of patients with Stroke (N=131).

No	Socio-Demographic Characteristics	(N=131)			MS±SD
		Groups	F.	%	
1	Sex	Male	61	46.6	1.53±.5007
		Female	70	53.4	
2	Age	MS±SD = 55.75±18.005			
3	Employment Status	Employee	24	18.3	2.00±.61
		Unemployed	83	63.4	
		Retired	24	18.3	

4	Marital Status	Married	82	62.6	1.67±.946
		Single	13	9.9	
		Divorced//Widowed	32	24.4	
		Separated	4	3.1	
5	Living Arrangement	Live Alone	7	5.3	2.21±.526
		Live with Spouse/Husband	89	67.9	
		Live with Others	35	26.7	
6	Level of Education	Illiterate	12	9.2	3.79±1.779
		Literate	27	20.6	
		Primary School	21	16.0	
		Tertiary School	25	19.1	
		High School	18	13.7	
		College/Institute	18	13.7	
		Postgraduate	10	7.6	
7	Smoking	Yes	62	47.3	1.52±.501
		No	69	52.7	
Disease Duration		MS±SD = 2.44±244			
Number of Falling		MS±SD = 2.88±1.84			
N= number, **F**= Frequency, **%**= Percentage, **MS±SD**= Mean ± Standard Deviation.					

Table 2. The level of balance for patients with Stroke (N= 131)

No	Balance Functions	Lowest Level of Function		Low Level of Function		Moderate Level of Function		High Level of Function		Highest Level of Function	
		F	%	F	%	F	%	F	%	F	%
1	Sit to stand	34	26.0	50	38.2	20	15.3	24	18.3	3	2.3
2	Standing Unsupported	46	35.1	33	25.2	28	21.4	15	11.5	9	6.9
3	Sitting Unsupported	32	24.4	42	32.1	27	20.6	14	10.7	16	12.2
4	Standing to sitting	40	30.5	36	27.5	16	12.2	30	22.9	9	6.9
5	Transfers	34	26.0	34	26.0	29	22.1	28	21.4	6	4.6
6	Standing with eyes closed	48	36.6	21	16.0	21	16.0	30	22.9	11	8.4
7	Standing with feet together	48	36.6	32	24.4	28	21.4	19	14.5	4	3.1
8	Reaching forward with outstretched arms	57	43.5	37	28.2	30	22.9	6	4.6	1	0.8
9	Retrieving object from ground	62	47.3	17	13.0	26	19.8	21	16.0	5	3.8
10	Turning to look behind	42	32.1	29	22.1	22	16.8	21	16.0	17	13.0
11	Turning 360 degrees	48	36.6	38	29.0	30	22.9	10	7.6	5	3.8
12	Placing alternate foot on stool	61	46.6	35	26.7	25	19.1	10	7.6	0	0
13	Standing with one foot in front	59	45.0	37	28.2	25	19.1	9	6.9	1	0.8
14	Standing on one foot	81	61.8	15	11.5	28	21.4	4	3.1	3	2.3
No.= number, **F**= frequency, **%**= percentage.											

Table 3: Type of independencies for patients with Stroke.

No	Classification of independency	Sample (N=131)		M±SD
		F	%	
1	**Wheelchair bound**	84	64.1%	1.44±.64
2	**Walking with assistance**	36	27.5%	
3	**Independent**	11	8.4%	
	Total	131	100%	

N= number**, F=** frequency**, %=** percentage**, M±SD=** Mean ± Standard Deviation**, Level of independency**: **0-1.33**= Wheelchair bound, **1.34-2.67**= Walking with assistance, **2.68-4**= independent.