



Original Article

Volume 2, Issue 1, April 2026

Association Between Lower Limb Dominance, Balance and Motor Function Among Stroke Survivors in Lagos State, Nigeria: A Cross-Sectional Analytical Study

Oladunni C. Osundiya¹, Imisiifeoluwa Esther Adeola¹, Abubakar B. Saleh², Olumide O. Dada^{3*}, Olajide A. Olawale¹

¹Department of Physiotherapy, College of Medicine, University of Lagos, Lagos, Nigeria;

²Department of Physiotherapy, Yobe State University, Damaturu, Yobe State, Nigeria;

³Department of Physiotherapy, Faculty of Clinical Sciences, College of Medicine, University of Ibadan, Ibadan, Nigeria

*Corresponding author: dadolu@yahoo.com

Abstract

Introduction: Stroke is often characterized by disturbances in balance and mobility among survivors. Detecting the effects of lower-limb dominance on motor behavior, particularly during balance tasks, has proven difficult. It remains unclear whether balance status and level of motor impairment are related to lower-limb dominance.

Objective: This study aimed to determine the association among balance, motor function, and lower-limb dominance in stroke survivors.

Methods: A cross-sectional study was conducted among 121 stroke survivors recruited using convenience sampling from five outpatient physiotherapy clinics in Lagos, Nigeria. The Waterloo Footedness Questionnaire-Revised (WFQ-R) was used to determine lower-limb dominance. Static and dynamic balance, as well as motor function, were assessed using the Static Balance Test (SBT), Dynamic Gait Index (DGI), and Fugl-Meyer Assessment of Lower Extremity (FMA-LE), respectively. Data were analyzed using Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics (mean, standard deviation, frequency, and percentages) were used to summarize data. Chi-square test was used to determine the association between lower-limb dominance and scores from the SBT, DGI, and FMA-LE.

Results: The mean age of participants was 54.6 ± 11.78 years. Most participants (81%) had a stroke onset greater than 6 months, while 93% had right lower-limb dominance. Over half (55.4%) had left-sided hemiplegia/hemiparesis. The mean scores were $DGI = 16.99 \pm 2.91$, $FMA-LE = 23.49 \pm 2.97$, and $SBT = 14.26 \pm 1.83$. There was a statistically significant association between DGI scores and lower-limb dominance ($\chi^2 = 3.89, p = 0.049$).

Conclusion: Stroke survivors whose non-dominant lower limb was affected demonstrated similar levels of motor function compared to those with dominant limb involvement. Although lower-limb dominance showed a significant association with dynamic balance, it did not independently predict balance or motor function outcomes.

Keywords: Stroke rehabilitation; Balance; Motor function; Lower-limb dominance.

© Trans-Saharan Publishers 2026. This is an Open Access article distributed under the terms of the Creative Commons Attribution licence (CC BY 4.0), which permits unrestricted re-use, provided the original work is properly cited. DOI: 10.5281/zenodo.19988116

Received: March 5, 2026 Revised: March 18, 2026 Accepted: April 4, 2026

Introduction

Stroke survivors are often left with neurological and functional deficits, which impair their ability to walk and affect their balance [Roelofs et al., 2023](#). Balance dysfunctions in stroke survivors are common and have significant impact on functional independence and overall recovery [Vincent-Onabajo et al., 2018](#). Stroke survivors present with abnor-

mal and delayed postural responses in the lower extremity muscles during standing displacements, as well as distorted proprioception [Schröder, 2023](#). They also demonstrate postural control problems such as loss of anticipatory activation during voluntary movements, increased sway during quiet standing, especially on the affected side, and decreased stability during weight shifting.

Individuals recovering from stroke typically exhibit uneven weight-bearing, favoring the stronger leg, and demonstrate limited weight-shifting capacity, particularly toward the affected side [Choi, 2022](#). This altered postural control is evident across various balance domains, static, dynamic, and reactive, and persists even in those with relatively high functional mobility, including individuals capable of independent community ambulation [Obembe et al., 2014](#). Cognitive-motor deficits, alongside impairments in balance and gait, are key contributors to limitations in functional independence and participation in daily activities. Poor postural stability remains a major barrier to achieving optimal recovery outcomes [Lee & Lee, 2023](#). Additionally, stroke survivors frequently experience a combination of physical, emotional, and cognitive challenges that hinder their ability to perform daily tasks, assume meaningful social roles, and reintegrate into community life [Shebl & Abd Elhameed, 2014](#).

The control of human balance is a complex process that relies on the integration of visual, vestibular, and somatosensory inputs within the central nervous system. It has been reported that approximately 83% of stroke survivors experience balance impairment [Li et al., 2019](#). One of the most common and widely recognized consequences of stroke is motor impairment, which may be defined as a loss or limitation of muscle control, movement, or mobility [Balasubramanian, 2015](#). There appears to be a direct relationship between motor impairment and functional ability; for instance, independence in walking has been associated with lower-limb strength [Fujita et al., 2020](#).

The dominant limb can be defined based on muscle strength, functional use, and personal preference, all of which may influence balance. Limb dominance is typically determined by identifying the leg an individual prefers and relies upon to perform functional activities, including maintaining balance [Greve et al., 2007](#). Lower-limb dominance (or lateral preference) may therefore affect functional performance. Clinicians are often required to make judgments regarding recovery status following injury, frequently relying on strength and dynamic performance measures [McGrath et al., 2016](#). Despite increasing evidence on post-stroke balance impairment, the influence of lower-limb dominance on balance and motor recovery remains poorly un-

derstood, particularly in low-resource settings such as Nigeria. Therefore, this study aimed to investigate the relationship between limb dominance, balance, and motor function among stroke survivors.

Methods

Study Design and Setting

This study employed a cross-sectional design involving 121 stroke survivors recruited using convenience sampling. Participants were receiving outpatient physiotherapy care at selected tertiary and secondary health facilities in Lagos State, Nigeria, including Lagos University Teaching Hospital (LUTH), Idi-Araba; Lagos State University Teaching Hospital (LASUTH), Ikeja; National Orthopaedic Hospital, Igbobi; Federal Medical Centre (FMC), Ebute Meta; and Isolo General Hospital, Isolo.

Sample Size Determination

The minimum sample size for the study was calculated using the formula proposed by Cochran (1977).

Eligibility Criteria

Stroke survivors aged 18 years and above who were able to follow instructions and could walk with or without support were included in the study. Participants were excluded if they had severe cognitive impairments or other medical conditions that could independently affect balance.

Ethical Considerations

Ethical approval was obtained from the Health Research and Ethics Committee of Lagos University Teaching Hospital (LUTH), Idi-Araba. Written informed consent was obtained from all participants prior to their inclusion in the study. Participants were informed about the objectives of the study and assured of their right to withdraw at any stage without any consequences.

Data Collection Procedure

Eligible participants were identified and recruited consecutively. The study instruments were administered only to participants who met the inclusion criteria. All assessments were conducted under standardized conditions.

Study Instruments

The following instruments were used for data collection:

- **Dynamic Gait Index (DGI):** Used to assess dynamic balance.
- **Waterloo Footedness Questionnaire-Revised (WFQ-R):** Used to determine lower-limb dominance.
- **Static Balance Test (SBT):** Used to assess static balance.
- **Fugl-Meyer Assessment-Lower Extremity (FMA-LE):** Used to evaluate motor function of the lower extremities.

Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics, including mean, standard deviation, frequency, and percentages, were used to summarize the data. The association between lower-limb dominance, balance, and motor function was assessed using the Chi-square test. Logistic regression analysis was further conducted to determine whether lower-limb dominance predicts balance and motor function outcomes among stroke survivors.

Results

Participant Characteristics

A total of 121 stroke survivors receiving treatment at physiotherapy outpatient units across selected health facilities in Lagos State participated in this study. These included two teaching hospitals, one general hospital, one Federal Medical Centre, and the National Orthopaedic Hospital, Igbobi.

Socio-demographic Characteristics

The mean age of the participants was 54.6 ± 11.78 years, with the majority (32.2%) within the 51–60 years age group. More than half of the participants were female (52.9%), and most were Christians (68.6%) and married (80.2%). In terms of educational attainment, 66 (54.5%) participants had tertiary education, while 35 (28.9%) were professionals in their respective fields (Table 1).

Clinical Characteristics

Sixty-seven (55.4%) participants had left-sided hemiplegia/hemiparesis, and the majority (109; 90.1%) presented with ischemic stroke. Most participants (98) had a stroke onset greater than 6 months prior to assessment. Hypertension alone was the most common comorbidity (50.4%), while 21.5% of participants had both hypertension and diabetes. Regarding limb dominance, 93% of participants had right-sided dominance, while 7% had left-sided dominance. Fifty-six (46.3%) participants had dominant-side affectation, whereas 65 (53.7%) had non-dominant side affectation (Table 2).

Table 1: Socio-demographic Characteristics of Participants (n = 121)

Variables	Frequency (n)	Percentage (%)
Age Group (years)		
<30	4	3.3
31–40	14	11.6
41–50	23	19.0
51–60	39	32.2
61–70	31	25.6
≥71	10	8.3
Total	121	100.0
Mean ± SD	54.60 ± 11.78	
Sex		
Male	57	47.1
Female	64	52.9
Total	121	100.0
Religion		
Christianity	83	68.6
Islam	36	29.8
Traditional	2	1.7
Total	121	100.0
Occupational Status		
Professional	35	28.9
Semiskilled	16	13.2
Skilled	21	17.4
Unemployed	28	23.1
Unskilled	21	17.4
Total	121	100.0

SD = Standard Deviation

Balance Status and Motor Function

The mean score for the Dynamic Gait Index (DGI) was 16.99 ± 2.91 , with only 22% of participants

classified as safe ambulators. A large proportion of participants (108; 89%) had moderate impairments in motor function based on the Fugl-Meyer Assessment for Lower Extremity (FMA-LE), with a mean score of 23.49 ± 2.97 . The mean score for the Static Balance Test (SBT) was 14.26 ± 1.83 , and over half of the participants (53%) demonstrated good balance (Table 3).

Table 2: Clinical Characteristics of Participants (n = 121)

Variables	Frequency (n)	Percentage (%)
Stroke Onset		
<3 months	1	0.8
3–6 months	22	18.2
>6 months	98	81.0
Total	121	100.0
Side of Affectation		
Left	67	55.4
Right	54	44.6
Total	121	100.0
Type of Stroke		
Haemorrhagic	12	9.9
Ischaemic	109	90.1
Total	121	100.0
Comorbidities		
Diabetes	2	1.7
Epilepsy	6	5.0
Hypertension	61	50.4
Hypertension & Diabetes	26	21.5
None	26	21.5
Total	121	100.0
Dominant Side Affectation		
Dominant	56	46.3
Non-dominant	65	53.7
Total	121	100.0

Association Between Balance, Motor Function, and Lower Limb Dominance

Sixty-four participants demonstrated good static balance, with an approximately equal distribution between those with dominant and non-dominant side affectation. There was no statistically significant association between lower-limb dominance and static balance ($p = 0.385$).

Ninety-four participants were classified as being at high risk of falls based on their DGI scores;

among these, 55 (58.5%) had non-dominant side affectation, while 39 (41.5%) had dominant side affectation. A statistically significant association was observed between lower-limb dominance and dynamic balance ($p = 0.049$) (Table 4).

Lower Limb Dominance as a Predictor of Outcomes

Logistic regression analysis was conducted to determine whether lower-limb dominance predicts static balance, dynamic balance, and motor function. The dependent variables were entered into the model, and results were interpreted using odds ratios (OR) and corresponding p -values (Table 5).

Lower-limb dominance did not significantly predict static balance (OR = 1.108, $p = 0.865$), dynamic balance (OR = 3.077, $p = 0.400$), or motor function (OR = 2.222, $p = 0.540$).

Table 3: Balance Status and Motor Function of Participants (n = 121)

Variables	Frequency (n)	Percentage (%)
Static Balance Test (SBT, total = 20)		
Good	64	52.9
Poor	57	47.1
Total	121	100.0
Mean \pm SD	14.26 ± 1.83	
Dynamic Gait Index (DGI, total = 24)		
High risk of fall	94	77.7
Low risk of fall	27	22.3
Total	121	100.0
Mean \pm SD	16.99 ± 2.91	
Fugl-Meyer Assessment-Lower Extremity (FMA-LE, total = 34)		
Mild impairment	13	10.7
Moderate impairment	108	89.3
Total	121	100.0
Mean \pm SD	23.49 ± 2.97	

SBT = Static Balance Test; DGI = Dynamic Gait Index; FMA-LE = Fugl-Meyer Assessment for Lower Extremity; SD = Standard Deviation

Table 4: Association Between Outcomes and Lower Limb Dominance (n = 121)

Variables	Dominant	Non-dominant	Total	χ^2	df	p-value
Static Balance Test (SBT)						
Good	32 (50.0)	32 (50.0)	64 (100.0)	0.756	1	0.385
Poor	24 (42.1)	33 (57.9)	57 (100.0)			
Total	56 (46.3)	65 (53.7)	121 (100.0)			
Dynamic Gait Index (DGI)						
High risk of fall	39 (41.5)	55 (58.5)	94 (100.0)	3.890	1	0.049*
Low risk of fall	17 (63.0)	10 (37.0)	27 (100.0)			
Total	56 (46.3)	65 (53.7)	121 (100.0)			
Fugl-Meyer Assessment-LE						
Mild impairment	7 (53.8)	6 (46.2)	13 (100.0)	0.335	1	0.563
Moderate impairment	49 (45.4)	59 (54.6)	108 (100.0)			
Total	56 (46.3)	65 (53.7)	121 (100.0)			

Values are presented as frequency (percentage). *Statistically significant at $p < 0.05$.

Table 5: Lower Limb Dominance as a Predictor of Static Balance, Dynamic Balance, and Motor Function (n = 121)

Dependent Variables	Odds Ratio (OR)	SEM	p-value	95% CI (Lower)	95% CI (Upper)
SBT	1.108	0.732	0.865	0.210	3.707
DGI	3.077	1.330	0.400	0.224	42.199
FMA-LE	2.222	1.303	0.540	0.173	28.564

SBT = Static Balance Test; DGI = Dynamic Gait Index; FMA-LE = Fugl-Meyer Assessment for Lower Extremity; SEM = Standard Error of Mean; CI = Confidence Interval; statistical significance set at $p \leq 0.05$.

Discussion

This study was conducted to determine the association among balance, motor function, and lower-limb dominance, as well as to assess whether lower-limb dominance could predict balance and motor function status among stroke survivors.

The findings revealed a predominance of ischemic stroke among middle-aged participants. This may be attributed to vascular risk factors such as hypertension, diabetes, and hypercholesterolemia, which play significant roles in the development of stroke. This observation aligns with Howard et al., 2023, who reported that ischemic stroke is the most common type and occurs predominantly among middle-aged individuals.

In this study, the majority of participants presented with left-sided hemiplegia or hemiparesis, consistent with findings reported by Ali et al., 2020. However, this contrasts with the report by Olawale et al. (2019), who documented a higher incidence of right-sided hemiplegia. Hypertension emerged

as the leading stroke-related comorbidity in the current study, which is in agreement with findings from Ostwald et al., 2006, who identified hypertension as the most prevalent comorbidity among stroke survivors. Similarly, Aslam et al., 2022 identified hypertension as the most frequent risk factor in their multicentric study on stroke in young adults.

Most participants in this study were right lower-limb dominant. Although there is no definitive explanation for this predominance, limb dominance is believed to arise from functional asymmetry of the cerebral hemispheres, with most individuals exhibiting left-hemispheric dominance. This finding is consistent with Teo et al., 2018, who reported a higher prevalence of right lower-limb dominance, particularly among right-handed individuals. Their study demonstrated that right-handed individuals were significantly more likely to exhibit ipsilateral lower-limb dominance compared to left-handed individuals, who showed less predictable patterns. Similar observations have also been reported by Li

et al., 2021. These findings suggest that individuals with right-sided upper and lower-limb dominance tend to demonstrate greater lateralization than those with left-sided dominance.

The results of this study showed that the majority of participants had good static balance. In this context, good static balance was defined as a score greater than 15 on the Static Balance Test. Participants who scored above this threshold were able to maintain their centre of gravity for up to 10 seconds, consistent with findings reported by Pickenbrock et al., 2016. However, no significant association was found between static balance and lower-limb dominance. This finding is supported by McGrath et al., 2016, who reported that lower-limb dominance did not significantly influence postural balance in healthy sedentary individuals.

The mean Dynamic Gait Index (DGI) score indicated that most participants had relatively poor dynamic balance. This finding is consistent with previous studies reporting a high prevalence of gait and balance impairments among stroke survivors Borode et al., 2023. Interestingly, the majority of participants with poor dynamic balance had their non-dominant lower limb affected. Although a statistically significant association was found between DGI scores and lower-limb dominance, lower-limb dominance did not predict dynamic balance status. This finding aligns with the results of a systematic review and meta-analysis by Schorderet et al., 2021, which reported strong evidence that lower-limb dominance does not influence balance. However, their study was limited to healthy individuals, and the authors suggested that differences due to limb dominance may be less evident among older adults or individuals with impairments.

Regarding motor function, most participants demonstrated moderate impairment, with a greater proportion having their non-dominant lower limb affected. There was no statistically significant association between motor function and lower-limb dominance, and limb dominance did not predict motor function outcomes. This finding is consistent with Menezes et al., 2016, who reported that pre-stroke lower-limb dominance did not significantly influence measures of impairment or activity limitation among individuals with chronic stroke. Participants with dominant limb involvement showed similar levels of impairment compared to those with non-dominant limb in-

volvement.

Conclusion

Based on the findings of this study, there was no significant association between lower-limb dominance and static balance. However, a significant association was observed between lower-limb dominance and dynamic balance. Stroke survivors whose non-dominant lower limb was affected demonstrated similar levels of motor function as those with dominant limb involvement. Overall, lower-limb dominance did not predict balance status or motor function among stroke survivors.

Implications for Further Studies

Future research should further explore the role of lower-limb dominance in balance training and neurological rehabilitation interventions, particularly in stroke populations within low-resource settings.

What is Known About This Topic

- Loss of lower-extremity muscle strength following stroke negatively affects dynamic balance.
- Lower-limb dominance does not significantly influence single-leg postural balance.
- Functional mobility is often more impaired when the dominant side is affected compared to the non-dominant side.

Authors' Contributions

Concept and design: OOD and OCO; Data collection: ABS and IEA; Data analysis and interpretation: OOD, OCO, and OAO; Drafting of manuscript: ABS; Critical review of manuscript: OCO and OAO; Supervision: OCO.

Funding

The authors declare that no funding or grant was received for this study.

Conflict of Interest

The authors declare that there is no conflict of interest regarding this study.

References

- Ali, M. U., Garba, A. Y., Oyeyemi, A. L., Masta, M. A., Gujba, F. K., & Modu, A. A. (2020). Socio-demographic and clinical correlates of community reintegration of stroke survivors in nigeria. *International Neuropsychiatric Disease Journal*, *14*(3), 1–7.
- Aslam, A., Khan, U., Niazi, F., & Anwar, I. (2022). Etiology and risk factors of stroke in young adults: A multicentric study. *Annals of Medicine and Surgery*, *82*.
- Balasubramanian, S. (2015). Motor impairments following stroke. *Frontiers in Human Neuroscience*, *30*, 406–413.
- Borode, A. O., Awotidebe, T. O., Ademoyegun, A. B., Falokun, I. G., Omisore, O. B., & Adedoyin, R. A. (2023). Interrelationship among fear of falling, gait characteristics and dynamic balance in stroke survivors: A case-control study. *Turkish Journal of Neurology*, *29*(4), 241–248.
- Choi, W. (2022). Effects of robot-assisted gait training with body weight support on gait and balance in stroke patients. *International Journal of Environmental Research and Public Health*, *19*(10), 5814.
- Fujita, T., Ohashi, Y., Kurita, M., Yamane, K., Yamamoto, Y., Sone, T., & Iokawa, K. (2020). Functions necessary for gait independence in patients with stroke: A study using decision tree. *Journal of Stroke and Cerebrovascular Diseases*, *29*(8), 104998.
- Greve, J., Alonso, A., Bordini, A. C. P., & Camanho, G. L. (2007). Correlation between body mass index and postural balance. *Clinics*, *62*, 717–720.
- Howard, G., Banach, M., Kissela, B., Cushman, M., Muntner, P., Judd, S. E., & Howard, V. J. (2023). Age-related differences in the role of risk factors for ischemic stroke. *Neurology*, *100*(14), e1444–e1453.
- Lee, K., & Lee, G. (2023). The test–retest reproducibility, standard error measurement, and smallest real difference of dynamic balance tests in chronic stroke survivors. *Applied Sciences*, *13*(11), 6358.
- Li, J., Zhang, P., Liu, Y., Chen, W., Yi, X., & Wang, C. (2021). Stroke lateralization in large hemisphere infarctions: Characteristics, stroke-related complications, and outcomes. *Frontiers in Neurology*, *12*, 774247.
- Li, J., Zhong, D., Ye, J., He, M., Liu, X., Zheng, H., & Zhang, S. L. (2019). Rehabilitation for balance impairment in patients after stroke: A protocol of a systematic review and network meta-analysis. *BMJ Open*, *9*(7), e026844.
- McGrath, T. M., Waddington, G., Scarvell, J. M., Ball, N. B., Creer, R., Woods, K., & Smith, D. (2016). The effect of limb dominance on lower limb functional performance: A systematic review. *Journal of Sports Sciences*, *34*(4), 289–302.
- Menezes, K. K., Faria, C. D., Scianni, A. A., Avelino, P. R., Faria-Fortini, I., & Teixeira-Salmela, L. F. (2016). Previous lower limb dominance does not affect measures of impairment and activity after stroke. *European Journal of Physical and Rehabilitation Medicine*, *53*(1), 24–31.
- Obembe, A. O., Olaogun, M. O., & Adedoyin, R. (2014). Gait and balance performance of stroke survivors in south-western nigeria: A cross-sectional study. *The Pan African Medical Journal*, *17*(Suppl 1), 6.
- Ostwald, S. K., Wasserman, J., & Davis, S. (2006). Medications, comorbidities, and medical complications in stroke survivors: The CARES study. *Rehabilitation Nursing*, *31*(1), 10–14.
- Pickenbrock, H. M., Diel, A., & Zapf, A. (2016). A comparison between the static balance test and the berg balance scale: Validity, reliability, and comparative resource use. *Clinical Rehabilitation*, *30*(3), 288–293.
- Roelofs, J. M., Zandvliet, S. B., Schut, I. M., Huisinga, A. C., Schouten, A. C., Hendricks, H. T., & Weerdesteyn, V. (2023). Mild stroke, serious problems: Limitations in balance and gait capacity and the impact on fall rate and physical activity. *Neurorehabilitation and Neural Repair*, *37*(11–12), 786–798.
- Schorderet, C., Hilfiker, R., & Allet, L. (2021). The role of the dominant leg while assessing balance performance: A systematic review and meta-analysis. *Gait & Posture*, *84*, 66–78.
- Schröder, J. (2023). *Dynamics of lower limb and standing balance recovery early post-stroke*:

- Measurement, mechanisms and treatment* [Doctoral dissertation, University (Doctoral dissertation)].
- Shebl, A. M., & Abd Elhameed, S. H. (2014). Impact of informal caregivers training program on geriatric patients' functional status and post-stroke depression. *IOSR Journal of Nursing and Health Science*, 3(4), 45–53.
- Teo, I., Thompson, J., Neo, Y. N., Lundie, S., & Munnoch, D. A. (2018). Lower limb dominance and volume in healthy individuals. *Lymphology*, 50(4).
- Vincent-Onabajo, G., Joseph, E., & Musa, H. Y. (2018). Impact of balance on functional independence after stroke: A cross-sectional study at rehabilitation settings in nigeria. *NeuroRehabilitation*, 42(4), 499–504.