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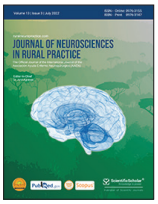

Original Article

A comprehensive analysis of stroke admissions at a rural Nigerian tertiary health facility: Insights from a single-center study

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ABSTRACT

Objectives: This research intended to examine the demographic and clinical attributes of stroke admissions in a rural Nigerian hospital.

Materials and Methods: A retrospective analysis of stroke admissions was conducted over 1 year. All necessary data were obtained from patients' records and SPSS was employed for data analysis. $P < 0.05$ was deemed significant.

Results: There were 52 stroke cases, accounting for 5.9% of medical admissions. The patients' mean age was 62.81 ± 12.71 years, while females constituted 51.9% of cases. Common risk factors included hypertension (76.9%), hyperlipidemia (38.5%), alcohol (26.9%), and diabetes mellitus (26.9%). Clinical manifestations included hemiparesis/plegia (84.6%), altered consciousness (63.5%), slurred speech (61.5%), cranial nerve deficit (61.5%), aphasia (42.3%), and headache (34.6%). Ischemic stroke (71.2%) predominated over hemorrhagic stroke (28.8%). The average hospitalization duration was 17.62 ± 8.91 days, and the mean onset to arrival time was 121.31 ± 136.06 h. Discharge and mortality rates were 82.7% and 13.5%, respectively. The association between stroke subtypes and mortality was significant ($P = 0.001$).

Conclusion: Stroke constitutes a significant portion of medical admissions in Nigeria, with ischemic stroke being more prevalent. High mortality rates underscore the urgent need to manage risk factors to prevent stroke.

Keywords: Risk factor, Stroke, Morbidity, Mortality, Nigeria, Treatment outcome

INTRODUCTION

Stroke poses a significant health challenge with notable economic implications. It ranks as the second most common cause of death after ischemic heart disease.[1] The annual death toll from stroke amounts to 6.5 million worldwide, with 80–86% of these deaths concentrated in low- and middle-income countries (LMICs).[1,2] The prevalence of stroke in LMICs rises by 6% each year.[3] Globally, there has been a consistent rise in the incidence and impact of stroke, particularly due to the rising rates of hypertension.[1]

Stroke accounts for a substantial percentage of admissions and mortality in neurology in Africa, including Nigeria, where it constitutes 5.7–26.2% of admissions to the emergency room and 4–17% of medical mortalities.[4,5] Fatality rates ranging from 21% to 45% have been documented by earlier studies.[6-10] Limited health-care funding and access to quality medical care in rural areas exacerbate the negative impact of stroke outcomes.[11]

Despite the burden of stroke, data on stroke epidemiology in rural areas of Nigeria are sparse. Understanding stroke statistics, including incidence and mortality, in rural areas is crucial for improving health-care delivery and meeting patient and community expectations.[1,4] This study intended to evaluate the demographic and clinical attributes of stroke cases in a rural tertiary health facility in South-South Nigeria.

MATERIALS AND METHODS

Study design, setting, and population

This was a retrospective review of stroke cases admitted to the neurology unit of a rural teaching facility in South-South Nigeria from January to December 2021. The study included adults aged 18 years and above who were diagnosed with stroke and admitted to the medical wards during the specified period. Excluded from the study were patients with stroke mimics and incomplete data. The institutional ethics committee approved the study and informed consent

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requirements were waived due to the retrospective nature of the study.

Data collection

This study involved the review of case files of individuals admitted with a stroke diagnosis over a given period. Information extracted from these files included sociodemographic data, timing of symptom onset to presentation, risk factors, clinical characteristics, comorbidity, duration of hospital stay, type of stroke, and treatment outcomes. Stroke diagnosis and classification were determined either by neuroimaging or the World Health Organization criteria[12] if imaging was unavailable. Key physiological variables were also recorded. Treatment outcomes were categorized into discharge, discharge against medical advice (DAMA), referred, or death.

Statistical analysis

The study used SPSS version 25 for data analysis. Continuous variables were reported as mean values and standard deviations, while categorical variables were expressed as frequencies and percentages. Associations between variables were assessed using Pearson's Chi-square test or Fisher's exact test, with *P*-value below 0.05 indicating statistical significance.

RESULTS

There were 52 stroke cases, accounting for 5.9% of all medical admissions, with an average age of about 63 years. Stroke occurrence significantly increased with age ($P = 0.044$) and was slightly more common in females (51.9%) [Table 1].

The most common risk factors were hypertension (76.4%), dyslipidemia (38.5%), diabetes mellitus (DM) (26.9%),

Table 1: Sociodemographic characteristics of stroke patients.

Characteristics	Total (N=52) *n* (%)	Stroke types		*P*-value
		Hemorrhagic (N=15) *n* (%)	Ischemic (N=37) *n* (%)	
Age groups (years)				
<45	5 (9.6)	2 (13.3)	3 (8.1)	**0.045**[a]
45–64	26 (50.0)	11 (73.3)	15 (40.5)	
≥65	21 (40.4)	2 (13.3)	19 (51.4)	
Mean±SD	62.81±12.71	57.13±9.08	65.11±13.34	0.178[b]
Gender				
Male	25 (48.1)	8 (53.3)	17 (45.9)	0.629[c]
Female	27 (51.9)	7 (46.7)	20 (54.1)	
Occupation				
Farming	7 (13.5)	3 (20.0)	4 (10.8)	0.254[a]
Trading	20 (38.5)	6 (40.0)	14 (37.8)	
Civil servant	4 (7.7)	1 (6.7)	3 (8.1)	
Pensioner	11 (21.2)	1 (6.7)	10 (27.0)	
Housewife	3 (5.8)	0 (0.0)	3 (8.1)	
Priest	1 (1.9)	1 (6.7)	0 (0.0)	
Artisans	6 (11.5)	3 (20.0)	3 (8.1)	
Level of education				
Informal	5 (9.6)	0 (0.0)	5 (13.5)	0.037[a]
Primary	16 (30.8)	7 (46.7)	9 (24.3)	
Secondary	18 (34.6)	2 (13.3)	16 (43.2)	
Tertiary	13 (25.0)	6 (40.0)	7 (18.9)	
Marital status				
Single	3 (5.8)	1 (6.7)	2 (5.4)	0.604[a]
Married	47 (90.4)	13 (86.7)	34 (91.9)	
Separated	1 (1.9)	0 (0.0)	1 (2.7)	
Widowed	1 (1.9)	1 (6.7)	0 (0.0)	
Body mass index (kg/m^2)				
Normal (18.5–24.9)	28 (53.8)	10 (66.7)	18 (48.6)	0.287[a]
Overweight (25–29.9)	15 (28.8)	2 (3.8)	13 (25.0)	
Obesity (≥30)	9 (17.3)	3 (20.0)	6 (16.2)	
Mean±SD	26.23±4.56	25.77±5.40	26.42±4.24	0.397[b]

Bold indicates statistically significant *P*-value. [a]Fisher's exact test, [b]*t*-test, [c]Chi-square test. N: Number, *n*: Frequency, SD: Standard deviation. All values are stated in numbers (percentages) unless otherwise stated

alcohol (26.9%), and a history of previous stroke (11.5%). A majority (75%) of patients had two or more risk factors [Table 2].

Typical symptoms included hemiparesis/plegia (84.6%), altered consciousness (63.5%), and slurred speech (61.5%). Seizures occurred significantly more frequently in hemorrhagic strokes (40%) compared to ischemic strokes (8.1%) ($P = 0.012$) [Table 3].

Most cases were ischemic stroke (71.2%), with the rest being hemorrhagic stroke (28.8%). The majority (88.5%) of patients experienced their first stroke, while 11.5% had a repeat stroke. Neuroimaging was not conducted in 17 (32.7%) patients. Patients stayed in the hospital for an average of about 18 days, and the average time from symptom onset to hospital arrival was about 121 h. Almost half (46.2%) of the patients arrived at the hospital more than 72 h after stroke onset, while only one (1.9%) arrived within 4.5 h. Forty-three (87.2%) patients were discharged and 7 (13.5%) died. Most deaths (85.7%) occurred in hemorrhagic stroke patients, indicating a significant association between stroke type and mortality ($P = 0.001$) [Table 4].

Table 2: Identified risk factors of stroke.

Risk factors	Total (N=52) *n* (%)	Stroke types		*P*-value[b]
		Hemorrhagic (N=15) *n* (%)	Ischemic (N=37) *n* (%)	
Hypertension	40 (76.9)	11 (73.3)	29 (78.4)	0.726
Diabetes mellitus	14 (26.9)	3 (20.0)	11 (29.7)	0.520
Heart disease	2 (3.8)	1 (6.7)	1 (2.7)	1.000
Previous stroke	6 (11.5)	2 (13.3)	4 (10.8)	1.000
Smoking	1 (1.9)	1 (6.7)	0 (0.0)	0.288
Alcohol	14 (26.9)	7 (46.7)	7 (18.9)	0.081
OCP	4 (7.7)	1 (6.7)	3 (8.1)	1.000
Hyperlipidaemia	20 (38.5)	7 (46.7)	13 (35.1)	0.439[c]
Obesity	9 (17.3)	3 (20.0)	6 (16.2)	1.000
Family history of stroke	7 (13.5)	1 (6.7)	6 (16.2)	0.433
Atrial fibrillation	5 (9.6)	1 (6.7)	4 (10.8)	1.000
Number of risk factors				
1 risk factor	13 (25.0)	3 (20.0)	10 (27.0)	0.596
≥2 risk factors	39 (75.0)	12 (80.0)	27 (73.0)	

[b]Fisher's exact test, [c]Chi-square test. OCP: Oral contraceptive pills, N: Number, *n*: Frequency. All values are stated in numbers (percentages) unless otherwise state

Table 3: Clinical features of stroke in the study population.

Clinical features	Total (N=52) *n* (%)	Stroke types		*P*-value[b]
		Hemorrhagic (N=15) *n* (%)	Ischemic (N=37) *n* (%)	
Hemiparesis	44 (84.6)	14 (93.3)	30 (81.1)	0.412
Headache	18 (34.6)	3 (20.0)	15 (40.5)	0.158[c]
Vomiting	5 (9.6)	1 (6.7)	4 (10.8)	1.000
Altered sensorium	33 (63.5)	11 (73.3)	22 (59.5)	0.347
Seizures	9 (17.3)	6 (40.0)	3 (8.1)	**0.012**
Fever	7 (13.5)	0 (0.0)	7 (18.9)	0.093
Aphasia	22 (42.3)	6 (40.0)	16 (43.2)	0.830[c]
Dysarthria	15 (28.8)	5 (33.3)	10 (27.0)	0.740
Dizziness	3 (5.8)	1 (6.7)	2 (5.4)	1.000
Slurred speech	32 (61.5)	8 (53.3)	24 (69.4)	0.439[c]
Ataxia	9 (17.3)	2 (13.3)	7 (18.9)	0.712
Blurred vision	3 (5,8)	1 (6.7)	2 (5.4)	1.000
Restlessness	2 (3.8)	0 (0.0)	2 (5.4)	0.581
Dysphagia	1 (1.9)	0 (0.0)	1 (2.7)	1.000
CN VII palsy	32 (61.5)	8 (53.3)	24 (69.4)	0.439[c]

Bold indicates statistically significant *P*-value, [b]Fisher's exact test, [c]Chi-square test. CN: Cranial nerve, N: Number, *n*: Frequency. All values are stated in numbers (percentages) unless otherwise stated

Table 4: Clinical characteristics of stroke patients.

Characteristics	Total (N=52) *n* (%)	Stroke types		*P*-value
		Hemorrhagic (N=15) *n* (%)	Ischemic (N=37) *n* (%)	
Pulse rate (bpm)				
<60	2 (3.8)	0 (0.0)	2 (5.4)	0.291[a]
60–100	38 (73.1)	13 (86.7)	25 (67.6)	
>100	12 (23.1)	2 (13.3)	10 (27.0)	
Mean±SD	90.33±19.15	92.20±19.84	89.57±19.10	0.951[b]
Respiratory rate (cpm)				
12–20	20 (38.5)	6 (40.0)	14 (37.8)	0.885[c]
>20	32 (61.5)	9 (60.0)	23 (62.2)	
Mean±SD	23.58±5.68	23.20±5.441	23.73±5.83	0.734[b]
Systolic BP (mmHg)				
<90	1 (1.9)	0 (0.0)	1 (2.7)	0.705[a]
90–120	4 (7.7)	0 (0.0)	4 (10.8)	
120–139	4 (7.7	1 (2.7)	3 (8.1)	
≥140	43 (82.7)	14 (93.3)	29 (78.4)	
Mean±SD	160.23±34.74	164.67±22.00	158.43±38.85	0.204[t]
Diastolic BP (mmHg)				
<60	1 (1.9)	0 (0.0)	1 (2.7)	0.788[a]
60–80	10 (19.2)	2 (13.3)	8 (21.6)	
≥90	41 (78.8)	13 (86.7)	28 (75.7)	
Mean±SD	99.81±21.55	106.67±18.39	97.03±22.34	0.743[b]
GCS scores				
≤8 (severe/poor)	16 (30.8)	7 (46.7)	9 (24.3)	0.207[a]
9–12 (Moderate)	13 (25.0)	4 (26.7)	9 (24.3)	
13–15 (mild/good	23 (44.2)	4 (26.7)	19 (51.4)	
Mean±SD	11.44±3.84	11.20±3.41	11.54±4.05	0.468[b]
Time to presentation (hours)				
≤4.5	1 (1.9)	0 0.0)	1 (2.7)	0.720[a]
4.6–12	5 (9.6)	1 (6.7)	4 (10.8)	
13–24	12 (23.1)	2 (13.3)	10 (27.0)	
25–72	10 (19.2)	3 (20.0)	7 (18.9)	
>72	24 (46.2	9 (60.0)	15 (14.5)	
Mean±SD	121.31±136.06	135.00±122.30	115.76±142.48	0.673[b]
Random plasma glucose (mg/dL)				
70–140	32 (61.5)	9 (60.0)	23 (62.2)	0.307[a]
141–199	8 (15.4)	4 (26.7)	4 (10.8)	
≥200	12 (23.1)	2 (13.3)	10 (27.0)	
Mean±SD	152.15±66.51	146.20±72.10	154.57±64.99	0.994[b]
Duration of admission (days)				
≤14	22 (42.3)	7 (46.7)	15 (40.5)	1.000[a]
15–28	28 (53.8)	8 (53.3)	20 (51.4)	
29–42	1 (1.9)	0 (0.0)	1 (2.7)	
43–56	1 (1.9)	0 (0.0)	1 (2.70	
Mean±SD	17.62±8.91	17.00±7.19	17.86±9.59	0.547[b]
Outcome of care				
Discharged	43 (87.2)	8 (53.3)	35 (94.6)	**0.001**[a]
DAMA	2 (3.8)	1 (6.7)	1 (2.7)	
Death	7 (13.5)	6 (40.0)	1 (2.7)	
Diagnosis of stroke				
Imaging (CT scan)	35 (67.3)	10 (66.7)	25 (67.6)	1.000[a]
Clinical (no scan)	17 (32.7)	5 (33.3)	12 (32.4)	

Bold indicates statistically significant *P*-value. [a]Fisher's exact test, [b]*t*-test, [c]Chi-square test. BP: Blood pressure, DAMA: Discharge against medical advice. CT: Computerized tomography, GCS: Glasgow coma scale, SD: Standard deviation, N: Number, *n*: Frequency. All values are stated in numbers (percentages) unless otherwise stated

DISCUSSION

This research aimed to investigate the demographics and clinical trends of stroke in a rural teaching hospital in South-South Nigeria, a region with limited epidemiological data on stroke.

The study included 52 stroke cases, which made up 5.9% of medical ward admissions. This rate was slightly higher but comparable to previous studies in rural and urban Nigeria, with stroke accounting for 4.5% and 4.25% of medical admissions, respectively.[9,13] In contrast, a South-Western Nigerian urban hospital reported that 26.2% of its medical ward admissions were stroke patients,[5] a potential consequence of increased urbanization, and associated risk factors.

Gender is an important factor in early stroke risk assessment, with the incidence in females historically underreported.[12] Recent United States data revealed a growing concern for strokes in women, surpassing men in annual estimates.[14] In this study, stroke prevalence was slightly higher in women (51.9%) than men (48.1%), though not statistically significant, a trend observed in some earlier Nigerian studies.[7,15,16] This may be due to factors such as increased life expectancy, use of birth control pills, hormone therapy, and pregnancy-related complications.[7] Conversely, some studies report higher stroke prevalence in males, possibly due to the absence of vascular protection from endogenous estrogen.[4] Previous studies showed that stroke typically affects individuals between 50 and 70 years of age, corroborating the average age of 63 years in our patients.[4,13,17] This supports findings correlating age with stroke prevalence,[6,13] despite some contradictory reports.[11,15]

Ischemic stroke is conventionally considered to have a higher incidence than hemorrhagic stroke.[5,18] The study reaffirms that ischemic stroke is more prevalent than hemorrhagic stroke, consistent with the previous research.[5,7] However, some studies indicate a higher incidence of hemorrhagic stroke,[6,15] potentially because such patients are more inclined to seek care medical care due to the severity of their symptoms.

Neuroimaging plays a crucial role in diagnosing and classifying stroke subtypes for guiding acute treatment.[19] In this study, 67.3% of the patients had a cranial computerized tomography (CT) scan done, which far exceeds the 5.8% reported by Ekeh *et al*.[20] However, Arabambi *et al*.[5] observed a higher access rate (81%) to neuroimaging in Lagos compared to our study, potentially due to travel and cost challenges experienced by our patients. The absence of neuroimaging in some of our patients hinders their effective targeted treatment. The inconsistency in sensitivity results from validation studies of the Siriraj stroke score in Nigerians also challenges the reliable clinical identification of stroke types.[11]

Hypertension (76.9%) emerged as the predominant risk factor, consistent with the previous reports.[7,13,17,21] Controlling hypertension plays a crucial role in preventing strokes, potentially reducing the risk by up to 40%.[22] Sustained increases in blood pressure substantially increase stroke risk.[7,22] Hyperlipidemia was the second leading risk factor for stroke in this study, with a prevalence of 38.5%. Other studies by Ojo and Onyegiri,[13] Okokhere *et al*.,[17] Lisk *et al*.,[23] reported lower rates of hyperlipidemia (11.9–18.4%), but Karaye *et al*.[24] in Kano, Nigeria found a higher rate of 70% among stroke patients. These variations may be due to differences in the definition of hyperlipidemia.

Consistent with earlier research, DM was observed in 26.9% of stroke cases, reaffirming its role as a prevalent risk factor for stroke.[7,16,17,21] Patients with DM have a nearly fourfold increased risk of stroke compared to the general population, attributed to its contribution to atherosclerosis formation.[25] Ensuring optimal blood glucose control is crucial in preventing stroke in individuals with DM. The rising alcohol use observed reflects changing lifestyle patterns, with alcohol ranking as the second risk factor (25.0%) in a study conducted in Abuja.[13] Regular alcohol consumption is associated with hypertension, cerebral infarction, intracranial hemorrhage, and an increased likelihood of stroke-related mortality.[26]

In this study, 11.5% of patients had a prior history of stroke, consistent with similar research.[4,7] Recurrent strokes are common due to uncontrolled risk factors and limited stroke awareness. Smoking contributed to 1.9% of stroke risk factors, primarily among men, aligning with rural smoking patterns. The previous research has reported much higher rates of smoking.[7,13,27] Cessation of smoking can decrease the doubled risk of developing an ischemic stroke associated with smoking.[28] Most stroke patients (75%) in this study had multiple risk factors, emphasizing their cumulative impact in amplifying stroke occurrence. This finding is consistent with earlier studies.[7,24] Comprehensive management, particularly addressing cardiovascular risk factors, is crucial for stroke prevention.[12,24]

The clinical presentation of individuals with stroke in the study population aligns with the report of the previous research in Africa.[4,21,29] The time from symptom onset to hospital presentation varied based on the type of stroke. On average, patients arrived at the hospital 121 h after experiencing symptoms, longer than in the previous studies.[4,29] The duration of admission was also longer compared to prior findings.[13,30] Patients with ischemic stroke sought medical care earlier than those with hemorrhagic stroke, contradicting previous research.[4] Prompt presentation within 4.5 h is crucial for positive outcomes in managing ischemic stroke, but only one patient in the study arrived within this timeframe. Delays in seeking medical

care among Nigerians are due to inadequate knowledge of stroke warning signs, as well as limited road access, lack of transportation, ignorance, poverty, and cultural/religious beliefs.[31] Addressing these factors is necessary to improve the timely presentation and outcomes for stroke patients.

This study had positive treatment outcomes, with 87.2% of patients effectively managed and discharged. Similar results were found in other studies.[4,32] The DAMA rates (3.8%) in this study were lower compared to the previous studies.[4,33] Financial constraints, cultural/religious beliefs, and lengthy recovery periods may contribute to DAMA. Health education, effective communication, and inclusion in the National Health Insurance Scheme can promote early health-care-seeking and reduce DAMA rates.

The in-hospital mortality rate was 13.5%, similar to previous studies,[4,13] with higher rates of 23.8–41.2% reported in other studies.[6,7,21] The correlation between older age, hemorrhagic stroke, and higher mortality rates supports previous evidence.[4,7,15] Developed nations have seen a decline in stroke-related mortality, attributed to well-organized stroke care.[34] The higher male death rate observed in this study is comparable to the previous reports,[7,35] but studies in Sierra Leone[23] showed poorer outcomes in women.

Limitations of this study include limited access to brain CT scans, retrospective design, and small sample size. There is a possibility that this study does not provide an accurate depiction of stroke-related morbidity and mortality in the community, and there could be potential errors or missing data.

CONCLUSION

Stroke has a tremendous impact on health-care systems in LMICs like Nigeria. This study provides valuable data for planning, resource allocation, and policy formulation. Advancing age and hypertension plays a crucial role in increasing the risk. Early detection and management of hypertension and other modifiable cardiovascular risk factors are important. Health education is vital for raising awareness about risk factor management, lifestyle changes, and recognizing stroke warning signs.

Declaration of patient consent

Institutional Review Board (IRB) permission obtained for the study.

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Conflicts of interest

There are no conflicts of interest.

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