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Research Article

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Prevalence and Management of Stroke in Resource-Limited Settings: A Retrospective Study

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ABSTRACT

Background: Stroke is a major public health concern in sub-Saharan Africa, where its rising incidence is driven by the epidemiological transition and the high prevalence of cardiovascular risk factors. Despite medical advancements, the comprehensive and specialized management of stroke remains inadequate in low- to middle-income countries (LMICs). This is due to multiple factors, including delayed diagnosis, limited technical resources, a severe shortage of dedicated neurovascular units, and other systemic challenges that will be further explored in this article. This study is based on a comprehensive analysis of clinical management at the Yaounde Emergency Centre (YEC) which will attempt to highlight the challenges related to stroke management in sub-Saharan African countries.

Methods: We carried out a retrospective descriptive study over a period of one year going from the 01st January 2024 to 31st December 2024 at the YEC. We used the emergency department registers, and looked for all files of patients admitted at the YEC and treated for Stroke-like conditions. We excluded any incomplete patient files and all cases with clear alternative diagnoses that explained the neurological deficits. The extracted data were entered and managed using a generated Google sheet. The demographic characteristics of our population, the risk factors, the symptoms and signs, the clinical presentation, the imaging used, the different types of strokes found, the different vascular regions affected, the different treatment and the outcomes of patients were extracted into an excel file and then analyzed using R Studio.

Results: One hundred and eighty-nine files were included. The age ranged from 31 to 92 years. There were 52.9% of women. We found that CT scans were realized for 84.65% of patients (n=160), 14.81% of the patients had no neuroimaging realized (n=28). 56.1% of the patients were diagnosed with cerebral ischemic stroke (n=106), whereas 37.6% were diagnosed with brain hemorrhage (n=71), 2.1% with cerebellar stroke (n=4) and 4.2% with transient ischemic attack (n=8). The most affected artery was the middle cerebral artery and its branches 22.22% (n=42), while in 51.32% of the files the affected vascular region was not mentioned. The majority of patients (67.2%) were discharged in less than a week within hospitalization (n=127). 55.03% were discharged after partial recovery (n=104) and 24.87% of these patients passed away (n=47).

Conclusion: This study highlights the critical need for stroke and cardiovascular disease prevention while emphasizing the importance of establishing dedicated stroke units for optimal patient care.

Keyswords: Stroke, Ischemic Stroke, Brain Hemorrhage, Low-Middle-Income Country, Cardiovascular Risk Factors, Africa

Introduction

According to the World Health Organization (WHO), stroke is characterized by the abrupt onset of focal or global neurological dysfunction persisting for more than 24 hours or leading to death, with no apparent cause other than a vascular origin [1,2]. It is broadly classified into two major subtypes: ischemic stroke, resulting from cerebral infarction due to vascular occlusion, and brain hemorrhage, caused by the rapid accumulation of blood within the brain parenchyma or ventricular system, unrelated to trauma [2]. Annually, stroke affects approximately 16 million individuals worldwide and accounts for 5.7 million deaths, with 85% of these occurring in Africa [2,3]. It remains a major neurological emergency requiring prompt symptom recognition,

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precise determination of symptom onset, comprehensive neurological evaluation, and rapid interpretation of auxiliary investigations to guide therapeutic interventions. International guidelines advocate structured management protocols, including the implementation of specialized stroke units, intensive acute care measures such as intravenous thrombolysis within 4.5 hours of symptom onset, administration of aspirin within the first 48 hours, and decompressive surgery when indicated [1,4]. Despite a rising incidence of stroke in sub-Saharan Africa, management remains a great challenge due to resource constraints, often resulting in fragmented and suboptimal care that fails to align with established international guidelines. A recent global survey on thrombolytic therapy uptake revealed a mere 19% adoption rate in low- and middle-income countries compared to 50% in high-income nations [3]. In Cameroon, stroke accounts for approximately 30% of neurological consultations, with a mortality rate of 25% [5,6]. However, the availability of trained personnel and the implementation of evidence-based management strategies remain inadequate [7]. This study aims to document gaps in in-hospital care, delays in seeking medical consultation, sources of care sought, and the quality of stroke management in a resource-limited structure: the Yaounde emergency center (YEC). Identifying these challenges is crucial for designing targeted information, education, and communication (IEC) strategies to optimize stroke care in low-resource settings.

Methodology

Study Design and Setting: We carried a retrospective descriptive study from a patient's file for a period of one year. The study was conducted at the Yaounde Emergency Center located in Yaounde, Centre Region, Cameroon (figure 1), a region characterized by limited access to advanced diagnostic and therapeutic resources for stroke management. This Center is a hospital made of 04 departments: an emergency Department (04 beds for non-trauma patients, 03 beds for trauma patients, 01 bed for dechoc patients), the primary care area (10 beds), the Intensive Care Unit (11 beds) and the hospitalization Department (20 beds).

Study Population and Sampling

Initial File Review: A comprehensive review of 2,940 patient files from 01st January 2024 to 31st December 2024 was conducted. This initial review aimed to identify all cases with documentation suggestive of stroke-like symptoms or diagnoses or imaging.

Identification of Stroke-Like Cases: From the initial file review, 318 patient files were identified as containing information indicating stroke-like presentations. These cases were flagged for further scrutiny.

Inclusion and Exclusion Criteria: The 318 identified files were subsequently subjected to rigorous screening based on predefined inclusion and exclusion criteria, then narrowed down to 189 Stroke cases.

Inclusion Criteria: Documented neurological deficits (e.g., hemiparesis, facial weakness, speech impairment, sensory loss) of acute onset. Documentation suggestive of a clinical diagnosis of stroke, cerebrovascular events or similar terminology. Availability of sufficient patient data for analysis. Patient files from individuals of all ages. Patients with transient ischemic attacks that resolved completely within 24 hours.

Exclusion Criteria: Incomplete patient files. Cases with clear alternative diagnoses (e.g., trauma, seizures with postictal paralysis, known tumors, brain abscesses, etc..) that explained neurological deficits. Final Sample: Application of the inclusion and exclusion criteria resulted in a final sample of 189 patient files, representing the cases included in the analysis.

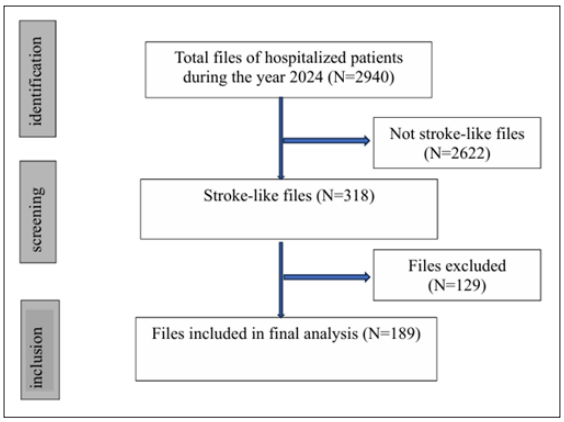

Figure 1: PRISMA Flowchart of the stroke files selection at the Yaounde Emergency Center during the year 2024

Data Collection

A standardized data extraction Google form was developed and used to collect relevant information from the 189 selected patient files. The extracted data included: demographic information (age, sex), documented risk factors or comorbidities (e.g., hypertension, diabetes, smoking, atrial fibrillation), documented time of onset of symptoms, and time of arrival to the facility, presenting symptoms and signs, available diagnostic imaging, documented primary diagnosis, documented treatment and management, documented outcomes.

Data Analysis

The extracted data were entered and managed using a generated Google sheet. Statistical analysis was performed using R Studio 2025.5.1.513 for Windows 10/11. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize the demographic and clinical characteristics of the study population.

Ethical Considerations

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical clearance was obtained from the ethical board of the University of Yaounde I. Patient confidentiality was maintained throughout the study. All patient identifiers were removed during data extraction and analysis.

Limitations

Retrospective design: This design is susceptible to limitations related to incomplete or inaccurate documentation. Limited diagnostic capabilities: The low-resource setting may have limited access to advanced neuroimaging, potentially affecting the accuracy of stroke diagnosis. Potential for selection bias due to the nature of retrospective chart review. Lack of standardized follow up data.

Significance

This study provides valuable insights into the presentation, management, and outcomes of stroke-like presentations in a low-resource setting. The findings can inform on the development of targeted interventions to improve stroke care in similar settings.

Results

From an initial review of 2,940 patient files, 189 cases were identified as confirmed stroke cases, from which obtained data were analyzed, clearly showing a stroke prevalence of 6.43% at YEC in 2024 (so a ratio of about 65:1000).

Demographics

The study population comprised 47.1% males (n=89) and 52.9% females (n=100). Minimum age was 31 years old and Maximum was 92 years old. The median was 64.00 with a mean age of 62.93 years (1st quartile = 52.00, 3rd quartile = 72.00).

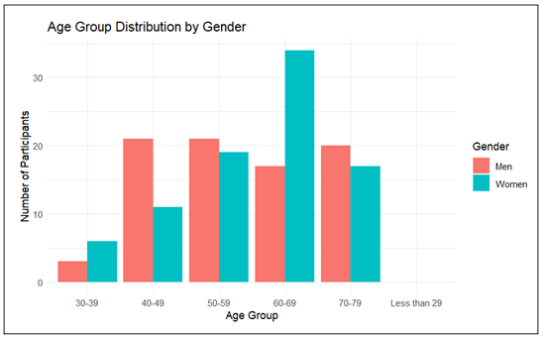

Figure 2: Age group distribution by gender

Risk Factors or comorbidities

While 31.22% presented no comorbidities nor risk factors (n=59); common documented past medical history was represented with 60.32% for elevated blood pressure (n=114), 12.17% for Diabetes Mellitus (n=23), 14.3% for previous Strokes (n=27), 11.11% for obesity (n=21) and 1.6% for smoking (n=3). Other risk factors or comorbidities included Arrhythmogenic Dilated Cardiomyopathy.

Clinical Presentations

The most frequently documented presenting symptoms were 69.84% hypertension (n=132), 68.78% hemiparesis (n=130) and 38.62% impaired consciousness (n=73). 42.32% of the patient files did have the stroke side mentioned (n=80), for 32.27 % of them it was on the left side (n=61) and for 25.39 % on the right side (n= 48). Other clinical pictures included prior aphasia, headache, asthenia, seizures, low blood pressure, atrial fibrillation, lipothymia, apraxia, blurred vision.

Imaging

Due to the limitations of the low-resource setting, limited CT scans were performed in 84.65% of patients (n=160), only 0.52% of Brain MRI was performed (n=1). No Brain MRA nor Brain CT Angiography were performed and 14.81% of the patients had no neuroimaging performed (n=28).

Diagnostic Findings

56.1% of the patients were diagnosed with cerebral ischemic stroke (n=106), whereas 37.6% were diagnosed with brain hemorrhage (n=71), 2.1% with cerebellar stroke (n=4) and 4.2% with transient ischemic attack (n=8). Branches of the cerebral artery and cerebellar artery affected were represented as follow: 7.94% for the anterior cerebral artery and its branches (n=15), 22.22% for the middle cerebral artery and its branches (n=42), 7.94% of the posterior cerebral artery and its branches (n=15), 11.11% of the basilar artery and its branches (n=21) and 0.53% for the cerebellar artery and its branches (n=1). For 51.32% of the cases (n=97), no indication on the vascular region affected was mentioned. In 32.27% of the cases, the affection was in the Left hemisphere (n=61) compared to 25.39% in the right hemisphere (n=48). There was no mention of the affected side in 69% of the files (n=80).

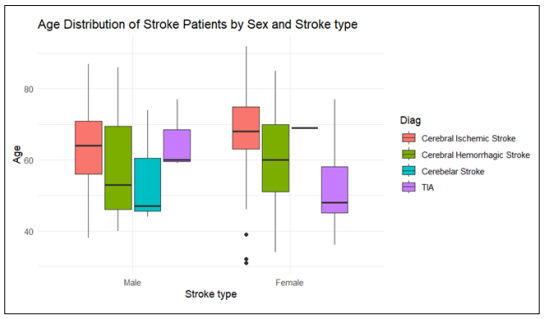

Figure 3: Age distribution of Stroke patients by Gender and Stroke type

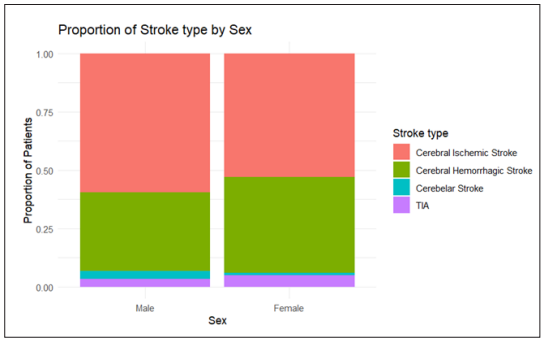

Figure 4: Proportion of Stroke type according to gender

Treatment and Management

Concerning non pharmacological treatment, only 15.34% received physiotherapy (n=29), 2.6% received muscle electrostimulation (n=5) and 83.6% did not receive any kind of non-pharmacological treatment (including venous thrombolysis prophylaxis or intravenous mechanical thrombolysis (n=158). Pharmacological treatment administered was represented by 80.95% of blood pressure lowering therapy (n=153), followed by 50.79% of antiplatelet therapy (n=96), 44.44% of statins (n=84) and 14.81% of anticoagulation therapy (n=28). Only one patient received thrombolytic therapy and 9.52% used anxiolytics (n=18). For 42.85% of the patients the onset was more than 24 hours prior to consultation (n=81), for 31.74% of them it was between 4.5 and 24 hours (n=60) and lastly in 25.39% of the cases the onset was less than 4.5 hours (n=48).

In-hospital duration

67.2% of the patients were discharged in less than a week within hospitalization (n=127), 29.1% within 01 to 03 weeks (n=55) and 3.7% after more than 03 weeks (n=7).

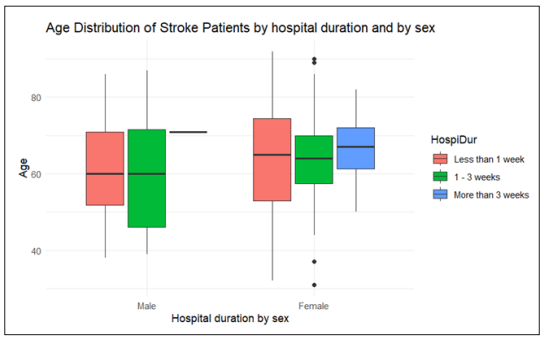

Figure 5: Age distribution of Stroke patients by hospital duration and by gender

Outcomes

24.87% of these patients passed away (n=47), 61.9% were discharged after partial recovery (n=117), 7.94% after full recovery (n=15) and 5.29% were discharged against medical advice (n=10).

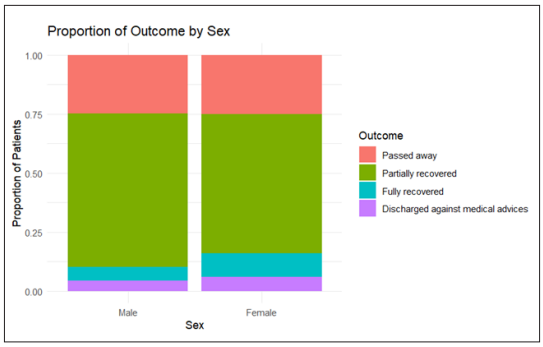

Figure 6: Proportion of Outcome distribution by gender

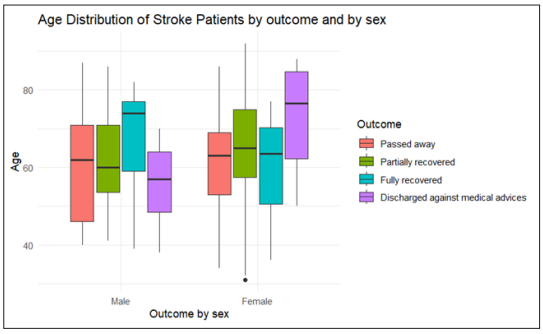

Figure 7: Age distribution of Stroke patients by Outcome and by gender

Key Findings

In summary (Table 1), this retrospective analysis highlights the challenges of stroke management in a low-resource setting. The study reveals a high prevalence of neurological affections and among them, stroke. Documented cardiovascular risk factors and/or comorbidities are often associated with stroke. Imaging, as a key tool for diagnosis if often underperformed. Ischemic stroke is more prevalent than brain hemorrhage. When it comes to management, non-pharmacological treatment is not really used whereas pharmacological options are only partially used even when indicated. In-hospital stay varies but remains for most cases under 01 week, including intensive care. But as expected, most patient exit the hospital with partially restored motor functions and in a satisfactory state.

Table 1: Summary results of the proportion of participants by gender

Characteristics	Overall	Men	Women
Participants	189 (100)	89 (47,1)	100 (52,9)
Age groups, n(%)			
Less than 29	0(0)	0 (0)	0(0)
30-39	9 (4,8)	3 (1,6)	6 (3,2)
40-49	32 (16,9)	21 (11,1)	11 (5,8)
50-59	40 (21,1)	21 (11,1)	19 (10,0)
60-69	51 (27)	17 (9,0)	34 (18,0)
70-79	37 (19,6)	20 (10,6)	17 (9,0)
≥80	20 (10,6)	7 (3,7)	13 (6,9)
Risk factors and comorbities, n(%)			
obesity	21 (11,1)	8 (4,2)	13 (6,9)
Primary hypertension	114 (60,3)	51 (27,0)	63 (33,3)
Diabete mellitus	23 (12,2)	14 (7,4)	9 (4,8)
Smoking	3 (1,6)	1 (0,5)	2 (1,1)
Previous stroke	27 (14,3)	17 (9,0)	10 (5,3)
no risks factors	59 (31,2)	29 (15,3)	30 (15,9)
others	2 (1,1)	0 (0,0)	2 (1,1)
Time from onset to admission, n(%)			
0 to 4,5 hours	48 (25,4)	25 (13,2)	23 (12,2)
4,5 to 24 hours	60 (31,7)	29 (15,3)	31 (16,4)
More than 24	81 (42,8)	35 (18,5)	46 (24,3)
Clinical presentation, n(%)			
Hemiplegia/hemiparesia	130 (69,8)	64 (33,9)	66 (34,9)
Monoplegia/ monoparesia	5 (2,6)	3 (1,6)	2 (1,0)
Facial drop	37 (19,6)	17 (9,0)	20 (10,6)
Dysarthria	27 (14,3)	10 (5,3)	17 (9,0)
Hight blood pressure	132 (69,8)	63 (33,3)	69 (36,5)
Impared consciousness	73 (38,6)	31 (16,4)	42 (22,2)
No symptom	7 (3,7)	2 (1,1)	5 (2,6)
Imaging, n(%)			
Brain CT Scan	160 (84,7)	72 (38,1)	88 (46,6)
Brain MRI	1 (0,5)	1 (0,5)	0 (0,0)
Brain CT Angiography	0 (0,0)	0 (0,0)	0 (0,0)
Brain MRA	0 (0,0)	0 (0,0)	0 (0,0)
No imaging	28 (14,8)	16 (8,5)	12 (6,3)
None of the above	0 (0,0)	0 (0,0)	0 (0,0)
Diagnosis, n(%)			
Cerebral ischemic stroke	106 (56,1)	53 (28,05)	53 (28,05)

Cerebral hemorrhagic stroke	71 (37,6)	30 (15,9)	41 (21,7)
Cerebelar Stroke	4 (2,1)	3 (1,6)	1 (0,5)
TIA	8 (4,2)	3 (1,6)	5 (2,6)
Stroke side, n(%)			
Left	61 (32,3)	33 (17,5)	28 (14,8)
Right	48 (25,4)	19 (10,1)	29 (15,3
Not mentioned	80 (42,3)	37 (19,6)	43 (22,7)
Vascular region affected by stroke or its branches, n(%)			
Anterior cerebral A	15 (7,9)	6 (3,1)	9 (4,8)
Middle cerebral A	41 (21,7)	22 (11,6)	19 (10,0)
Posterior cerebral A	14 (7,4)	4 (2,1)	10 (5,3)
Basillar A	21 (11,1)	9 (4,8)	12 (6,3)
Not mentioned	92 (48,7)	47 (24,9)	45 (23,8)
Others	6 (3,1)	2 (1,0)	4 (2,1)
Non pharmacological treatment, n(%)			
Muscle electrostimulation	5 (2,6)	1 (0,5)	4 (2,1)
Physiotherapy	29 (15,3)	12 (6,3)	17 (9,0)
Intravenous mechanical thrombolysis	0 (0,0)	0 (0,0)	0 (0,0)
Venous Thrombolism prophylaxis	0 (0,0)	0 (0,0)	0 (0,0)
None of the above	158 (83,6)	75 (39,7)	83 (43,9)
Pharmacological treatment, n(%)			
Blood pressure lowering therapy	153 (80,9)	73 (38,6)	80 (42,3)
Antiplatelets therapy	96 (50,8)	50 (26,5)	46 (24,3)
Thrombolytic therapy	1 (0,5)	0 (0,0)	1 (0,5)
Statins	84 (44,4)	41 (21,7)	43 (22,7)
Anticoagulation therapy	28 (14,8)	12 (6,3)	16 (8,5)
Others (Anxiolytics)	18 (9,5)	9 (4,75)	9 (4,75)
Duration of in-hospital care, n(%)			
less than 1 week	127 (67,2)	68 (36,0)	59 (31,2)
1 - 3 weeks	55 (29,1)	20 (10,6)	35 (18,5)
More than 3 weeks	7 (3,7)	1 (0,5)	6 (3,2)
Outcome, n(%)			
Passsed away	47 (24,8)	22 (11,6)	25 (13,2)
Partiially recovered	117 (61,9)	58 (30,7)	59 (31,2)
Fully recovered	15 (7,9)	5 (2,6)	10 (5,3)
Discharged against medical advices	10 (5,3)	4 (2,1)	6 (3,2)

Discussion

General Context and Study Limitations: This retrospective study conducted at the Yaounde Emergency Center (YEC) contributes to the understanding of stroke in low-resource urban African settings. As reported by, studies in Cameroon face limitations including missing imaging data, retrospective data entry, and heterogeneity in clinical record quality [6]. Similar constraints are described by Akinyemi in Nigeria, highlighting widespread challenges in sub-Saharan Africa stroke research infrastructure [8]. These factors affect diagnostic accuracy, limit generalizability, and contribute to underestimation of true disease burden.

Demographic Characteristics: The mean age of 64 years aligns with regional data: in both reports mean ages between 62 and 64 years [6,9]. This is comparable to Osegbe in Lagos, Nigeria (63.8 years, 2021) and Temesgen in Ethiopia (62.7 years, 2021), confirming that stroke in sub-Saharan Africa predominantly affects the elderly, mirroring the rise of non-communicable diseases [10,11].

The female predominance (52.9%) in our cohort is consistent with findings from Tchaleu in Yaoundé and Arowoiya. in South Africa, who reported similar proportions [12, 13]. This trend may be attributed to women's longer life expectancy, especially in urban Cameroon, and to postmenopausal vascular risks such as central obesity, dyslipidemia, and insulin resistance. Habtegiorgis in Ethiopia also suggest that women are more likely to utilize health services than men in certain settings [14].

Diagnosis and Vascular Localization

Neuroimaging was performed in 84.7% of our patients, which is significantly higher than the 63.5% reported by Mapoure, 59% by Arowoiya, and 43.2% by Temesgen. This reflects relative improvement in imaging access at YEC but also suggests disparities within Cameroon itself [6,11,13].

However, 14.8% of patients still had no imaging—a proportion close to the 13.6% reported by Nakibuuka in Uganda [15]. The lack of MRI and angiographic modalities, as noted by Bissek, limits vascular territory specification, impairing both diagnostic precision and tailored therapeutic strategies [9]. Only 22.2% of strokes in our cohort had a confirmed middle cerebral artery involvement, a figure echoing the diagnostic uncertainty reported by Osei in Ghana (2020) and Orowoiya et al. in South Africa [13,16].

Bryer and Kengne advocate for strengthening imaging access through teleradiology networks and continuous training of clinicians to improve diagnostic yield and reduce misclassification [17,18].

Patient Outcomes and Prognosis

Our in-hospital mortality rate (24.9%) is consistent with other Cameroonian studies: Mapoure et al. reported 25.6% and Tchaleu reported 21.5% [6,12]. These values also align with regional findings: Osegbe in Nigeria (25.1%, 2021) and Temesgen in Ethiopia (24.2%, 2021) [10,11].

Factors contributing to this mortality include

Delayed presentation

Kouna in Yaoundé reported that only 19% of patients arrived within the 4.5-hour thrombolysis window [19]. This is comparable to findings by Osei in Ghana, who observed median admission delays exceeding 12 hours [16].

Comorbidities and severe subtypes

Arowoiya and Heikinheimo emphasized the negative impact of hemorrhagic stroke and associated conditions such as HIV and uncontrolled hypertension on prognosis [13,20].

Lack of specialized stroke units

According to Bryer, stroke units can halve mortality, yet remain rare in SSA [17]. This is corroborated by, who noted the absence of stroke-dedicated pathways in Cameroon [9].

Low reperfusion therapy use

Ogun and Kengne both noted that thrombolysis is almost nonexistent in public facilities due to infrastructure, cost, and late presentation [18,21].

These findings point to a systemic deficit rather than patient-level factors, and support health system interventions including pre-hospital triage, stroke awareness campaigns, and decentralization of acute stroke care.

Rehabilitation and Long-Term Care

Only 15.3% of patients received physiotherapy in our study, and none received speech or occupational therapy. This matches the findings of Tchaleu, who found that fewer than 10% of patients accessed any rehabilitation during hospitalization [12]. Kengne reported that Cameroon lacks a national rehabilitation policy, with services largely concentrated in private and urban centers [18].

Comparable issues were reported in other SSA settings: Nakibuuka highlighted the lack of structured follow-up care, and Oyake showed that less than 20% of post-stroke patients completed rehab cycles [15,22].

Promising models include community-based rehabilitation and telerehabilitation. Oyake demonstrated improved motor recovery and patient adherence via phone-guided rehab [22]. Adapting these low-cost interventions in Cameroon-through mobile platforms and community health workers-could improve post-stroke outcomes, particularly for underserved rural populations.

Conclusion

The results of this study confirm the trends observed in other sub-Saharan African countries: an increasing incidence of strokes, a still largely imperfect management approach, and high in-hospital mortality. Efforts must be made to improve access to imaging, strengthen diagnostic capabilities, establish stroke care units, and incorporate rehabilitation into the patient care pathway.

Conflict of Interest

All the Authors confirm having no conflict of interest of any kind to declare.

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