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The Influence of Stroke Subtype, Antihypertensive and Thrombolytic Therapy on Hospital Length of Stay for Stroke Patients in a Resource-Limited Setting: A Retrospective Cohort Study

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ABSTRACT

Background: Age is a well-established risk factor for stroke, yet its distribution across different stroke subtypes remains underexplored, particularly in African populations. Understanding these variations may enhance diagnostic precision and inform early management strategies.

Objective: To investigate whether age at stroke onset differs significantly according to stroke subtype in a clinical cohort of African patients.

Methods: We conducted a cross-sectional analysis of patients diagnosed with ischemic stroke, cerebral hemorrhagic stroke, cerebellar stroke, or transient ischemic attack (TIA). Age differences across groups were assessed using one-way ANOVA, followed by Tukey's HSD post-hoc tests.

Results: 72 patients with cerebral ischemic stroke (CIS) stayed less than a week; 33 stayed between 1–3 weeks; only 1 stayed more than 3 weeks. Secondly, 43 patients with cerebral hemorrhagic stroke (CHS) stayed less than a week, 22 stayed between 1–3 weeks, and 6 stayed more than 3 weeks. On the other hand, patients with cerebellar stroke (CS) are rare, and all had short stays (<1 week)

95 patients using blood pressure-lowering drugs stayed <1 week; 51 stayed 1–3 weeks; 7 stayed >3 weeks. No antihypertensive group had 32, 4, and 0 in the same durations, respectively. Most patients received antihypertensives, suggesting hypertension was a dominant comorbidity.Only 1 patient receiving thrombolytic therapy stayed more than 3 weeks, while the rest (188) did not receive it and were mostly discharged within 1 to 3 weeks. The low thrombolytic use shows limited access to advanced stroke care in this study

Conclusion: Age at stroke onset varies significantly by subtype. Cerebral haemorrhagic stroke is more likely to occur at an older age, supporting its association with vascular fragility and long-standing hypertension. In contrast, ischemic stroke spans a broader age spectrum, underscoring the need for vigilance across all adult age groups. These findings reinforce the clinical value of considering patient age in the early differentiation of stroke subtype, particularly in high-burden settings.

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Background

With an incidence and mortality that are always significant, second leading cause of death (about 7 million) and the third leading cause of death and disability (over 160 million Disability-Adjusted Life-Years lost (DALYs) in the world, as expressed by the World Stroke Organization) [1,2]. Despite the advances made in terms of research and therapeutic plan regularly updated, strokes remain a major global public health issue according to the WHO and particularly in African countries because of its frequency with the bulk of the global stroke burden (87.2% of deaths and 89.4% of DALYs), their socio-economic consequences (The estimated global cost of stroke is over US$890 billion (0.66% of the global GDP) per year, and is projected to almost double by 2050 and with a worse impact on the future of survivors [1,2]. There are various indicators on the status or quality of therapeutic care and the prognosis. The effectiveness of care and the outcome of the victims over time is measured by the duration of hospitalization. The latter can be influenced by many factors, such as the speed and quality of initial care, the severity of stroke, the presence of comorbidity [3]. In a social context of limited-income countries, these factors can be particularly difficult to identify. In this study conducted after analysis of medical data from patients treated at the Yaounde emergency center for a period of one year, we highlight Influence of Stroke Subtype, Antihypertensive and Thrombolytic therapy on Hospital Length of Stay for Stroke Patients.

Methodology

We carried out a retrospective descriptive and analytical study based on patient records over a one-year period. The research took place at the Yaounde Emergency Center, situated in Yaounde, in the Centre Region of Cameroon. This medical facility comprises four departments: an Emergency Department (with 04 beds for non-trauma patients, 03 for trauma cases, and 01 bed for critically

unstable patients), a Primary Care Unit (10 beds), an Intensive Care Unit (11 beds), and an Inpatient Ward (20 beds).

A total of 2,940 patient records, dated from January 1st to December 31st, 2024, were thoroughly reviewed to identify entries indicating possible stroke symptoms, diagnoses, or imaging results. From this pool, 318 records showed signs consistent with stroke-like conditions. These were selected for more detailed evaluation.

The 318 cases were assessed using established criteria to determine eligibility. After this screening, 189 cases met the requirements for inclusion. Acute neurological symptoms such as weakness on one side of the body, facial drooping, speech difficulties, or sensory changes. Notes indicating a clinical diagnosis of stroke, cerebrovascular accident, or related terminology. Availability of adequate information in the file for meaningful analysis. All age groups were considered. Cases of transient ischemic attacks (TIAs) that resolved completely within 24 hours were also included. Records are lacking sufficient detail. Cases where neurological symptoms could be attributed to other confirmed conditions, such as trauma, post-seizure paralysis, brain tumors, or abscesses.

Following the inclusion and exclusion process, 189 patient records were selected for the final analysis. A standardized Google Form was used to extract relevant data from the selected records. Information gathered included demographics (age and sex), known risk factors (e.g., high blood pressure, diabetes, smoking, atrial fibrillation), time of symptom onset and arrival at the facility, clinical signs and symptoms, available imaging results, documented diagnosis, treatments administered, and patient outcomes. The data were entered and managed in a Google Sheet and analyzed using R Studio version 2025.5.1.513 on Windows 10/11. Descriptive statistics such as frequencies, percentages were used to summarize the findings. A Fisher's exact test was for statistical analysis and a Cramer's V test for the strength of associations.

This research adhered to ethical standards outlined in the Declaration of Helsinki. Approval was granted by the ethics committee of the University of Yaounde I. Patient anonymity was ensured by removing all identifying information during data extraction and analysis. The study depends on existing records, which may be incomplete or inaccurate. As the facility operates in a low-resource setting, access to advanced brain imaging was restricted, possibly affecting diagnostic accuracy. Being a retrospective chart review, there is a risk of unintentional exclusion or misclassification of cases. Lack of uniform follow-up data limited insights into long-term outcomes. This study offers important observations about the relationship between stroke subtype, antihypertensive therapy, thrombolytic therapy and the hospital duration in a resource-limited environment. The results can help guide future efforts to improve stroke prognostic prediction as a whole.

Results

In this cohort of 189 stroke patients, 67.2% (n = 127) had a hospital stay of less than a week, 29.1% (n = 55) stayed hospitalized between 1 - 3 weeks and only 3.7% (n = 7) stayed more than 3 weeks. The distribution of gender was also uneven, with 36% (n = 68) of men staying at the hospital for less than a week, in contrast to 31.2% (n = 59) for women. While 18.5% (n = 35) of women stayed for 1 - 3 weeks,10.6% (n= 20) of men were hospitalized during the same period. And lastly 3.2% (n = 6) of women were hospitalized for more than 3 weeks, unlike 0.5% (n = 1) of men (Table 1).

Table 1: Distribution of Stroke Patients According to Gender and Hospital Duration

Duration of in-hospital care, n(%)	Overall	Men	Women
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)

Stroke Type and Hospital Duration

Descriptive analysis: 72 patients with cerebral ischemic stroke (CIS) stayed less than a week; 33 stayed between 1–3 weeks; only 1 stayed more than 3 weeks. Secondly, 43 patients with cerebral hemorrhagic stroke (CHS) stayed less than a week, 22 stayed between 1–3 weeks, and 6 stayed more than 3 weeks. On the other hand, patients with cerebellar stroke (CS) are rare, and all had short stays (<1 week) (Table 2).

Table 2: Distribution of Stroke Subtypes According to Hospital Duration

	Less than a week	1 - 3 weeks	More than 3 weeks
Cerebral Ischemic Stroke	72	33	1
Cerebral Hemorrhagic stroke	43	22	6
Cerebellar Stroke	4	0	0
TIA	8	8	8

There is a statistically significant and a weak to moderate association between stroke type and hospital duration (Fisher's Exact Test p = 0.046; Cramér's V = 0.19): Cerebral Ischemic stroke patients had the largest range of stays (mostly <3 weeks), Cerebral Hemorrhagic stroke patients tended to have longer hospitalizations, consistent with more severe neurological damage and complications. On the other hand, cerebellar stroke had the shortest stays, less than a week. The stroke type influences the duration of hospitalization, but other factors such as comorbidity or even treatment approach, may contribute strongly (Figure 1a and 1b).

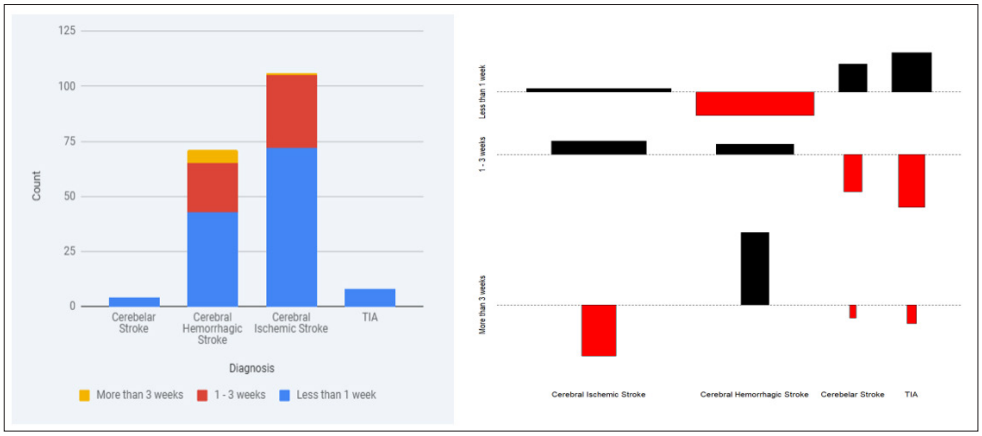

Figure 1: Stacked Barchart of Stoke Subtype According to Hospital Duration (a = left) and Association Plot Between Stroke Subtype According to Hospital Duration (b = right)

Blood Pressure-Lowering Drugs and Hospital Duration

Descriptive analysis: 95 patients using blood pressure-lowering drugs stayed <1 week; 51 stayed 1–3 weeks; 7 stayed >3 weeks. No antihypertensive group had 32, 4, and 0 in the same durations, respectively. Most patients received antihypertensive drug, suggesting hypertension was a dominant comorbidity.

Table 3: Distribution of Blood Pressure-Lowering Drugs Use According to Hospital Duration

	Less than a week	1 - 3 weeks	More than 3 weeks
Yes	95	51	7
No	32	4	0

There is a statistically significant and a weak to moderate association between blood pressure lowering drugs and hospital duration (Fisher's Exact Test p = 0.0074; Cramér's V = 0.23): Patients who received blood pressure medication were more likely to have shorter hospital stays, suggesting that hypertension management complexity influences recovery duration. Blood pressure needs to be stabilized before discharge. Hypertension is both a risk factor and a prolonging factor for stroke recovery (Figure 2a and 2b).

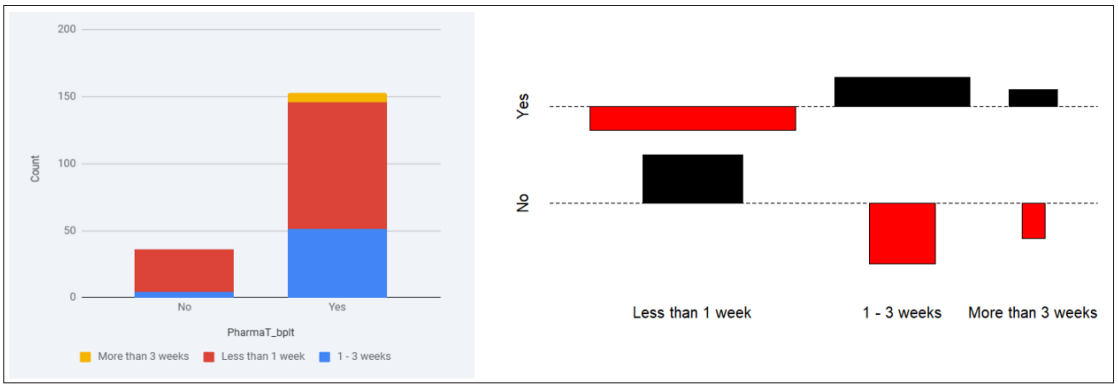

Figure 2: Stacked barchart of Blood Pressure-Lowering drugs use according to Hospital duration (a = left) and association plot between stroke subtype according to Hospital duration (b = right)

Thrombolytics and Hospital Duration

Descriptive Analysis

Only 1 patient receiving thrombolytic therapy stayed more than 3 weeks, while the rest (188) did not receive it and were mostly discharged within 1 to 3 weeks. The low thrombolytic use shows limited access to advanced stroke care in this study.

Table 4: Distribution of Thrombolytics Use According to Hospital Duration

	Less than a week	1 - 3 weeks	More than 3 weeks
Yes	0	0	1
No	127	55	6

There is a statistically significant and a weak to moderate association between thrombolytics and hospital duration (Fisher's Exact Test p = 0.037; Cramér's V = 0.37): Most patients were not given thrombolytics, and had relatively short hospital stays. Some factors like a low availability of thrombolytics in LMICs coupled with a high pricing, could explain the low use of thrombolytics (Figure 3a and 3b).

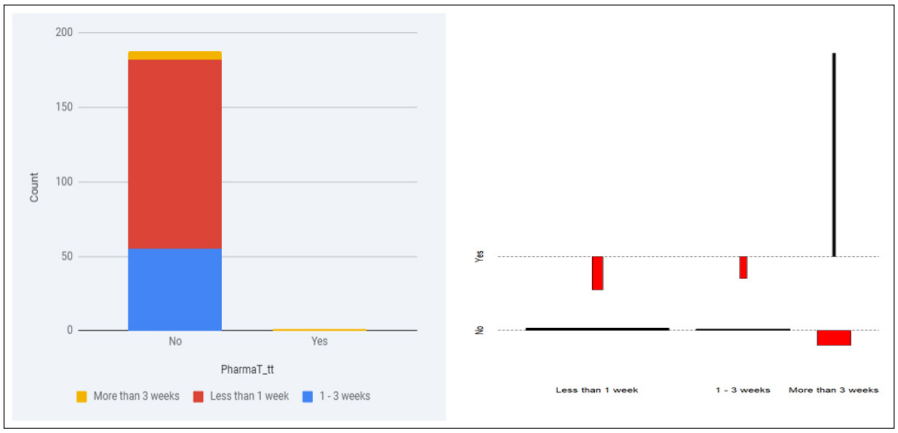

Figure 3: Stacked barchart of Thrombolytics use according to Hospital duration (a = left) and association plot between stroke subtype according to Hospital duration (b = right)

Discussion

This study aimed to determine the factors that influence the length of hospitalization for patients who have suffered a stroke. Numerous factors can explain the variability in the length of hospitalization. In some developed countries, the factors that prolong the length of hospitalization are mainly related to the severity of the stroke (type of stroke, comorbidities, and admission to intensive care), whereas those that shorten it include a high density of neurologists and the availability of follow-up and rehabilitation care [4].

In our study, the average length of hospitalization was less than 7 days in 67.2% of cases (n=127). We found that more men (36%) were hospitalized for less than a week, while more women were hospitalized for between 1 and 3 weeks (18.5%) and more than 3 weeks (3.2%). Thus, the length of hospital stay is shorter for men than for women. This result is similar to the length of 12.2 days found in women compared to 11.5 days found in men in a study in France [4].

Statistical analysis using Pearson's Chi-squared and Fisher's Exact tests highlighted three main factors influencing the length of hospitalization: subtypes of stroke, use of antihypertensive medication, and the use of thrombolytic treatment.

Type of Stroke and Length of Hospital Stay

In our practice, there was a statistically significant and a weak to moderate association between stroke type and length of stay in the hospital. Patients suffering from hemorrhagic stroke exceeded 3 weeks of hospitalization. This long hospital stay in cases of hemorrhagic stroke has also been observed in several other studies [5-7]. It was due, on one hand, to the duration of immobilization of those patients, and on the other hand to the more difficult recovery of consciousness. Our results differ from a study on stroke as a complication of coronavirus disease in 2019 which found a longer hospital stay in the ischemic stroke population [8]. The longer hospitalization in the hemorrhagic stroke group can be explained by the presence of more clinical severity signs, more complications during hospitalization, and a high mortality rate, which ranges from 14.9% to 77% in Africa and all of which are due to late presentation at hospital [9].

Use of Antihypertensive Medication and Length of Hospitalization

Hypertension was the most common risk factor, found in 60.3% (n=114) of cases. 80.9% (n=153) of patients were taking antihypertensive drugs. In our study, there was a statistically significant and a weak to moderate association between blood pressure lowering drugs and hospital duration. Patients who received antihypertensive treatment spent less time in hospital. Our results are consistent with those of the large multiethnic intracerebral haemorrhage cohort in Singapore who found that Initial antihypertensive class was associated with hospital length of stay (p=0.028) [10]. This implies that antihypertensive treatment has a beneficial effect in case of hemorrhagic stroke. However, the results of different studies suggest somewhat contradictory consequences of antihypertensive treatment in acute ischemic stroke, ranging from harmful effects to no effect [11].

Use of Thrombolytic and Length of Hospitalization

Only one patient received thrombolytic treatment and was hospitalized for more than 3 weeks, while the other 188 did not receive it and most were discharged in less than 1 week. Intravenous thrombolysis is one of the standard treatments for acute ischemic stroke. Several explanations of low use of thrombolytics in the literature mention a delayed hospital admission for patients suffering from stroke in various healthcare facilities [12,13]. This could also be explained by the low use of ambulance services. Indeed, patient transport is mostly done by personal vehicles or public transport [14,15]. Some authors highlight the low public awareness of stroke signs and symptoms, coupled with the lack of medical transport, leading to delays in seeking care [16]. Others agree that the lack of (mobile) Stroke units, healthcare staff, the high cost of access to brain imaging and intravenous thrombolysis and low availability of thrombolytics constitute a real barrier to the use of thrombolytics in low- and middle-income countries [16,17].

Study Limitations

Sample size for thrombolysis: The small size of patient (only one) who could have benefited from thrombolytic treatment in our entire population would constitute a bias in the analysis of the association between thrombolytic use and length of hospital stay. Therefore, a larger sample would be recommended, even though we are in a low- and middle-income country.

Conclusion

Our study highlighted three factors influencing the length of hospital stay in stroke patients: the type of stroke, the use of antihypertensive drugs, and the administration of thrombolytics. These results reflect the complexity of stroke management in low-income country contexts, where specialized medical resources remain limited. They highlight the need to strengthen prevention

strategies, improve medical transport systems, and facilitate access to specialized examinations and treatments in order to optimize stroke care pathways. As further steps, we recommend improving stroke management strategies and making stroke care units; rehabilitation units and the competent personnel available.

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