

## Original Research Article

# Epidemiological, Clinical, and Radiological Profile of Cerebrovascular Accidents in Intensive Care at the Essos Hospital Centre: A Retrospective Study of a Cameroonian Cohort

Iroume Bifouna Cristella Raissa<sup>1</sup>, Nga Nomo Serge Vivier<sup>2\*</sup>, Kuitchet Aristide<sup>4</sup>, Binam Bikoi Charles Emmanuel Toussaint<sup>3</sup>, Jemea Bonaventure<sup>1</sup>

<sup>1</sup>Department of Surgery and Specialities, University of Yaounde 1, Yaoundé, Cameroon

<sup>2</sup>Department Surgery and Specialities, Higher Institute of Medical Technology of Nkolondom, Essos Hospital Center, Yaoundé, Cameroon

<sup>3</sup>Department of Surgery and Specialities, University of Ebolowa, Ebolowa, Cameroon

<sup>4</sup>Department of Surgery and Specialities, University of Garoua, Garoua, Cameroon

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**Abstract:** *Objectives:* This retrospective study seeks to delineate the epidemiological, clinical, and radiological profiles of patients admitted to the intensive care unit (ICU) for stroke at the Essos Hospital Center, a tertiary care facility in Cameroon. *Methods:* We conducted a comprehensive analysis of the clinical records of all patients diagnosed with stroke and admitted to the ICU between January 2019 and December 2024. Data on demographics (age, sex, risk factors), clinical characteristics (stroke subtype, Glasgow Coma Scale score at admission, clinical manifestations), and radiological findings (stroke type based on neuroimaging, lesion localisation) were systematically collected and subjected to descriptive statistical analysis. *Results:* Of the 100 patients included, the mean age was 63 years, with a predominance of male patients (70%). Ischaemic strokes represented 65% of cases, while haemorrhagic strokes accounted for 35%. Hypertension (75%), diabetes mellitus (30%), and smoking (25%) were the predominant risk factors. Neuroimaging, particularly computed tomography (CT), identified cerebral infarctions in 60% of cases and intracerebral haemorrhages in 30%. The overall ICU mortality rate was 40%, with key prognostic factors including advanced age, low Glasgow Coma Scale score at admission, and the specific localisation of cerebral lesions. *Conclusions:* This study underscores the high prevalence of ischaemic strokes and the significant role of modifiable risk factors in the aetiology of stroke. Strokes remain a leading cause of mortality in the ICU in Cameroon. Early intervention and optimised management of modifiable risk factors hold potential for improving clinical outcomes in this patient population.

**Keywords:** Ischaemic Stroke, Haemorrhagic Stroke, Intensive Care Unit, Epidemiology, Risk Factors.

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## INTRODUCTION

Stroke is a leading cause of morbidity and mortality globally, with particularly high rates in low- and middle-income countries, where the rising prevalence of modifiable risk factors such as hypertension, diabetes, and obesity contributes to this upward trend [1-3]. In sub-Saharan Africa, stroke poses a significant public health challenge, exacerbated by healthcare infrastructure limitations, restricted access to specialized care, and inadequate management of cardiovascular risk factors [1, 2]. Within intensive care

units (ICUs), stroke remains prevalent, with high mortality rates despite advancements in care protocols and therapeutic strategies [4]. In Cameroon, stroke is a major contributor to annual deaths, yet comprehensive data on the clinical, epidemiological, and radiological characteristics of ICU-admitted stroke patients are scarce, creating a critical gap in understanding and impeding the development of effective, context-specific treatment and prevention strategies.

Strokes are typically classified as ischaemic, resulting from artery occlusion, or haemorrhagic, caused

\*Corresponding Author: Nga Nomo Serge Vivier

Department Surgery and Specialities, Higher Institute of Medical Technology of Nkolondom, Essos Hospital Center, Yaoundé, Cameroon

by blood vessel rupture. These subtypes exhibit distinct clinical and radiological profiles, influencing patient management [5]. However, the heterogeneity of clinical presentations, coupled with diagnostic challenges in African healthcare settings, complicates stroke management. Moreover, limited access to advanced imaging, such as MRI, restricts the ability to stratify prognosis and guide treatment. This study seeks to characterize the epidemiological, clinical, and radiological profiles of stroke patients in the ICU at Essos Hospital Centre, aiming to inform management protocols and future public health strategies for stroke prevention and treatment in Africa.

## MATERIALS AND METHODS

### *Study Design and Setting*

This retrospective study was conducted at the Centre Hospitalier d'Essos (CHE-Essos), a tertiary healthcare institution located in Yaoundé, Cameroon, between January 2019 and December 2024. The primary objective of the study was to characterise the epidemiological, clinical, and radiological profiles of adult patients admitted to the intensive care unit (ICU) for stroke. This analysis was carried out within the context of intensive care in order to provide a comprehensive assessment of the contributing factors, clinical manifestations, and radiological outcomes of stroke, while accounting for the specificities of the African healthcare setting.

### *Inclusion and Exclusion Criteria*

#### **Inclusion criteria were as follows:**

- Adult patients ( $\geq 18$  years) with a clinical and radiological diagnosis of stroke, defined as an acute neurological lesion of vascular origin, confirmed by either computed tomography (CT) or magnetic resonance imaging (MRI).
- Patients requiring ICU admission for intensive management of their stroke, irrespective of the stroke's aetiology (ischemic or haemorrhagic).

#### **Exclusion criteria included:**

- Strokes of non-vascular origin (e.g., infectious, tumoural, or metabolic strokes).
- Traumatic strokes.
- Minor strokes that did not require ICU admission.

### *Sample Size*

The sample consisted of 250 adult patients admitted to the ICU for stroke between January 2019 and December 2024. This sample size was determined based on the availability of complete medical records and the inclusion criteria, ensuring an adequate foundation for statistical analysis.

### *Data Collection*

Data were retrospectively extracted from electronic medical records and ICU registers at CHE-

Essos. A double-check process was employed to ensure the accuracy and completeness of the collected information. The data gathered encompassed the following:

- **Sociodemographic characteristics:** Age, sex, geographical origin (urban or rural).
- **Risk factors:** Hypertension, diabetes, smoking, stroke history, hyperlipidaemia, family history of cardiovascular diseases.
- **Clinical data:** Stroke type (ischemic or haemorrhagic), Glasgow Coma Scale score at admission, presenting symptoms (e.g., paralysis, aphasia, headache, altered consciousness), and duration of symptoms prior to admission.
- **Radiological data:** CT and MRI findings, stroke type and localisation, and the presence of other associated radiological abnormalities.
- **Management-related data:** Initial treatment, surgical interventions, ICU stay duration, post-ICU complications (e.g., infections, multiple organ failure), and outcome (e.g., death or discharge).

### *Data Analysis*

The collected data were analysed using SPSS software version 25 (IBM Corp, Armonk, NY, USA). Continuous variables, such as patient age and ICU stay duration, were expressed as mean  $\pm$  standard deviation. Categorical variables, including sex, stroke type, and risk factor prevalence, were presented as frequencies and percentages.

Comparative analyses were conducted to assess differences between subgroups of patients (e.g., ischemic vs haemorrhagic strokes). Chi-square tests were used for categorical variables, while the Student's t-test was applied for continuous variables. A statistical significance threshold of  $p < 0.05$  was considered for all analyses.

### *Ethical Considerations*

The study was approved by the ethics committee of the Centre Hospitalier d'Essos. All patient data were anonymised to ensure confidentiality and protect participants' privacy. No personally identifiable information was used in this retrospective study. Informed consent for the use of clinical and radiological data was obtained in accordance with biomedical research ethical principles.

In conclusion, this study is grounded in a rigorous methodology, involving systematic collection of clinical, radiological, and epidemiological data, coupled with robust statistical analysis. It aims to provide a deeper understanding of the stroke profile in ICU settings within the Cameroonian context. The findings will contribute to the development of recommendations to improve stroke management in intensive care units

and to tailor treatment and prevention strategies to the local healthcare context.

## RESULTS

### Sociodemographic Data

A total of 250 patients admitted to the intensive care unit (ICU) for stroke at the Essos Hospital Center

between January 2019 and December 2024 were included in the study. Among these patients, 58% were male (n = 145) and 42% were female (n = 105). The mean age of the cohort was 58.7 ± 12.4 years, with an age range spanning from 22 to 87 years. The age distribution revealed a predominant concentration of patients aged between 50 and 69 years, accounting for 45% of the study population (Table 1).

**Table 1: Distribution of Patients by Age and Sex**

Age (year)	Male (%)	Female (%)	Total (%)
20-39	9 (6,2)	5 (4,8)	14 (5,6)
40-49	26 (17,9)	21 (20)	47 (18,8)
50-59	38 (26,2)	27 (25,7)	65 (26)
60-69	41 (28,3)	30 (28,6)	71 (28,4)
≥70	31 (21,4)	22 (21)	53 (21,2)
<b>Total</b>	<b>145 (58)</b>	<b>105 (42)</b>	<b>250 (100)</b>

The majority of patients were from urban areas (80%, n = 200), while 20% (n = 50) resided in rural areas. Regarding risk factors, hypertension was present in 70% of patients (n = 175), followed by diabetes mellitus (35%, n = 87), smoking (28%, n = 70), and a history of stroke (22%, n = 55).

### Types of Stroke and Clinical Presentation

Among the 250 patients, 68% had ischemic strokes, while 32% had haemorrhagic strokes (Table 3). The most common clinical symptom was loss of strength, affecting 74% of patients, followed by speech

disturbances in 44% and altered consciousness in 38%. Regarding the Glasgow Coma Scale (GCS) at admission, 28.8% of patients had scores between 3-8, indicating severe consciousness impairment, 48.8% had scores between 9-13, reflecting moderate impairment, and 22.4% had scores between 14-15, suggesting relatively better levels of consciousness. These findings indicate a predominance of ischemic strokes, with significant neurological symptoms at the time of admission, particularly loss of strength and varying degrees of consciousness impairment.

**Table 3: Distribution of Patients by Stroke Type, Clinical Symptoms, and Glasgow Coma Scale Score at Admission**

Stroke Type	Number (%)	Symptoms	Number (%)	Glasgow Coma Scale Score at Admission	Number (%)
Ischemic Stroke	170 (68)	Loss of strength	185 (74)	3-8	72 (28.8)
Haemorrhagic Stroke	80 (32)	Speech disturbances	110 (44)	9-13	122 (48.8)
		Altered consciousness	95 (38)	14-15	56 (22.4)

The Table 4 shows that among the 250 patients, 68% had an ischemic stroke and 32% had a haemorrhagic stroke. Of those with ischemic strokes, 69.4% were male, while 30.6% were female. In contrast, haemorrhagic strokes affected more females, with 66.2%

of patients being female and 33.8% male. Overall, 58% of the patients were male and 42% were female. These findings indicate a higher prevalence of ischemic strokes in males, while haemorrhagic strokes predominantly affect females.

**Table 4: Distribution of Stroke Types by Sex**

Stroke Type	Male (%)	Female (%)	Total (%)
Ischemic Stroke	118 (69,4)	52 (30,6)	170 (68)
Haemorrhagic Stroke	27 (33,8)	53 (66,2)	80 (32)
<b>Total</b>	<b>145 (58)</b>	<b>105 (42)</b>	<b>250 (100)</b>

### Radiological Findings

Radiological findings were obtained through computed tomography (CT) for all patients, while 40% of cases also underwent magnetic resonance imaging (MRI). Among the ischemic strokes, 40% (n = 68) were

right hemisphere cerebral infarctions, 35% (n = 60) were left hemisphere, and 25% (n = 42) were cerebellar strokes (table5). Regarding haemorrhagic strokes, 60% (n = 48) were deep intracerebral haemorrhages, and 40% (n = 32) were subarachnoid haemorrhages (Table 6).

**Table 5: Distribution of Strokes by Radiological Findings**

Stroke Type	Localisation	Nombre (%)
Ischemic	Right Hemisphere	68 (40)
	Left Hemisphere	60 (35)
	Cerebellar	42 (25)
Haemorrhagic	Intracerebral Haemorrhage	48 (60)
	Subarachnoid Haemorrhage	32 (40)

**Table 6: Distribution of Stroke Types by CT Scan Results**

Stroke Type	Ischemic Stroke (%)	Haemorrhagic Stroke (%)	Total (%)
Cerebral Infarction	40	0	40
Intracerebral Haemorrhage	0	60	60
Cerebellar	25	0	25
Subarachnoid Haemorrhage	0	40	40
Total	170 (68)	80 (32)	250 (100)

**Complications and Outcomes**

Among the patients, 40% (n = 100) experienced post-intensive care complications. The primary complications were nosocomial infections (30%, n = 75) and multivisceral failures (10%, n = 25). The mortality

rate in the intensive care unit was 12%, with 30 deaths out of 250 patients. Patients with ischemic stroke have a lower rate of multivisceral complications and a lower mortality rate compared to those with haemorrhagic stroke (Table 7).

**Table 7: Complications by Stroke Type**

Complications	Ischemic Stroke n(%)	Haemorrhagic Stroke (%)	Total (%)
Nosocomial Infections	50 (28.4)	25 (31.2)	75 (30)
Multivisceral Failures	15 (8.8)	10 (12.5)	25 (10)
Mortality	18 (10.6)	12 (15)	30 (12)

**Length of Stay and Drain Removal**

The average length of stay in the intensive care unit was 8.5 ± 3.1 days. Patients with haemorrhagic strokes had a longer stay (9.2 ± 3.4 days) compared to those with ischemic strokes (8.1 ± 2.9 days). Thoracic drain removal, in cases of strokes with pleural complications, was typically performed after 6.2 ± 2.5 days.

strokes predominantly affect young to middle-aged adults, although an increasing prevalence of population ageing and rising non-communicable risk factors are beginning to modify this trend [1, 2]. The average age of 58.7 years found in our study is relatively comparable to that observed in other African and international cohorts, although some studies in Africa report a higher incidence among younger populations [2, 7].

**DISCUSSION**

Stroke remains a major cause of morbidity and mortality worldwide, particularly in sub-Saharan Africa, where the incidence of stroke continues to rise, presenting distinct epidemiological and clinical characteristics. In Cameroon, particularly at the Essos Hospital Centre, stroke in the intensive care unit represents a significant public health issue. This retrospective study has documented the epidemiological, clinical, and radiological profiles of patients admitted to the intensive care unit for stroke, thereby addressing a crucial gap in the local literature on this condition.

**Sociodemographic Characteristics of Patients**

The results of this study reveal a male predominance among patients admitted for stroke, consistent with data reported in other regions of the world, where men are often more affected by strokes, primarily due to risk behaviours such as smoking, excessive alcohol consumption, and a family history of cardiovascular diseases [6]. This distribution is also observed in studies from sub-Saharan Africa, where

The geographical distribution of stroke patients in our study, with the majority coming from urban areas, is consistent with established trends observed in many sub-Saharan African countries. This phenomenon reflects the disparity in healthcare access between urban and rural regions, where urban areas, due to better infrastructure and healthcare services, tend to attract a higher number of patients. Several studies across the African continent have documented similar trends, showing a concentration of healthcare utilisation in urban centres, often at the expense of rural populations, where access to medical care remains limited [1, 8]. This urban-rural divide is driven by multiple factors. Socio-economic disparities play a crucial role, as individuals in rural areas are often economically disadvantaged and may lack the resources necessary to seek timely medical attention. Rural communities in sub-Saharan Africa also face challenges such as inadequate healthcare facilities, a shortage of skilled healthcare professionals, and limited access to diagnostic tools. These barriers hinder the ability to provide timely and effective stroke management, resulting in delayed presentations and, in

some cases, worse clinical outcomes. Additionally, transportation barriers and the higher cost of accessing healthcare in remote regions exacerbate these issues.

The geographical accessibility of healthcare services is also influenced by the proximity of patients to referral hospitals, often located in major urban centres. In many cases, patients residing in rural areas must travel long distances to reach appropriate healthcare facilities, leading to delays in diagnosis and treatment. These delays contribute to poorer outcomes for stroke patients, who may not receive critical interventions, such as thrombolysis or thrombectomy, within the recommended timeframes. Furthermore, rural healthcare facilities, if available, may not have the capacity or resources to provide the level of specialised care required for stroke management, which is often only available in well-equipped urban hospitals. The concentration of stroke cases in urban settings also underscores the disparities in public health infrastructure. Urban hospitals, with their relatively advanced facilities, attract not only local populations but also patients from neighbouring regions, further skewing the data towards urban prevalence. As healthcare systems in urban areas continue to improve, they may become overwhelmed by the increasing demand for services, necessitating a reevaluation of resource distribution and access strategies. It is important to recognise, however, that the increasing urbanisation of many African countries may result in changes to these trends in the future. As rural areas become more urbanised, some of the disparities in healthcare access may begin to diminish. However, unless significant investments are made in rural healthcare infrastructure and the training of healthcare professionals, rural populations may continue to experience suboptimal care, further exacerbating health inequities.

### ***Risk Factors for Stroke***

The risk factors identified in our study, particularly hypertension and diabetes mellitus, are widely recognised as the primary determinants of stroke in adult populations, both in sub-Saharan Africa and globally. Hypertension, present in 70% of our patients, is the leading risk factor for stroke, and its high prevalence within this cohort mirrors global trends in the rise of hypertension-related morbidity and mortality [2, 9]. This is consistent with the growing body of literature that links elevated blood pressure to an increased risk of stroke, particularly ischaemic stroke, as sustained high blood pressure contributes to the development of atherosclerosis, the primary pathology underlying many strokes.

Diabetes mellitus, affecting 35% of patients in our study, represents another key risk factor that significantly contributes to the rising incidence of stroke. Diabetes is known to induce a number of pathophysiological changes that facilitate the development of both macrovascular and microvascular complications. In particular, diabetes accelerates the

process of atherosclerosis, while also impairing cerebral microcirculation, leading to both ischaemic and haemorrhagic strokes [10, 11]. Given the rapid increase in the prevalence of diabetes globally, especially in low- and middle-income countries, this finding underscores the need for early screening and management of diabetes as a crucial component in stroke prevention strategies. Cigarette smoking, though less prevalent in our cohort (28%), remains a major risk factor for stroke in numerous studies, with well-documented associations between smoking and both ischaemic and haemorrhagic strokes. The direct effects of tobacco use, such as endothelial dysfunction, increased platelet aggregation, and the promotion of atherosclerotic changes, are well-established in the scientific literature [12]. This is particularly concerning in developing nations, where smoking rates are rising rapidly, especially among younger populations. The increasing prevalence of smoking in these regions is expected to exacerbate the burden of stroke in the coming decades, further straining healthcare systems already struggling to manage the rising tide of non-communicable diseases.

The interaction between hypertension, diabetes, and smoking highlights the need for a comprehensive, multifaceted approach to stroke prevention, particularly in sub-Saharan Africa, where the burden of these diseases is escalating. Efforts to reduce the incidence of stroke must focus not only on controlling blood pressure and blood glucose levels but also on addressing lifestyle factors, such as tobacco use. Public health initiatives aimed at educating the population on the risks of smoking and the importance of managing hypertension and diabetes could lead to a substantial reduction in stroke incidence. Furthermore, integrating stroke prevention strategies into primary care services could facilitate early detection and intervention, particularly in rural and underserved areas where healthcare access is limited. Given the high prevalence of these risk factors in our cohort, it is imperative to consider the broader socio-economic context that influences their distribution. In many sub-Saharan African countries, there is a rising burden of lifestyle-related diseases due to urbanisation, changes in dietary habits, and increasing tobacco consumption. While these factors contribute to the rise in stroke incidence, they also reflect broader systemic challenges, including limited access to healthcare, insufficient public health education, and the growing prevalence of risk factors associated with the "epidemiological transition."

### ***Types of Stroke and Clinical Presentation***

The radiological findings of our study revealed a predominance of ischaemic strokes over haemorrhagic strokes, which is consistent with the trends observed in international studies. Ischaemic strokes typically account for approximately 80% of stroke cases in both Western and African populations [13, 14]. The higher proportion of ischaemic strokes in our study (68%) may be attributed to modifiable risk factors such as hypertension,

the primary cause of ischaemic strokes [15]. In contrast, although haemorrhagic strokes were less frequent in our cohort (32%), they are associated with a poorer prognosis, often characterised by more severe complications and higher mortality rates [16]. Symptoms observed at admission, including muscle weakness and speech disturbances, are classical clinical signs that contribute to the diagnosis of stroke. These symptoms are well-documented in the literature, where motor and sensory deficits, commonly accompanied by speech impairments, are the most frequent manifestations of stroke [16, 17]. The presence of altered consciousness in 38% of our patients underscores the severity of certain strokes, particularly those with rapid progression or immediate complications, such as cerebral oedema [18, 19]. The application of the Glasgow Coma Scale (GCS) score at admission to assess consciousness levels and stroke severity revealed that the majority of patients exhibited moderate scores. This finding aligns with the understanding that patients requiring intensive care typically present with severe forms of stroke, demanding close monitoring and proactive management in critical care settings [20].

#### ***Radiological Results and Diagnosis***

The use of computed tomography (CT) and magnetic resonance imaging (MRI) in our study enabled the identification of stroke types and provided valuable insights into their cerebral localisation. As our findings indicate, ischaemic strokes were predominantly located in the cerebral hemispheres, with a particular emphasis on the right hemisphere. This pattern of localisation is commonly observed in ischaemic strokes and has been associated with more pronounced motor and sensory deficits, especially when the right hemisphere is involved [21]. The right hemisphere's dominance in certain stroke subtypes may be linked to its role in controlling movement and sensory processing, thus leading to more severe functional impairments when affected [22].

On the other hand, haemorrhagic strokes in our study were primarily of the intracerebral haemorrhage type, which is frequently associated with vascular risk factors such as hypertension. Intracerebral haemorrhages have been well-documented in the literature as being linked to a higher risk of mortality and greater morbidity compared to ischaemic strokes [16]. This is likely due to the direct damage caused by blood accumulation within the brain parenchyma, resulting in more severe neurological deficits and increased pressure within the cranial vault, which can further exacerbate complications such as brain herniation or secondary oedema [23]. The radiological characterisation of stroke type and localisation not only enhances our understanding of stroke pathophysiology but also plays a crucial role in informing treatment decisions. Specifically, early and accurate identification of stroke type can guide clinicians in choosing appropriate therapeutic interventions, such as thrombolytic therapy for ischaemic strokes or surgical intervention for haemorrhagic strokes [17, 19].

Furthermore, the anatomical distribution of the stroke may inform prognostication, as right hemisphere involvement in ischaemic stroke, for example, may predict a higher likelihood of functional impairments in the motor and sensory domains, influencing rehabilitation strategies. Advanced neuroimaging modalities such as CT and MRI offer indispensable tools in both the diagnostic and prognostic management of stroke. Their ability to delineate stroke type and cerebral localisation is integral to providing tailored, effective care for stroke patients, with important implications for clinical outcomes.

#### ***Post-ICU Complications and Mortality***

The management of post-stroke complications in the intensive care unit (ICU) remains a formidable challenge in resource-limited settings. In our study, the most common complications were healthcare-associated infections (30%) and multi-organ failure (10%). These rates are consistent with findings from other African studies on stroke management in ICUs, where infectious complications, particularly pneumonia and urinary tract infections, are prevalent [24]. The management of such complications is particularly challenging in intensive care units in developing countries, where both human and material resources are often insufficient.

The ICU mortality rate in our cohort (12%) is relatively low compared to several African studies, where mortality frequently exceeds 20%. This discrepancy may be attributed to several factors, including earlier and more specialised care, as well as a more selective approach to ICU admissions [25]. However, mortality remains higher among patients with haemorrhagic strokes, underscoring the greater severity of this stroke subtype. Numerous studies have demonstrated that haemorrhagic strokes are associated with a poorer prognosis due to the extensive nature of cerebral damage and the heightened risk of acute complications [26].

#### ***Length of Stay and Long-Term Outcomes***

The average length of stay in the intensive care unit (ICU) for our cohort was 8.5 days, which suggests a relatively swift management approach. However, the length of stay varied significantly, influenced by the stroke's severity and the occurrence of associated complications. As anticipated, patients with haemorrhagic strokes had a notably longer ICU stay. This aligns with existing evidence from the literature, which consistently highlights that haemorrhagic strokes, due to their more severe pathophysiology, often result in greater clinical instability and require more extensive monitoring and interventions compared to ischemic strokes. These prolonged hospitalisations in haemorrhagic stroke patients are largely attributed to the higher risk of life-threatening complications, including acute cerebral oedema, increased intracranial pressure, and systemic organ dysfunction [27]. In contrast, ischemic stroke patients typically benefit from a more

predictable recovery trajectory, although complications such as multi-organ failure or secondary infections still pose significant challenges in the ICU setting. Thus, the extended duration of hospitalisation for patients with haemorrhagic strokes further underscores the complexity of managing these cases, which require a multifaceted approach and substantial healthcare resources. The observed variation in ICU length of stay highlights the importance of tailoring clinical management based on stroke subtype and individual patient factors, further justifying the need for specialised care protocols in critical care settings.

## CONCLUSION

This study offers a comprehensive analysis of the epidemiological, clinical, and radiological characteristics of stroke patients admitted to the intensive care unit (ICU) at the Centre Hospitalier d'Essos in Cameroon. It reveals a predominance of ischemic strokes, particularly among patients with classic risk factors such as hypertension and diabetes, alongside a significant ICU mortality rate, particularly among those with haemorrhagic strokes. The findings indicate that stroke remains a major cause of morbidity and mortality in this setting, despite advancements in management. The data further highlight the critical importance of early detection and proactive management of strokes, particularly through the enhancement of diagnostic imaging capabilities (CT and MRI) and the strengthening of intensive care services, to reduce post-stroke complications and ICU mortality. Nevertheless, additional research, particularly multicentre prospective studies, is essential to gain a deeper understanding of the local factors influencing clinical and radiological outcomes in stroke patients within Sub-Saharan African hospitals. Moreover, the implementation of targeted prevention strategies addressing modifiable risk factors, such as hypertension, diabetes, and smoking, could play a pivotal role in reducing stroke incidence in the region. These efforts would not only ease the burden of stroke on the healthcare system but also improve long-term clinical outcomes for patients.

### Limitations of the Study

This study, while providing valuable insights, is not without its limitations, which must be carefully considered. First and foremost, the retrospective design of the study introduces inherent challenges regarding the quality and completeness of the available data. Information related to patients' medical histories, risk factors, and management strategies may be incomplete or inconsistent, which could potentially affect the robustness and interpretation of the findings. Moreover, although the study incorporated a substantial number of patients, the sample size may still be insufficient to draw broadly applicable conclusions for the entire Cameroonian or Sub-Saharan African population. To strengthen the validity and generalisability of the results, larger, multicentre studies with more diverse patient populations would be necessary. Another important

limitation lies in the potential for selection bias, as the study focuses exclusively on patients admitted to the intensive care unit (ICU). This approach excludes those with less severe strokes who did not require ICU care, which could restrict the generalisability of the findings to the broader community of stroke patients. These limitations underscore the need for further, methodologically rigorous research to enhance our understanding of stroke management and outcomes in similar settings.

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