JOURNAL OF SCIENCE & DISEASES

# Epidemiology of Acute Stroke in Patients Admitted to the Intensive Care Unit

## Épidémiologie des Accidents vasculaires cérébraux aigus chez les patients admis en unité de soins intensifs

Njall Pouth C[1], Ndom Ntock F[1], Bilogui Adjessa W[1], Ebana Mvogo S[1], Njock LR[1] , Ze Minkande J[2]

## Article original

[1] Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Cameroon
[2] Faculty of Biomedical Sciences, University of Yaoundé 1, Cameroon

**Corresponding Author:**
Clotilde Njall Pouth , Anesthesiologist-Intensivist, Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Cameroon,
Email:clotildenjall1@gmail.com ,
Tel: +237 671934381

**Keywords:** Stroke, Intensive Care, Epidemiology, Mortality.

**Mots-clés :** AVC, Soins intensifs, Épidémiologie, Mortalité.

**Date de soumission :** 17/01/2025
**Date d' acceptation :** 01/03/2025

### ABSTRACT

**Background**: Stroke, caused by either cerebral infarction or hemorrhage, represents a major public health concern and the third leading cause of mortality worldwide. This study aimed to assess the epidemiological aspects of stroke patients admitted to the intensive care unit.
**Methodology**: A cross-sectional study was conducted over a 5-month period in the intensive care unit of Laquintinie Hospital in Douala, recruiting 280 patients. Clinical diagnosis, admission delays, reasons for admission, and patient outcomes were assessed for each patient upon admission. Statistical analysis were performed using R software.
**Results**: The mean age of patients was 60.11 ± 13.38 years, with a male-to-female ratio of 1.31. The average admission delay was 40 ± 8.2 hours after the stroke. The main reasons for admission were neurological distress (79.7%), hemodynamic distress (16.2%), and respiratory distress (10.8%). The prevalence of stroke was 26.42%, predominantly hemorrhagic strokes (63.51%). The mortality rate was 62.1%.
**Conclusion**: The prolonged admission delays and high mortality rates underscore the urgent need to improve stroke prevention, early diagnosis, and intensive care management in Cameroon.

### RESUME

**Introduction** : L'accident vasculaire cérébral (AVC), causé par un infarctus cérébral ou une hémorragie, représente un problème majeur de santé publique et la troisième cause de mortalité dans le monde. Cette étude visait à évaluer les aspects épidémiologiques des patients victimes d'AVC admis en unité de soins intensifs.
**Méthodologie** : Une étude transversale a été menée sur une période de 5 mois dans l'unité de soins intensifs de l'Hôpital Laquintinie de Douala, recrutant 280 patients. Le diagnostic clinique, les délais d'admission, les motifs d'admission et les issues des patients ont été évalués lors de leur admission. Les analyses statistiques ont été effectuées à l'aide du logiciel R.
**Résultats** : L'âge moyen des patients était de 60,11 ± 13,38 ans, avec un ratio hommes/femmes de 1,31. Le délai moyen d'admission était de 40 ± 8,2 heures après l'AVC. Les principaux motifs d'admission étaient la détresse neurologique (79,7 %), la détresse hémodynamique (16,2 %) et la détresse respiratoire (10,8 %). La prévalence des AVC était de 26,42 %, avec une prédominance des AVC hémorragiques (63,51 %). Le taux de mortalité était de 62,1 %.
**Conclusion** : Les délais prolongés d'admission et les taux de mortalité élevés soulignent l'urgence d'améliorer la prévention des AVC, le diagnostic précoce et la prise en charge en soins intensifs au Cameroun.





Citation as **J Sci Dis 2025, Vol 3 (2): 26-30**

## Introduction

Strokes are defined as a sudden neurological deficit of vascular origin caused by either an infarction or a hemorrhage in the brain. According to the World Health Organization (WHO), strokes are characterized by the rapid development of localized or global clinical signs of cerebral dysfunction lasting more than 24 hours, which may lead to death, with no other apparent cause than a vascular origin [1]. The underlying mechanisms include the interruption of blood supply to the brain (ischemic stroke) or intracerebral hemorrhage due to the rupture of a blood vessel (hemorrhagic stroke), leading to irreversible neuronal damage [2]. Epidemiologically, cardiovascular diseases, including strokes, account for approximately 17.3 million deaths annually worldwide, representing 30% of global mortality, according to the WHO in 2008 [3]. In Europe, cardiovascular diseases are responsible for 42.5% of deaths, with 10,000 deaths occurring daily, making them the leading cause of mortality and disability [4]. The annual incidence of strokes ranges between 100 and 200 cases per 100,000 inhabitants, with a significant increase with age [5]. In Canada, more than 50,000 cases of stroke are reported each year [6].

In Africa, strokes are a very frequent pathology. In Nigeria, a hospital-based study reported a prevalence of 15 per 100,000 inhabitants [7], while in Senegal, strokes constitute 37% of neurological hospitalizations, with an incidence estimated between 1% and 2% of the general population [8]. In The Gambia, the mortality rate for strokes ranges from 27% to 44%, while in Abidjan (Côte d'Ivoire), strokes account for 45% of overall mortality in neurology departments [9]. Overall, mortality rates in African studies remain high, ranging between 47% and 79% [10]. This situation is explained by the rise of non-communicable diseases such as hypertension, diabetes, and dyslipidemia, combined with lifestyle changes, including increased alcohol and tobacco consumption and physical inactivity [11].

In Cameroon, strokes account for approximately 10% of intensive care unit (ICU) hospitalizations, of which 81.25% are hemorrhagic strokes [12]. A study conducted in Douala reported a mortality rate of 53.75% in intensive care services [13]. This high mortality is often attributed to unidentified severity factors, late and inadequate management, and a lack of appropriate infrastructure [14].

ICUs play a crucial role in managing acute strokes. However, epidemiological data remain insufficient, particularly in Sub-Saharan Africa, where studies on severity factors and prognostic elements are limited. This study therefore aims to fill these gaps by identifying the severity factors of patients admitted to the ICU for acute strokes to improve prognosis and reduce mortality in Cameroonian hospitals.

## Patients and Methods

This cross-sectional study was conducted in the intensive care unit (ICU) of Laquintinie Hospital in Douala over a period of 5 months, from April to August 2024. The target population included all patients admitted to the ICU during this period who provided consent or whose consent was obtained from relatives for comatose patients. Patients who died before a definitive diagnosis or refused to participate were not included. Sociodemographic, clinical, and paraclinical data, as well as the delay and reason for admission, were collected during patient management or via telephone survey for transferred patients or those discharged from the hospital.

All patients underwent a complete clinical and cardiovascular evaluation, supplemented by medical imaging and a detailed clinical assessment. The research protocol was validated by the National Ethics Committee, and administrative authorizations were obtained from the hospital director and the department head. Patients were fully informed about all aspects of the study and included only after providing informed consent. Data were entered into Excel and analyzed using R software (version 4.4.2). Categorical variables were presented as frequencies and percentages, while numerical variables were expressed as mean ± standard deviation. Fisher's and Pearson's chi-square tests were used to evaluate associations between variables, with a confidence interval set at 95% and an error margin of 5% (Ho rejected if $p < 0.05$).

## Results

The average age of patients was 60.11 ± 13.38 years. The sex distribution revealed a predominance of males, with 56.8% men



Citation as J Sci Dis 2025, Vol 3 (2): 26-30

compared to 42.2% women, resulting in a sex ratio of 1.31. In terms of age distribution, 48.6% of patients were aged 50 to 70 years, followed by 27.1% who were over 70 years, and 23.6% who were under 50 years. Regarding profession, a large majority of patients (77.8%) worked in the informal sector, while 18.9% were employed in the private sector, and only 4.3% in the public sector (**Table 1**).

**Table1:** *socioprofessional factors*

| Factors | n(%) |
|---|---|
| **Mean age ± SD (years)** | 60.11 ± 13.38 |
| **Gender** | |
| Male | 159 (56.8%) |
| Female | 121 (42.2%) |
| **Sex-ratio** | 1.31 |
| **Age group (years)** | |
| < 50 | 66 (23.6%) |
| [50 - 70[ | 136 (48.6%) |
| > 70 | 76 (27.1%) |
| **Work sector** | |
| Informal sector | 218 (77.8%) |
| Private sector | 53 (18.9%) |
| Public sector | 12 (4.3%) |

The results showed that 26.1% of patients were admitted after 72 hours, while only 16.8% were admitted within 6 hours, indicating a significant delay in admission. Among cardiovascular risk factors, hypertension (HTN) was predominant at 81.1%, followed by physical inactivity (55.4%), overweight (40.5%), and alcoholism (29.7%). A history of diabetes and stroke was reported in 22.9% of patients each, while smoking and heart disease were less frequent, at 12.1% and 10.8%, respectively.

Regarding reasons for admission, neurological distress was the most common at 79.7%, followed by hemodynamic distress (16.2%) and respiratory distress (10.8%). Finally, blood glucose levels revealed that 48.6% of patients had glucose levels between 1.27 and 2 g/l, while 25.7% had normal values (0.8 to 1.26 g/l) and 13.5% exceeded 3 g/l (**Table 2**).

The prevalence of cerebrovascular accidents (strokes) among patients admitted to the intensive care unit (ICU) was 26.4% (74 out of 280 patients). Conversely, 73.57% of patients (206 out of 280) did not present with a stroke (**+**).

**Table 2**: *clinical and paraclinical parameters*

| Parameters | Count (n) | Percentage (%) |
|---|---|---|
| **Admission delay (in hours)** | | |
| < 6 | 47 | 16.8 |
| 6 – 12 | 44 | 15.7 |
| 12 – 24 | 14 | 5 |
| 24 – 48 | 84 | 30 |
| 48 – 72 | 18 | 6.4 |
| > 72 | 73 | 26.1 |
| **Cardiovascular risk factors** | | |
| Hypertension (HTN) | 60 | 81.1 |
| Sedentary lifestyle | 41 | 55.4 |
| Overweight | 30 | 40.5 |
| Alcoholism | 22 | 29.7 |
| Diabetes | 17 | 22.9 |
| History of stroke | 17 | 22.9 |
| Smoking | 9 | 12.1 |
| Heart disease | 8 | 10.8 |
| **Reason for admission** | | |
| No distress | 15 | 5.4 |
| Respiratory distress | 30 | 10.8 |
| Hemodynamic distress | 45 | 16.2 |
| Neurological distress | 190 | 79.7 |
| **Glycemic values (g/l)** | | |
| 0.8 – 1.26 | 72 | 25.7 |
| 1.27 – 2 | 136 | 48.6 |
| 2.1 – 3 | 34 | 12.7 |
| > 3 | 38 | 13.5 |

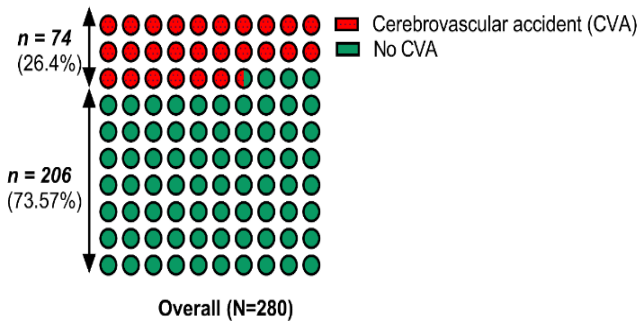


**Figure 1**: *prevalence of cerebrovascular accident in patients admitted to the intensive care unit.*

Hemorrhagic strokes were the most frequent, accounting for 63.51% of cases (47 patients), while ischemic strokes represented 26.4% of cases (27 patients) (**Figure 2**).

Among the 74 patients diagnosed with a cerebrovascular accident (CVA), 62.1% (46 patients) died as a result of their stroke, while 37.2% (28 patients) survived (**Figure 3**).



Citation as **J Sci Dis 2025, Vol 3 (2): 26-30**

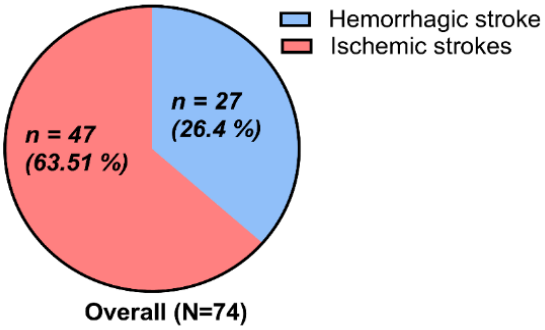


**Figure 2**: *types of stroke*

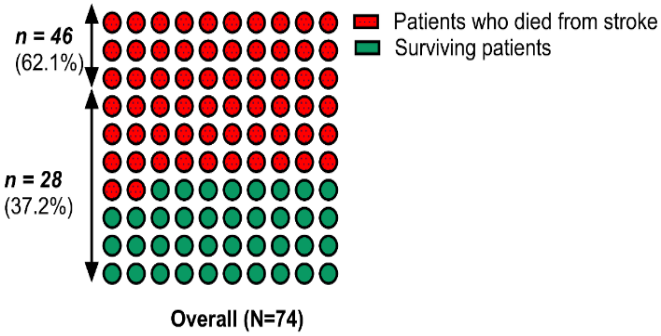


**Figure 3:** *stroke mortality rate*

## Discussion

Stroke is a major public health issue, particularly in intensive care units (ICUs), where acute forms are severe and frequent. The objective of this study was to better understand the epidemiological aspects of strokes in a Cameroonian context, thereby contributing to a still limited body of literature on this subject in sub-Saharan Africa.

In our study, the mean age of patients was 60.11 ± 13.38 years, with a predominance of males (sex ratio of 1.31). These results are consistent with other studies conducted in Africa, such as the one in Senegal, which reported a mean age of 57 years with a male predominance [16]. This trend may be explained by increased exposure of men to risk factors such as smoking and alcohol consumption. In comparison, studies in developed countries report higher mean ages (beyond 65 years), reflecting differences in demographic structures and lifestyle habits [23].

The average admission delay, estimated at 40 ± 8.2 hours, is concerning. This delay highlights gaps in the early recognition of stroke symptoms and in referral systems. Similar delays have been observed in Gabon, where studies reported delays due to geographical obstacles and frequent reliance on traditional medicine [17]. Conversely, in developed countries, admission delays are often less than 4 hours, thanks to well-structured emergency response systems and awareness campaigns targeting the population [23].

The high prevalence of hemorrhagic strokes (63.51%) differs significantly from trends observed in Western countries, where ischemic strokes represent 80% to 85% of cases [23]. However, this difference aligns with other studies conducted in Douala, Dakar, and Yaoundé, where hemorrhagic strokes are also predominant [15–18]. This variation can be attributed to the high prevalence of uncontrolled hypertension, the main risk factor for hemorrhagic strokes in these regions [20,22].

The observed mortality rate in our study, reaching 62.1%, underscores the severity of strokes in ICUs. This percentage is comparable to findings from other African studies, such as in Mali, where a mortality rate of 59% was recorded [19]. This high mortality can be attributed to factors such as delays in care, the absence of specialized neurovascular units, and limitations in intensive care services. In comparison, in developed countries, stroke-related mortality rates are often below 30%, thanks to access to advanced treatments such as thrombolysis and specialized neurosurgery [23].

These results can be explained by several factors. The high prevalence of hemorrhagic strokes reflects the widespread presence of uncontrolled hypertension, which remains a major public health challenge in sub-Saharan Africa [20]. The high mortality rate is exacerbated by the lack of suitable infrastructure for managing severe strokes, including multimodal management of intracranial hypertension and continuous monitoring in intensive care. Finally, admission delays reflect both cultural barriers, such as reliance on traditional medicine, and logistical obstacles, including insufficient medicalized ambulances and infrastructure [17].

Compared to global data, our findings show significant disparities. Ischemic strokes are predominantly reported in developed countries, and mortality rates are significantly lower [23]. These differences underscore the urgency of strengthening primary prevention, particularly through hypertension control and population



Citation as J Sci Dis 2025, Vol 3 (2): 26-30

education, and improving healthcare structures, notably by establishing neurovascular units in developing countries.

## Conclusion

Strokes are a frequent and severe pathology in ICUs, particularly in sub-Saharan Africa. This study at Laquintinie Hospital in Douala highlighted a high prevalence of hemorrhagic strokes, a prolonged average admission delay, and an alarming mortality rate. These findings reflect local challenges related to limited access to care, the high prevalence of uncontrolled hypertension, and the absence of specialized infrastructure. They call for improved prevention, increased awareness, and enhanced care systems to reduce stroke-related mortality and sequelae in resource-limited settings like Cameroon.

### Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

### Funding

The authors confirm that the research was conducted without any external funding.

### Author Contributions

NPC, DJ, and NTF designed the experimental approach and drafting plan. NPC, DJ, and NTF recruited participants and performed laboratory analyses. NPC and NTF conducted the statistical analysis. BFA and DV produced the graphs. NPC drafted the manuscript. BFA, DV, ZMJ, and BY reviewed the manuscript. All listed authors made a substantial, direct, and intellectual contribution to the work and approved its publication.

### Acknowledgments

We thank all individuals who voluntarily agreed to participate in the study, as well as the staff of the Intensive Care Unit of Laquintinie Hospital in Douala, Cameroon, for their support throughout this work.

### References

1. Joseph Emmerich. Diseases of the vessels. Doin. Paris; 1998. 379 p. (coll. “Inter méd”).
2. Sagui E. [Stroke in sub-Saharan Africa]. Med Trop (Mars). 2007 Dec;67(6):596–600.
3. WHO. A report from WHO/Europe warns against fatal levels of salt consumption and uncontrolled high blood pressure. 2024.
4. The European Registers of Stroke (EROS) Investigators. Incidence of stroke in Europe at the beginning of the 21st century. Stroke. 2009 May;40(5):1557–63.
5. Lahlou N, Sekkali H, El Marjani O, El Azzouzi L, Ouaha H, Akoudad. Cardiological assessment of ischemic stroke. The Moroccan Journal of Cardiology. 2011;11–8.
6. Walker RW, Rolfe M, Kelly PJ, George MO, James OFW. Mortality and recovery after stroke in The Gambia. Stroke. 2003 Jul;34(7):1604–9.
7. Touré K, Diagne S, Seck L, Sow A, Ndiaye M, Diop M, et al. Predictive factors of stroke mortality at the Neurology Clinic of CHU Fann, Dakar - Senegal. Afr J Neuro Sci. 1970 Jan 1;29(2):29–36.
8. Cowppli-bony P, Sonan-douayoua T, Yapi-yapo P, Kraidiy L, Boa Yapo F, Beugré Kouassi E. Stroke mortality. Médecine d’Afrique Noire. 2006 May;5305:299–305.
9. Tambwe M, Mbala M, Lusamba DN, M’buyamba-Kabangu JR. Morbidity and mortality in hospitalized Zairean adults. S Afr Med J. 1995 Feb;85(2):74.
10. Mapoure YN, Kuate C, Tchaleu CB, Ngahane HBM, Mounjouopou GN, Ba H, et al. Stroke epidemiology in Douala: Three years prospective study in a teaching hospital in Cameroon. WJNS. 2014;4(5):406–14.
11. Bengono Bengono RS, Amengle AL, Ndikontar R, Kona Ngondo S, Gouag, Iroume C, Bala L, et al. Clinical and prognostic aspects of strokes in intensive care in Cameroon. Health Sciences and Disease. 2023 Feb;24(2 Suppl 1). 1-5.
12. Byass P, De Savigny D, Lopez AD. Essential evidence for guiding health system priorities and policies: anticipating epidemiological transition in Africa. Global Health Action. 2014 Dec;7(1):23359.
13. Defo BK. Demographic, epidemiological, and health transitions: are they relevant to population health patterns in Africa? Global Health Action. 2014 Dec;7(1):22443.
14. D. Mignonsin, Y. Tetchi, M. Kane, A. Amonkou, A. Bondurand. Management of stroke patients in intensive care. Médecine d’Afrique Noire. Available from: https://www.santetropicale.com/Resume/123907.pdf.
15. Mapoure YN, Kuate C, Tchaleu CB, Ngahane HBM, Mounjouopou GN, Ba H, et al. Stroke epidemiology in Douala: Three years prospective study in a teaching hospital in Cameroon. WJNS. 2014;4(5):406–14.
16. Sène Diouf F, Basse AM, Ndao AK, Ndiaye M, Touré K, Thiam A, et al. Functional prognosis of strokes in developing countries: Senegal. Annals of Physical Medicine and Rehabilitation. 2006 Apr;49(3):100–4.
17. Kouna NP, Millogo A, Siéméfo KF, Assengone-Zeh Y. Epidemiological and evolutionary aspects of strokes at the Libreville Hospital Center (Gabon). African Journal of Neurological Sciences. 2013;32(1):12–7.
18. Fouetio G, Binam F, Owono Etoundi P, Afane Ela A, Tangning C. Incidence, etiological profile, and evolution of strokes in the polyvalent intensive care unit of the Yaoundé Central Hospital. RAMUR. 2005;X(1):30.
19. Théra E. Strokes at the CHU of Point G: epidemioclinical and evolutionary profile. University of Bamako. 2007. Available from: https://www.bibliosante.ml/handle/123456789/8168
20. Ahmad A, Randrianantoandro T, Tehindrazanarivelo AD, Andriambao DS. Anatomical types and risk factors of strokes in Madagascar. Médecine d’Afrique Noire. 2002;49(5):429–35.
21. Strokes at the Gynaeco-Obstetrics and Paediatrics Hospital of Yaoundé: epidemiological, clinical, and paraclinical aspects. Swiss Arch Neurol Psychiatr. 2012 Feb;163(2):54–7.
22. Chan S, Ros S, You KY, Nhem S, Salle JY, Dudognon P, et al. The management of stroke in Phnom Penh, Cambodia. Bull Soc Pathol Exot. 2007 Feb;100(1):32–5.
23. Goldstein LB, Adams R, Alberts MJ, Appel LJ, Brass LM, Bushnell CD, et al. Primary prevention of ischemic stroke: A guideline from the American Heart Association/American Stroke Association Stroke Council. Stroke. 2006 Jun;37(6):1583–633.



Citation as **J Sci Dis 2025, Vol 3 (2): 26-30**