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Original Article

The epidemiological, clinical, radiological profiles and outcome of stroke in reference sub-Saharan African intensive care unit: a cross-sectional study

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Abstract

Background: Although stroke or cerebrovascular accidents (CVA) account for the second cause of death worldwide, data on CVA in the intensive care units (ICU) of Cameroon is scant. We investigated the sociodemographic, clinical, and radiological profiles, as well as outcomes of patients with CVA admitted to the ICU of the Yaounde Central Hospital.

Methods: We analyzed the hospital files of all patients admitted to the ICU of Yaounde Central Hospital from 1st January 2016 to 31st December 2016. All patients with confirmed CT-scan diagnosis of CVA were retained. Patients' files were studied for sociodemographic data, clinical variables, radiological patterns, and outcomes of ICU admission.

Results: The prevalence of cerebrovascular accidents was 12.2%. The mean age was 66.2 ± 13.5 years and 50% were males. The main reason for ICU admission was coma in 92.3%. The frequencies of comorbidities were hypertension (65.4%) and diabetes (7.7%). The main lesion for hemorrhagic CVA was at the capsulolenticular area and the main occluded vessel in ischemic CVA was the middle cerebral artery.

Conclusions: The findings suggest CVA patients in the aforementioned ICU have modifiable cardiovascular factors such as hypertension and diabetes for preventive interventions. Many patients have severe hypertension on admission, reflecting uncontrolled high blood pressure before their cardiovascular event. Overall, there is an urgent need for adequate follow-up of hypertension especially in elderly patients for CVA prevention.

Keywords: Cameroon, cerebrovascular accident, intensive care units, stroke

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Introduction

Sub-Saharan African (SSA) has the peculiarity of being one of the highest poverty-stricken regions in the world, with a double public health burden inflicted by the constant threat of communicable diseases (malaria, HIV/AIDS, and tuberculosis) and a rise in the incidence of non-communicable diseases (NCD), especially cardiovascular diseases (CVD) [1]. Amongst NCD, hypertension, diabetes mellitus, dyslipidemia, and overweight/obesity are emerging public health problems in SSA, stemming from increasing urbanization and westernized lifestyles [2]. All these conditions are prone to increase the incidence of stroke or cerebrovascular accident (CVA) in this part of the world.

Globally, CVA represents the second cause of death after ischemic heart diseases [3] and the first etiology of acquired handicaps [4]. The adverse outcomes of CVA are common and the case fatality rate is high [5]. In SSA, stroke patients are generally hospitalized in the neurology units or in intensive care units (ICU) since stroke units are not yet available [5]. Epidemiological data and prognosis of stroke have been studied in many neurological units of Cameroon [5]. Few reports conducted by Ze Minkinda et al. [6] in the ICU of the Yaounde Gynae-Obstetric and Pediatric Hospital (HGOPY) depicted a prevalence of 1.31% for CVA with hypertension as the principal risk factors. Meanwhile, little or no studies have demonstrated the epidemiology of CVA in the ICU of the Yaounde Central Hospital (YCH). The objectives of this study are to determine the prevalence of CVA, types of CVA, associated risk factors, time to admission, clinical presentation, and outcomes of CVA in the ICU of the YCH.

Methods

Study design and setting

This was a cross-sectional study carried out retrospectively at the ICU of the Yaounde Central Hospital between 1st January 2016 to 31st December 2016 (12 months). The YCH is a tertiary health facility and university teaching hospital in Yaounde, the political capital of Cameroon. Its ICU is managed by four intensive-care physicians, several residents and interns, four general practitioners and 15 nurses.

Ethics approval and consent to participate

The study was approved by the Institutional Review Board of the Faculty of Medicine and Biomedical Sciences, University of Yaounde I, Yaounde, Cameroon under the ethical clearance no 302/CIERSH/DM/2017. Administrative authorizations were equally obtained from the administration of both hospitals involved prior to the beginning of the study.

Sampling method, participants, and study variables

By consecutive convenience sampling, we studied the files of all patients with an established brain CT-scan diagnosis of stroke. Data were extracted from the files into a case record form. These data included: socio-demographic data: age and gender; past medical history: hypertension, diabetes, HIV/AIDS, tobacco and alcohol abuse, past strokes and dyslipidemia; clinical data: time to admission, mean arterial pressure (MAP), Glasgow coma score (GCS), neurological deficits. Blood pressure was measured in the ICU by nurses not dressed in white coats. It is a usual protocol in this ICU to take two measurements (in mmHg) on the right arm using an automated electronic blood pressure machine (MINDRAY Co. Ltd., Japan) through the standard procedure (JNC 7 recommendations) [7]; radiological data: type of stroke, affected cerebral territory or artery, presence of mass effect; outcome: duration of admission, in-ICU mortality rate and factors predictive of mortality.

Statistical analysis

The data obtained were entered into Epi info 3.5.1 statistical software. All the variables were distributed in the form of simple frequencies. Means of numerical variables were reported. Variables with too much missing data precluding meaningful analyses were excluded.

Results

Prevalence of CVA

CVA accounted for 52 (12.2%) ICU admissions out of a total of 426 admissions in the year 2016.

Sociodemographic and clinical characteristics

Their mean age was 66.2 ± 13.5 years (range: 35–91 years) and 50% were males. The main reason for ICU admission was coma in 92.3%. The frequencies of comorbidities were hypertension (65.4%), diabetes (7.7%), and HIV/AIDS (7.7%). Meanwhile, 13 (25%) had a recurrent CVA. On admission, their mean arterial pressure was 110 mmHg and mean GCS was 8.1 ± 2.8 (see Table 1).

Table 1. Sociodemographic and clinical characteristics

Variables	Frequencies	Percentage
Age (years)		
<65	21	40.4
65-74	17	32.7
75-84	8	15.4
≥85	6	11.5
Gender		
Male	26	50
Female	26	50
Time to admission		
<24 hours	14	26.9
>24 hours	38	73.1
Mean	4.9	
Comorbidities		
Hypertension	34	65.4
Past stroke	13	25
Diabetes	4	7.7
HIV/AIDS	4	7.7
Obesity	1	1.9
Heart failure	1	1.9
Mean arterial pressure		
Mean systolic blood pressure	153 ± 38	
Mean diastolic blood pressure	88 ± 22.7	
Stages of hypertension		
Stage 1 hypertension	13	25
Stage 2 hypertension	7	13.5
Stage 3 hypertension	13	25
Levels of Glasgow coma score		
13-14	4	0.8
8-12	17	32.7
6-7	10	19.2
4-5	9	17.3
≤3	2	3.8
Reason for admission		
Coma	48	92.3
Convulsion	5	9.6

CT-scan findings

There were 30 (57.7%) cases of hemorrhagic stroke and 22 (42.3%) cases of ischemic strokes. The most affected cerebral hemisphere was the right (55.8%) and 18 (34.6 %) had mass effects (see Table 2 and 3).

Outcomes

The mean duration of hospitalization was 6.9±6.2 days. The in-ICU mortality rate was 56.3%.

Table 2. CT-Scan patterns of hemorrhagic stroke

Location	Frequencies	Percentage
Capsulolenticular	14	26.9
Parietal	4	7.7
Occipital	5	9.6
Frontal	2	3.8
Frontoparietal	2	3.8
Temporal	3	5.7
Thalamic	3	5.7

Table 3. CT-Scan patterns of ischemic stroke

Location	Frequencies	Percentage
Middle cerebral artery	18	34.6
Anterior cerebral artery	2	3.8
Posterior cerebral artery	2	3.8

Discussion

This study aimed to determine the prevalence of CVA, types of CVA, associated risk factors, time to admission, clinical presentation, and outcomes of CVA in the ICU of the YCH. The prevalence rate of CVA was 12.2%, their mean age was 66.2±13.5 years. The main comorbidity was hypertension (65.4%) and the right hemisphere was more affected (56%). The mean duration of hospitalization was 6.9±6.2 days. The in-ICU mortality rate was 56.3%.

Though CVA is the second cause of death and the first cause of acquired handicap globally, its prevalence and incidence in the general population remain poorly studied in SSA [8]. The prevalence of stroke in the present study was 12.2%, higher than the 1.31% reported by Ze Minkande in the ICU of HGOPY [6] and lower than the 30% reported in a neurology unit of Senegal [9]. This intermediate prevalence observed in the ICU of HCY may be explained by the fact that the ICU of the YCH is one of the main referral ICU in the city of Yaounde and as such, it concentrates most critical care pathologies like CVA.

The mean age of patients was 66.2±13.5 years in accordance with the hypothesis that advanced age is a risk factor for cardiovascular diseases such as CVA [10]. The mean age in our cohort is almost similar to the 63.7±13.5 reported in HGOPY [6] and lower than 58.66±3.06 years cited in the Douala General Hospital [11]. The mean age in our series is 8 to 15 years lower than that observed in high-income countries [12,13]. This may be explained by the fact that in Cameroon patients often seek healthcare late.

There was an equal male to female ratio in our study contrarily to other SSA studies which found a male preponderance [11,14-16]. This male predominance cited in other series may be due to the hormonal differences and lifestyle of men who tend to consume alcohol and tobacco (known risk factors for CVA) more than women in SSA.

Up to 38 (73%) patients presented late to the ICU, that is 24 hours after the onset of symptoms or signs with 92% having a coma on ICU admission. This may infer that either the patients neglected their initial symptoms (such as headaches or muscle paralysis) or there were being referred to the ICU late by other departments of the hospital. This concurs with findings by Chan et al. [17], who demonstrated that 70% of CVA patients presented to the ICU after 24 hours of onset of symptoms.

With regards to the comorbidities associated with CVA, we found 65.4% of hypertension, 7.7% of diabetes, and 7.7% of HIV/AIDS. Indeed, several authors found hypertension as a major risk factor or comorbidity associated with both hemorrhagic and ischemic CVA; 62.1% by Ze Minkande in HGOPY [6] and 68% by Sagui in a SSA review [18]. However, some reports from high-income countries [12,13] observed a lower prevalence of 55% for hypertension in stroke patients.

There were more cases of hemorrhagic stroke (57.7%) than ischemic strokes (42.3%) in the present study. This is contrary to reports from HGOPY (34.48% hemorrhagic vs 65.52% ischemic) [6], Douala (48% hemorrhagic vs 52% ischemic) [11], Nigeria (49% hemorrhagic vs 51% ischemic) [16], and Europe (20% hemorrhagic vs 80% ischemic) [12]. We could not find any genetic or environmental factors from the literature which may explain the high prevalence of ischemic than hemorrhagic stroke elsewhere except in our study. Our findings may suggest that the prevalence of hemorrhagic stroke is on the rise compared to the previous known concept.

Similarly, to studies done by Ze Minkande [6] and Taourel [19], the middle cerebral artery and the capsulolenticular were the most affected blood vessels and cerebral territories in stroke patients.

In-ICU mortality in this study was 56.3% with a mean duration of hospitalization was 6.9 ± 6.2 days. This corroborates with findings of Ze Minkande [6] who observed an in-ICU mortality of 50%. Other reports from SSA cited an in-hospital mortality rate ranging between 9.5% to 26.8% [11,14,16]. The discrepancy in the mortality rate in the current study compared to that observed in other African studies is explained by the fact that these studies did not include severe cases of patients hospitalized in the ICU. Their study population were non-comatous and managed often in a neurology or cardiology unit, whereas 92.3% of our study population was in a coma and managed in an ICU, where there were at risk of acquiring a nosocomial infection.

Findings from the current study should be interpreted within the context of its limitations. We acknowledge some limitations of our study namely the short period of retrospective review (one year) and small sample size of patients with CVA ($n=52$), as such, our findings need to be generalized with caution. Also, being a retrospective and cross-sectional study, it was not easy to attribute the causality of CVA-related mortality mainly due to lack of this data in the patients records. However, through this study, we have contributed to the scant data on the burden of stroke in the ICU of tropical countries.

In conclusion, CVA accounts for one out of every 10 ICU admissions in the ICU of YCH. Majority of patients had an advanced age and were hypertensive, reflecting untreated or uncontrolled hypertension before CVA. Almost one out of two patients with CVA has a fatal outcome. Adequate follow-up of hypertensive elderly patients is crucial for prevention of CVA.

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Conflict of interest

The authors declare that they have no competing interests.

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