



Computer tomography pattern of stroke among patients received at the Medical Imaging Center of the Limbe Regional Hospital, South-west Region, Cameroon

Caractéristiques scanographiques des accidents vasculaires cérébraux chez les patients reçus au Centre d'Imagerie Médicale de l'Hôpital Régional de Limbe, Région du Sud-Ouest, Cameroun

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ABSTRACT

Background: Stroke is a significant public health concern globally and a leading cause of neurological morbidity. The aim of our study was to determine the characteristics of strokes diagnosed by CT scan at the Medical Imaging Center of the Limbe Regional Hospital in Cameroon.

Methods: We conducted a retrospective, cross-sectional study of patients with a clinical diagnosis of stroke who underwent brain CT imaging at the Limbe Regional Hospital between January 2020 and April 2022. Data were analyzed using SPSS version 25.0.

Results: A total of 496 patient records were included. The mean age of patients was 61.9 years (± 0.61), with the highest prevalence in the 61-70 age group. Ischemic stroke was the most common type (65.3%, n=324), while hemorrhagic stroke accounted for 26.6% (n=132) of cases, with a higher proportion occurring in patients aged 41-50 years. Ischemic strokes were slightly more frequent in females. Among ischemic strokes, 56.5% (n=183) occurred in the middle cerebral artery (MCA) territory, and 22.5% (n=73) in the anterior cerebral artery (ACA) territory. Hemorrhages were most frequently located in the thalamic region (28.5%), followed by the parietal lobe (16.9%) and temporal lobe (16.2%).

Conclusions: Ischemic stroke is the predominant type of stroke observed in the imaging department, with a slightly higher incidence in females, while hemorrhagic stroke was more prevalent in males. The MCA territory is the most common location for ischemic infarctions, and the thalamic region is the most frequent site for hematomas.

RESUME

Introduction : L'accident vasculaire cérébral (AVC) est un problème de santé publique majeur à l'échelle mondiale. Le but de l'étude était de décrire les caractéristiques des AVC diagnostiqués par scanner au Centre d'Imagerie Médicale de l'Hôpital Régional de Limbe au Cameroun.

Méthodes : Etude transversale et rétrospective sur les patients ayant reçu un diagnostic clinique d'AVC et tomodensitométrie cérébrale à l'Hôpital Régional de Limbe entre janvier 2020 et avril 2022. Les données ont été analysées à l'aide du logiciel SPSS version 25.0.

Résultats : 496 dossiers de patients ont été inclus. L'âge moyen des patients était de 61,9 ans ($\pm 0,61$), la tranche d'âge 61-70 ans étant la plus représentée. L'AVC ischémique était plus fréquent (65,3 %, n=324), tandis que l'AVC hémorragique représentait 26,6 % (n=132) des cas. Les AVC ischémiques étaient plus fréquents chez les femmes. Les territoires les plus atteints par les infarctus étaient ceux de l'artère cérébrale moyenne (ACM) 56,5 % (n=183) et de l'artère cérébrale antérieure (ACA) 22,5 % (n=73). Les hémorragies étaient le plus souvent localisées dans la région thalamique (28,5 %), suivie des lobe pariétal (16,9 %) et temporal (16,2 %).

Conclusion : L'AVC ischémique était prédominant dans le service d'imagerie médicale, avec une incidence légèrement plus élevée chez les femmes, tandis que l'AVC hémorragique était plus fréquent chez les hommes. Le territoire de l'ACM était la localisation prépondérante des infarctus ischémiques, et la région thalamique, le site le plus fréquent des hématomes.

Introduction

Stroke is a major public health issue worldwide. In 2019, there were 12.2 million new cases of stroke globally and 6.5 million deaths from stroke [1,2]. It is the second-leading cause of death (11.6% of total deaths), with 87% of those deaths occurring in low- and middle-income countries (LMICs) [2,3]. In Cameroon, the prevalence of stroke is 7.3%, and its mortality rates are 26.7% during the first month and 31.7% in the first three months after the stroke event [4].

According to the American Heart Association report (AHA), stroke is subtyped into ischemic and hemorrhagic at an occurrence rate of about 87% and 13%, respectively [2,3]. With ischemic stroke having a lesser fatality rate than the hemorrhagic type of stroke [2,3]. Globally in 2019, ischemic stroke was diagnosed in 77.2 million people, intracerebral hemorrhage 20.7 million, and subarachnoid hemorrhage was 8.4 million, accounting for a total incidence of stroke of 101.5 million people [1,3]. Hemorrhagic stroke has a worse prognosis compare to ischemic stroke, and its severity and outcome depend also on the location. [5].

Identifying the type of stroke plays a vital role in the management of the patient. Even though simple clinical profiles help to distinguish the types of stroke, there is still a need for diagnostic imaging. Non-contrast Computer Tomography (CT) scan is the most commonly used diagnostic imaging tool to diagnose stroke. It helps determine and describe factors associated with the prognosis and outcome: the type of stroke, the degree of obstruction or hemorrhage, and the extent of brain tissue damage. But CT is not accessible in all hospitals and emergency departments, which may lead to loss of treatment golden time [5]. CT scan has been relatively recently introduced in the South-West region and the imaging center of Limbe Regional Hospital was the only center offering that service in the region from 2016 to 2023.

Many studies have been conducted on characteristics of stroke but mostly clinical characteristics and mainly in internal medicine, neurological or intensive care units. The objective of our study was to determine the CT characteristics of patients diagnosed with a stroke at the Medical Imaging Center of Limbe Regional Hospital.

Material and Methods

The study was conducted from January 2020 to April 2022 at the Medical Imaging Center of the Regional Hospital of Limbe, in the South-west Region of Cameroon. It was considered as the reference center for medical imaging in the region, being the only one to offer CT-Scan examinations during the study period. A cross-sectional and retrospective study was conducted among patients to whom a

head CT scan was done for suspicion of stroke at the medical imaging center in Limbe Regional Hospital. We reviewed the register at the CT-Scan unit for all the brain CT scan records of patients referred to the center with clinical suspicion of stroke. Was excluded from the study brain CT examinations with incomplete information in the register. All the brain CT-Scan exams were done using a multi-detector 16-slices Hitachi CT scanner, model TSX-101A manufactured by Hitachi Global (Tokyo, Japan) and in service since November 2016. The images were acquired from the base of skull to the vertex without use of contrast agent. The parameters used were: tube voltage 120 kV; tube current-exposure time, 225mAs, slice thickness of 5mm, rotation time 0.75s and collimation 1,16. The brain CT scan were interpreted by 03 radiologists of at least 05 years of experience working in the imaging center during the study period. A data collection form was used to extract information on socio-demographic characteristics (gender, age) and CT findings (type of stroke, topography). All CT confirmed cases of stroke were classified as either hemorrhagic or ischemic stroke. Each data collection form was anonymized with a reference number. Data were entered and analyzed using Statistical Package for the Social Sciences version 25 (SPSS v25). Results were described as frequencies and proportions and presented using frequency tables and figures.

Results

A total of 3220 CT scan exams were conducted during the study period in the Limbe Imaging Center, out of which 496 were brain CT scan on suspicions of a stroke, giving a proportion of 15.4%. The sex ratio was 1. The age range of the individuals was from 17 to 101 years with a mean age of 61.9 ± 0.61 years. Less than two (02) percent of the individuals who did a brain CT scan were less than 30 years old and the majority 28.4%(n=141) were age between 61-70 years (Table 1).

Table 1: demographic distribution of patients (N=496)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	248	50.0
Female	248	50.0
Age (years)		
<30	8	1.6
30-40	25	5.0
41-50	71	14.3
51-60	115	23.2
61-70	141	28.4
71-80	98	19.8
>80	38	7.7

On the 496 brain CT scans done during the study

period for suspicion of CVA, 456 found positive signs of CVA, making an incidence of CVA at the imaging center of Limbe Regional Hospital of about 92%. The majority of the CVA type were ischemic in nature (65.3%, n=324) and 26.6%(n=132) were hemorrhagic in nature. 8.10% of CT-Scan did not show any sign of stroke. (Figure 1).

Out of the 324 cases of ischemic stroke, 56.5% (n=183) were located in the territory of the middle cerebral artery (MCA) and 22.5%(n=73) in the territory of the anterior cerebral artery (ACA). (Figure 3).

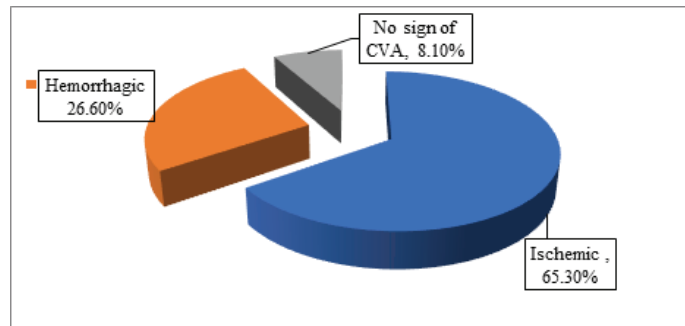
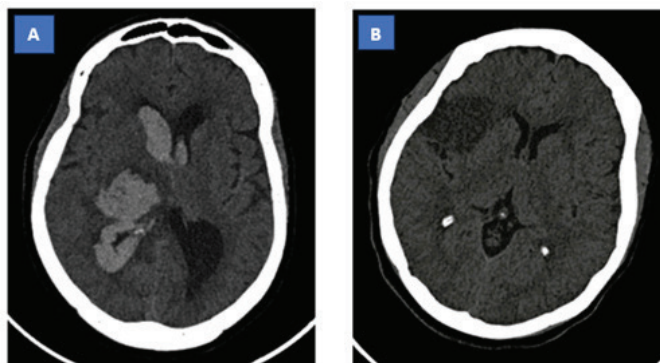


Figure 1: distribution of findings of brain CT Scan for stroke
CVA: Cerebro-Vascular Accident



Figures 2 : A. Right thalamic hemorrhagic stroke with intraventricular hemorrhage.
B. Ischemic stroke of the superficial territory of the right middle cerebral artery

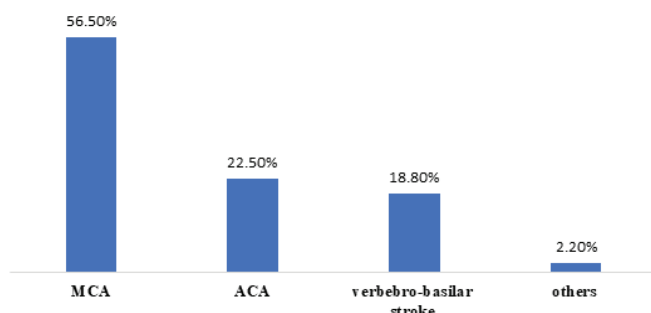


Figure 3: Vascular territories of ischemic stroke.
MCA: Middle Cerebral Artery, ACA: Anterior Cerebral Artery

With regards to the cases of hemorrhagic stroke, 28.5% were located in the thalamic area, 16.9% in the parietal lobe, 16.2% in the temporal lobe and 10.8% in the lenticular nucleus; as shown on figure

4 below.

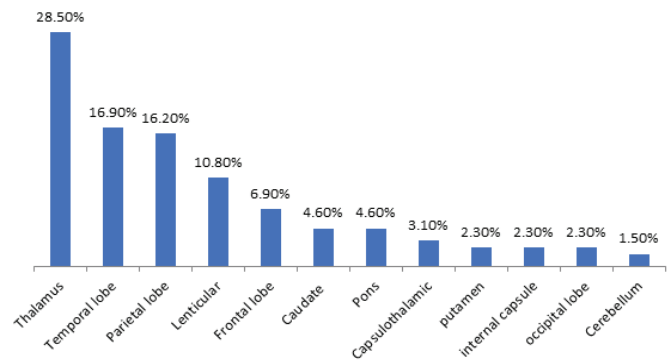


Figure 4: locations of Hemorrhagic stroke

Distribution of stroke among males and females at the Limbe Regional Hospital shows that, ischemic stroke was slightly more common among females than males (66.1%). On the other hand, hemorrhagic stroke was more frequent in males (27%), as illustrated on Figure 5 below.

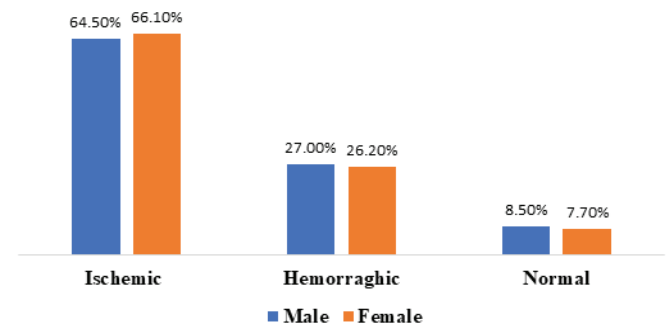


Figure 5: distribution of stroke among male and female at the Limbe regional hospital

As concerned age distribution of stroke, the results show that ischemic stroke was more prevalent among individuals age less than 30 years (50%) as well as among those who were between the ages of 30-40, 61-70, and 71-80 years at 52%, 54.6%, and 59.2% respectively. Hemorrhagic stroke however was more common among those who were age between 41-50 years (53.5%), 51-60 years (47%) and those older than 80 years (47.4%). (Figure 6)

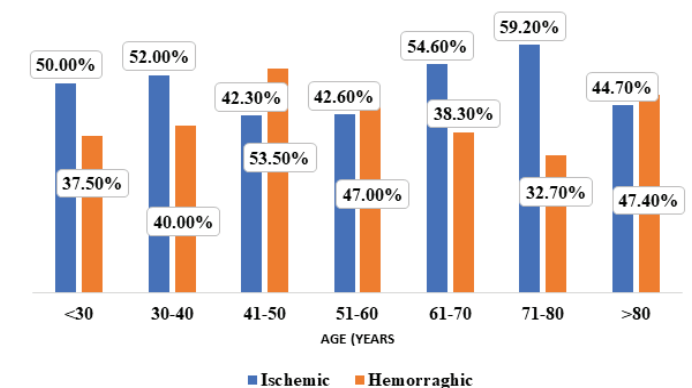


Figure 6: distribution of stroke among age groups

Discussion

Stroke is the leading cause of acquired disability (87%) and the leading cause of death (70%) in low-income and middle-income countries (LMICs) [6]. There are very few researches in Cameroon looking at the scannographic characteristics of patients who may have had a cerebrovascular accident, and this was the main aim of this study. Ischemic stroke was the most common type (65.3%, $n=324$), while hemorrhagic stroke accounted for 26.6% ($n=132$). Ischemic stroke was predominant in female patients while hemorrhagic stroke was more frequent in male and in the young age group of 41-50 years.

In the present study, the mean age of the patients was 61.9 ± 0.61 years which was higher in women than in men. A study in Douala Cameroon by Yacouba et al., reported a similar age distribution among its patients, a result similar to that of other LMICs [7,8,9]. Approximately eight young patients in our study who were in their late teens to early thirties experienced a stroke. The current study's mean age is 8 to 15 years younger than what is found in high income nations [10]. A precise reason for the disparity in the age of stroke onset between low- and high-income countries could be attributed to the ease of access to healthcare facilities for the screening of cardiovascular risk factors and to clinical and imaging early diagnosis. In Cameroon, people typically don't seek medical attention until they are experiencing severe symptoms.

In contrast to other epidemiological data, which showed up to 80% of ischemic strokes and 20% of hemorrhagic strokes, the percentage of ischemic strokes and hemorrhagic strokes in this study was 65.3% and 26.6%, respectively [11]. But we should keep in mind that in the present study about 8.10% of brain CT done for suspicion of stroke did not reveal any sign of recent stroke. This does not absolutely mean there is no stroke, since there are more advanced procedures which are more sensitive for early stroke detection, especially ischemic stroke such as: perfusion CT, angiography CT and MRI (diffusion and FLAIR sequences) [12]. However, we point out that, in contrast to our study, the incidence of strokes in Nouakchott in 2002 was reported by Diagana et al. to be 52% of ischemic strokes and 48% of hemorrhagic strokes [10]. Mapoure et al in Douala in 2012 described same proportion of ischemic (52%) and hemorrhagic (42%) strokes [7]. According to another study conducted by Eze et al, in Nigeria in 2008, 56.66% of strokes were ischemic type versus 23.13% hemorrhagic type [13]. We note that although lower proportions of ischemic stroke were recorded in previous studies, ischemic stroke remained consistently the most diagnosed on CT scan. However, in Cameroon, Bengono et al in 2019 in Yaounde and Njall et al in 2024 in

Laquintinie Hospital, Douala, found a predominance of hemorrhagic stroke, of 58.8 % and 63.51% respectively [14,15]. This could be explained by the fact that their studies were carried out in intensive care units where the most severe cases (especially unconscious patients) are usually admitted, and it is known that hemorrhagic strokes are potentially more severe and with a higher rate of mortality [4,16].

It is true, however, that these findings could still be contested due to inclusion bias and the identification of the type of stroke that necessitates imaging tests, which are out of reach for many patients in Africa. But the idea that hemorrhagic strokes could be the more common type in Africa, has not yet been confirmed by population-based epidemiological research even though it is proven that uncontrolled high blood pressure is the main risk factor for stroke in the sub-Saharan African context [2,6,17].

The present study showed that there was a slight sex difference in the prevalence of ischemic stroke. A slightly higher proportion of females presented with ischemic stroke and hemorrhagic stroke was more frequent in male gender. This finding was inconsistent with other reports of similar studies where the male gender was a significantly stronger predictor of both ischemic and hemorrhagic stroke [18,19]. Subjects who had a hemorrhagic stroke were relatively younger (53 ± 9.6 years) than those presenting with an ischemic stroke (63.4 ± 9.6 years). This finding was consistent with those reported by other previous studies in other settings [19-21].

Precise knowledge of arterial territory allows the distinction between infarcts/hematomas located within an arterial territory and infarcts/hematomas in the junction zone between arterial territories [22]. Precise evidence of the arterial territory infarcted after the occlusion of a specific cerebral artery or hematoma after the rupture of artery provides pertinent information about stroke mechanism and helps planning for investigations and subsequent management. In this study, MCA territory was the most common arterial territory involved. Followed by the ACA. This observation was in agreement with the results of previous studies [19-22]. In the present study, thalamus, parietal, and temporal lobes of the cerebrum were the most common sites of hematoma. In another study, basal ganglia (38%) were reported to be the most common site of hematomas followed by thalamus (29.6%) and lobar hemorrhage (18.3%) [10].

Conclusion

Ischemic stroke was the common type of stroke in the imaging department and was more prevalent in females while hemorrhagic stroke was more prevalent in males. Ischemic stroke mostly affected the territories of the MCA. Patients with hemorrhagic

stroke were relatively younger. It will be of great interest for further studies to correlate risk factors and clinical presentations with imaging characteristics in order to identify prognostic markers for good outcomes.

Limitations: The study did not include detailed clinical informations/risk factors and associated comorbidity. The results of this hospital-based unique centre study can't be projected to the general population of the South-west Region of Cameroon.

Conflict of interest: The authors declare no conflict of interest

Authors contribution: DFS and NC gave the topic idea, drafted the data extraction form and collected data. DFS and ONM analyzed data and drafted the manuscript. TJ, NC, NCD and TSM helped reviewing the manuscript. GGE and VSV corrected the final version of the manuscript. All the authors agree with the final version.

Abbreviations

CT: Computed Tomography

CVA: Cerebro-Vascular Accident

MCA: Middle Cerebral Artery

ACA: Anterior Cerebral Artery

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