

NEUROEPIDEMIOLOGIE

BURDEN OF STROKE IN CENTRAL AFRICA – A SINGLE CENTER RETROSPECTIVE REVIEW OF ISCHEMIC AND HAEMORRHAGIC STROKES IN PATIENTS VISITING A TERTIARY HOSPITAL IN KINSHASA, DRC.**LE FARDEAU DES ACCIDENTS VASCULAIRES CÉRÉBRAUX EN AFRIQUE CENTRALE - UNE REVUE RÉTROSPECTIVE MONIOCENTRIQUE D'ACCIDENTS VASCULAIRES CÉRÉBRAUX ISCHÉMIQUES ET HÉMORRAGIQUES CHEZ DES PATIENTS VISITANT UN HÔPITAL TERTIAIRE À KINSHASA, EN RDC.**

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ABSTRACT**Background**

This study aims to retrospectively review the data of patient's risk factors, clinical patterns, and outcomes of the stroke in a tertiary care hospital of central Africa, democratic republic of Congo (DRC).

Methods

We carried out a retrospective study of all the patients who had a clinical diagnosis of stroke with neurological deficit and pointing to a vascular cause as confirmed by computerized tomography (CT) or magnetic resonance imaging (MRI) brain. This study was conducted at private tertiary care hospital which is a public-private partnership run hospital in Kinshasa, DRC.

Result

A total of 1021 patients reviewed in the department of neurology were studied of whom 6.86% (70 patients) of neurological visits were attributed to stroke in that period. The mean age of the patients was 55 years. Males accounted for 67.1% of the cases and the rest were females. Out of these patients, 33(47.14%) belonged to the high socio-economic class while 37 (52.86%) belonged to the low class. The overall prevalence of stroke was found to be 6.86%. Ischemic stroke was significantly more frequent (94.3%) than haemorrhagic. Hypertension, higher alcohol intake, smoking, obesity, and dyslipidaemia were significant risk factors of stroke in an African population. Small vessel strokes were more frequent in this population.

Conclusion

This paper highlights the epidemiology of stroke in central Africa.

RESUME**Contexte**

Cette étude a pour but d'examiner rétrospectivement les données sur les facteurs de risque des patients, les aspects cliniques et le pronostic des accidents vasculaires cérébraux dans un hôpital de soins tertiaire d'Afrique centrale, en République démocratique du Congo (RDC).

Méthodes

Nous avons réalisé une étude rétrospective de tous les patients qui ont eu un diagnostic clinique d'accident vasculaire cérébral avec déficit neurologique et orientant vers une cause vasculaire confirmée par un scanner (CT) ou une imagerie par résonance magnétique (IRM) du cerveau. Cette étude a été menée à l'hôpital privé de soins tertiaires qui est un hôpital géré par un partenariat public-privé à Kinshasa, RDC.

Résultats

Un total de 1021 patients examinés dans le département de neurologie ont été étudiés dont 6,86% (70 patients) des visites neurologiques ont été attribuées à un AVC au cours de cette période. L'âge moyen des patients était de 55 ans. Les hommes représentaient 67,1% des cas. Parmi ces patients, 33 (47,14 %) appartenaient à la classe socio-économique élevée et 37 (52,86 %) à la classe inférieure. La prévalence globale de l'AVC était de 6,86 %. L'AVC ischémique était significativement plus fréquent (94,3 %) que l'AVC hémorragique. L'hypertension, une consommation élevée d'alcool, le tabagisme, l'obésité et la dyslipidémie étaient des facteurs de risque significatifs d'AVC dans une population africaine. Les accidents vasculaires cérébraux liés à l'artériolosclérose étaient plus fréquents dans cette population.

Conclusion

Cet article met en lumière l'épidémiologie des accidents vasculaires cérébraux en Afrique centrale.

INTRODUCTION

Stroke is defined as a focal neurological deficit lasting for more than 24 hours having a vascular aetiology. It is a common neurological disorder being second leading cause of death in the world and third leading cause of disability (11). Stroke is caused by the sudden death of brain cells due to the lack of oxygen when the blood flow to the brain is lost by block or rupture of the artery of the brain. It is also a leading cause of depression and dementia. Globally, 70% of the strokes and 87% of both stroke-related deaths and disability-adjusted life years occur in low and medium-income countries (LMIC).

During these decades, the western countries have seen a decline in stroke while the LMIC have seen an upsurge of stroke. The occurrence of stroke is 15 years earlier and causes more deaths of people who are living in LMIC. Strokes mainly affect the individuals who are the most productive of a nation. It is impacting the gross domestic product (GDP) of a nation and the growing crisis has gathered less attention which is unfortunate (11).

Stroke in sub-Saharan Africa is a major public issue. It has been documented to have higher mortality than the developed countries. Rural south Africa is seeing a flurry of cases. According to the latest world health organization (WHO), data published in 2017 Stroke Deaths in the Central African Republic reached 3,899 or 6.26% of total deaths. The age-adjusted Death Rate is 155.11 per 100,000 population and the Central African Republic ranks #13 in the world (8). The aetiology of these strokes is hypertension, diabetes mellitus (DM), alcohol intake, smoking, diet/nutrition, and human immunodeficiency virus (HIV). Several non-modifiable factors such as age, gender, ethnicity, race, and hereditary have also been identified (4). The incidence of ischemic strokes is higher than the haemorrhagic ones. Ischemic strokes account for 80-85% of the burden while the rest is 15-20% is haemorrhagic (3).

In Africa, most people live in rural areas, where poverty, illiteracy, unavailability, and lack of good care facility play's an important role in the outcomes of stroke. Since limited publications exists defining the stroke subtypes

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and epidemiology. This study aims to retrospectively review the data of patients admitted to our in-patient and out-patients visiting the department of neurology for determining the epidemiology of stroke and their subtypes with further details about the aetiology pertaining to the strokes.

MATERIAL AND METHODS

We carried out a retrospective study of all the patients who had a clinical diagnosis of stroke with neurological deficit and pointing to a vascular cause as confirmed by computerized tomography (CT) or magnetic resonance imaging (MRI) of the brain. Transient ischemic attack (TIA), which is a transient neurological deficit with recovery in 24 hours was excluded from the analysis. We are tertiary care centre located in the DRC.

DRC is a sub-Saharan African country despite its natural worth in billions due to the presence of precious metals. The eastern Congo is unstable while Kinshasa is modern and bustling. The data was collected between April 2014 and August 2015. The data was collected on the hospital information data system (HIS) and later was manually entered into data spreadsheets and evaluated.

The basic demographics, stroke subtype as confirmed by CT/MRI, potential risk factors, socio-economic information were all collected and reviewed. Also, neurological examination findings at admission, haematological and biochemical results were reviewed. The haematological and biochemical parameters were not available in all the cases which potentially limited our review to only the risk factors, clinical features, and type of the stroke. The demographics and risk factors collected and reviewed were as follows: Age, gender, chronic arterial hypertension, type 2 diabetes mellitus (T2DM), cigarette smoking, alcohol intake, and presence of obesity. The strokes were divided into ischemic and haemorrhagic followed by Stroke Project Classification subtype of all ischemic strokes. On CT/MRI, lacunar stroke (LACI) was seen as a small, round, hypodense/hypointense lesion of ≤ 25 (mm) along the course of penetrating arteries or deep vessels while non-lacunar infarct was defined as a large area of hypodensity/hypo intensity involving large vessel in the region of the vascular territory. The strokes were divided into LACI, total anterior cerebral infarction (TACI), partial anterior cerebral infarction (PACI), posterior circulation infarcts (POCI) were identified as non-lacunar circulation infarcts. (4) The data were analysed using the SPSS software version 25.0 for windows. Descriptive and frequency statistics were obtained for the variables of interest. Chi-square was used to test for statistical significance between categorical variables. A p-value of less than 0.05 was deemed as significant.

RESULTS

Out of the total patients visiting the department of neurology between May 2014 and July 2015 ; 70 patients had met the criteria for the clinical definition of stroke with the presence of a radiological diagnosis. The total number of patients reviewed in the department of neurology in the same period was 1021, among these a total of 6.86 % of neurological visits were attributed to stroke.

The age of the patients ranged from 20-80 years with a mean age of 55 years. Males accounted for 67.1% of the cases and the rest were females. The male : female ratio was 2:1. Table I provides the distribution of patients according to age group and sex.

The incidence of ischemic stroke was higher than the haemorrhagic stroke, lacunar infarction was the most common type of stroke seen in 39 (55.7%) patients as compared to the non-lacunar in 27(38.6%) patients as shown in the table II.

The various complex clinical features observed in patients were divided into hemiparesis/hemiplegic, monoparesis/monoplegia, speech disorders(aphasia/dysarthria), seizures, and others which includes visual disturbance, dementia, cranial nerve deficits (facial palsy), sensory symptom (hyperaesthesia / Tingling) dizziness, loss of consciousness and vomiting. The table III highlights the clinical presentation of strokes.

The risk factors are presented in Table IV, hypertension 58 (82.86%) emerged as the most common risk factor followed by the history of alcohol intake 58 (82.86%). Others include T2DM 15 (21.43%), coronary artery disease (1.43%), arrhythmias 4 (5.71%). Smoking was significantly noted in 3 (4.29%) patients with an active history of smoking and 12 (17.14%) with a history of smoking.

Table V shows the stratification of classes of the patients, dividing them into upper and lower socioeconomic status, using their occupation and education levels. 33 (47.14%) patients belonged to the high socio-economic class while 37 (52.86%) belonged to the low class, though data was missing for one patient only.

Obesity is defined as a body mass index (BMI) of ≥ 30 , the data shows 13 (18.57%) out of the 70 patients were found to be obese, although data was found missing in one patient. Dyslipidaemia was found as one of the risk factors seen in patients with stroke. In this study, the full lipid profile panel was not done due to financial constraints, hence the LDL data was available and extracted for identifying dyslipidaemia patients. Furthermore, dyslipidaemia was defined as an abnormality in LDL. The data shows 41 (58.5%) patients had their lipid profile data and 6 (8.57%) had dyslipidaemia.

The radiological evaluation of the stroke patient in these studies shows, most of the patients underwent a brain scan, either brain CT or brain MRI or both, and 6 patients were found without a CT scan, although meets clinical criteria of stroke. The Data reveals 51 (72.86%) patients out of the 70 patients had a CT scan brain done, while only 19 (27.14%) were found to have done the MRI brain Scan, most probably due to cost constraint as shown in Table VI. The findings in the radiological investigations show 39 (55.7%) number of patients had lacunar infarction and 27 (38.6%) had non-lacunar infarction. The site of lesion was in middle cerebral artery territory (corona radiata, globus pallidus, caudate, putamen), lenticulostriate, internal capsule, and thalamic for lacunar infarct vs parieto-occipital and cortical for non-lacunar type. This was most often found in the parietal lobe.

In the etiological evaluation, 8 (11.43%) patients were found to have a history of TIA. 70 patients had data of blood pressure (BP) available, and the mean BP was 146/86 mmHg and mean pulse rate was 73.

DISCUSSION

The burden of the stroke and its related risk factors, complications, and outcomes are not very well studied in DRC. In this regard, our retrospective study holds an important goal to report the burden of stroke along with its risk factors, complications, and outcomes in DRC. In our study among all the patients reviewed in the neurological department, 6.86% of visits were attributed to stroke. These results are similar to other studies conducted across various African countries (6).

Our study shows a higher frequency of stroke in males (61.7%) than females with male to female ratio of 2:1. The ratio is similar to the 3 studies conducted around the African and Arabian population which clearly showed male dominance (4,10), but different from 2 south Nigerian studies showing female predominance. (7,8).

Among these women, 47.8% were above the age of 65, these results can be efficiently supported by a study by Ajayi AO which states that patients with higher education and male gender are more aware of their increased risk factor for stroke than female gender and undereducated patients (1). Our study shows the prevalence of stroke is similar in both upper and lower socio-economic societies in and around DRC, which is in contrast with a study conducted in rural southwestern Nigeria (2,8) showing a higher prevalence of stroke (84.2%) among the lower socio-economic population of Nigeria. Our study also reported a significantly higher incidence of ischemic stroke (93.4%) than haemorrhagic stroke (5.7%), these findings align with other studies conducted across the African continent (8,10). Among the subtypes of ischemic stroke, lacunar subtype was more frequent (55.75%) than the non-lacunar subtypes (38.6%) which is similar to the previous study conducted in Kinshasa city in the year 2011-2012 (12). Our study also reported alcohol consumption as a significant ($p=0.003$) risk factor related with both the subtypes of ischemic strokes.

In our study, Hypertension was the most common risk factor of stroke (81.69%) followed by alcohol intake (71.83%), which is closer to various studies conducted in and around Africa (4,10,11). The risk is strongly related to both systolic and diastolic blood pressure besides, the risk for first-ever stroke or recurrent stroke appears to be log-linear throughout normal ranges. A rise in 10 mmHg in the mean arterial pressure leads to about 20-30% increase in stroke risk (11).

Cigarette smoking is also one of the risk factors (16.9%) among our patients. This rate of smoking is higher than 11.3% in another study in Nigeria (7) and 6% in Saudi Arabia but far less than 44% in Pakistan (5,8). The effect of smoking has been said to be dose-related, heavy smokers are more likely to develop stroke, however, the risk of having the disease reduces with smoking cessation.

In our study, 21.13% of patients were reported to have diabetes mellitus, as diabetes mellitus is a major risk factor for atherosclerosis and the excess risk of stroke in patients with diabetes mellitus is about four times higher when compared with normal individuals in a general population. Therefore, it is vital to ensure good glycaemic control in those with the condition to prevent the development of stroke. In the management of stroke, it is necessary to address all the risk factors and not just focus on few ones.

This was a retrospective study and, as such have certain inherent limitations, such as poor or incomplete medical record-keeping, missing data, and lack of essential, specific diagnostic facilities, as well as poor follow-up clinic visitation, and under-reporting of death after hospital discharge. Despite these limitations, we have been reviewing the pattern of stroke in the semi-urban population of the Democratic Republic of Congo.

CONCLUSION

The overall prevalence of stroke was found to be 6.86%, with a distribution of 2:1 in males and females, respectively. Ischemic stroke was significantly more frequent (94.3%) than haemorrhagic stroke. Hypertension, higher alcohol intake, smoking habit, obesity, and dyslipidaemia are significant risk factors of stroke in an African population. The establishment of practical guidelines for prevention, earlier detection, treatment, and control of stroke in primary health settings is a vital and necessary step. However, primary, secondary, and tertiary health services need to be advised to better suit the care for non-communicable diseases in low resources settings in the semi-urban community of the Democratic Republic of Congo.

Conflict of Interest: None

Table I : Age and gender breakdown in patients.

Serial.NO	AGE (Years)	Male	Female	Total (%)
1	20 – 29	3	0	4.28%
2	30 – 39	1	2	4.28%
3	40 – 49	11	3	20%
4	50 – 59	16	6	31.43%
5	60 – 69	6	11	24.3%
6	70 – 79	9	0	12.85%
7	≥ 80	1	1	2.86%

Table II : Types of Stroke

Stroke	Frequency	Total (%)
Lacunar	39	55.7%
Non lacunar	27	38.6%
Haemorrhagic	4	5.7%

Table III : Clinical Features of Stroke

STROKE CLINICAL FEATURES			
Seial.NO	Symptoms	Frequency	Percentage
1	Hemiplegia / Hemiparesis	53	75.71%
2	monoplegia/monoparesis	2	2.86%
3	Speech Disorder(Dysarthria/Aphasia)	2	2.86%
4	Seizures	1	1.43%
5	Others*	12	17.14%

Other symptoms (sensory /dizziness/ cranial nerve deficits /memory issues/visual loss/headache).

Table IV : Identified modifiable risk factors for stroke.

Serial.NO	Diagnosis	Frequency (N)	Total(%)
1	HYPERTENSION	58	82.86%
2	CAD	1	1.43%
3	DM	15	21.43%
4	CURRENT SMOKER	3	4.29%
5	EX SMOKER	12	17.14%
6	ALCOHOL INTAKE	58	82.85%
7	CARDIOMYOPATHY	0	0.00%
8	ARRHYTHMIA	4	5.71%
9	OBESITY (B.M.I \geq 30)	13	18.57%
10	DYSLIPIDEMIA	6	8.57%
11	HISTORY OF O.C.P	0	0%

Table V : Socioeconomic status in stroke patients

SOCIO ECONOMICS STATUS		
	Male	Female
Upper	29	4
Lower	21	16

Table VI : Radiology investigations in stroke patients reviewed

RADIOLOGY INVESTIGATIONS IN STROKE			
1	C.T Scans	51	72.86%
2	M.R.I	19	27.14%

Table VII : Factors associated with the subtype of Ischemic Infarct.

Factors associated	Lacunar Infarct (Number of Patients)	N on-lacunar Infarct (Number of Patients)	Total	P-value
Ages ≥ 55 years	22	14	36/70 (51.43%)	0.7146
Male gender	27	17	44/70 (62.85%)	0.5954
Hypertension	34	20	54/70 (77.14%)	0.1745
T2DM	6	6	12/70 (17.14%)	0.4789
Hypertension + T2DM	6	6	12/70 (17.14%)	0.4789
Smoking status	5	6	11/70 (15.71%)	0.3136
Alcohol intake	35	16	51/70 (72.86%)	0.0037
Obesity	7	6	13/70 (18.57%)	0.6678

REFERENCES

1. AJAYI AO, OJO OO. Knowledge and perception of stroke among at risk medical out-patients in a tertiary health institution in Nigeria. *Ann Afr Med.* 2007 Jun;6(2):51–3.
2. BWALA SA. Stroke in a subsaharan Nigerian hospital—a retrospective study. *Trop Doct.* 1989 Jan;19(1):11-4.
3. NAMALE G, KAMACOOKO O, KINENGYERE A, YPERZEELE L, CRAS P, DDUMBA E, SEELEY J, NEWTON R. Risk Factors for Hemorrhagic and Ischemic Stroke in Sub-Saharan Africa. *J Trop Med.* 2018 May 31;2018:4650851.
4. NJOKU C, ADULOJU AB. Stroke in Sokoto, Nigeria: A Five-Year Retrospective Study. *Ann Afr Med* 2003;3(2):73-6.
5. O'DONNELL MJ, XAVIER D, LIU L, ZHANG H, CHIN SL, RAO-MELACINI P, RANGARAJAN S, ISLAM S, PAIS P, MCQUEEN MJ, MONDO C, DAMASCENO A, LOPEZ-JARAMILLO P, HANKEY GJ, DANS AL, YUSOFF K, TRUELSEN T, DIENER HC, SACCO RL, RYGLEWICZ D, CZLONKOWSKA A, WEIMAR C, WANG X, YUSUF S; INTERSTROKE INVESTIGATORS. Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study. *Lancet.* 2010 Jul 10;376(9735):112-23. doi: 10.1016/S0140-6736(10)60834-3. Epub 2010 Jun 17. PMID: 20561675.
6. ODUSOTE K. Management of stroke. *Niger Med Pract* 1996;32:56-62.
7. OGUN SA, OJINI FI, OGUNGBO B, KOLAPO KO, DANESI MA. Stroke in south west Nigeria: a 10-year review. *Stroke.* 2005 Jun;36(6):1120–2.
8. ONWUCHEWA A, BELLGAM H, ASEKOMEH G. Stroke at the university of port harcourt teaching hospital, rivers state, Nigeria. *Trop Doct.* 2009 Jul;39(3):150–2.
9. OWOLABI MO, AKAROLO-ANTHONY S, AKINYEMI R, ARNETT D, GEBREGZIABHER M, JENKINS C, TIWARI H, ARULOGUN O, AKPALU A, SARFO FS, OBIAKO R, OWOLABI L, SAGOE K, MELIKAM S, ADEOYE AM, LACKLAND D, OVBIAGELE B; MEMBERS OF THE H3AFRICA CONSORTIUM. The burden of stroke in Africa: a glance at the present and a glimpse into the future. *Cardiovasc J Afr.* 2015 Mar-Apr;26(2 Suppl 1):S27-38. doi: 10.5830/CVJA-2015-038. PMID: 25962945; PMCID: PMC4557491.
10. RAJEH S, AWADA A, NIAZI G, LARBI E. Stroke in a Saudi Arabian National Guard community. Analysis of 500 consecutive cases from a population-based hospital. *Stroke.* 1993 Nov;24(11):1635–9.
11. SACCO RL, KASNER SE, BRODERICK JP, CAPLAN LR, CONNORS JJ, CULEBRAS A, ELKIND MS, GEORGE MG, HAMDAN AD, HIGASHIDA RT, HOH BL, JANIS LS, KASE CS, KLEINDORFER DO, LEE JM, MOSELEY ME, PETERSON ED, TURAN TN, VALDERRAMA AL, VINTERS HV; AMERICAN HEART ASSOCIATION STROKE COUNCIL, COUNCIL ON CARDIOVASCULAR SURGERY AND ANESTHESIA; COUNCIL ON CARDIOVASCULAR RADIOLOGY AND INTERVENTION; COUNCIL ON CARDIOVASCULAR AND STROKE NURSING; COUNCIL ON EPIDEMIOLOGY AND PREVENTION; COUNCIL ON PERIPHERAL VASCULAR DISEASE; COUNCIL ON NUTRITION, PHYSICAL ACTIVITY AND METABOLISM. An updated definition of stroke for the 21st century: a statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke.* 2013 Jul;44(7):2064-89. doi: 10.1161/STR.0b013e318296aeca.
12. TSHIKWELA ML, LONDA FB, TONGO SY. Stroke subtypes and factors associated with ischemic stroke in Kinshasa, Central Africa. *Afr Health Sci.* 2015 Mar;15(1):68-73. doi: 10.4314/ahs.v15i1.9. PMID: 25834532; PMCID: PMC4370162.