NEUROEPIDEMIOLOGY/NEUROEPIDEMIOLOGIE

A DESCRIPTIVE EPIDEMIOLOGICAL STUDY ON STROKE IN KAMPALA, UGANDA: A HOSPITAL-BASED STUDY

EPIDEMIOLOGIE DESCRIPTIVE DES ACCIDENTS VASCULAIRES CEREBRAUX A KAMPALA, OUGANDA: UNE ETUDE HOSPITALIERE

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Key words: Africa, Epidemiology, Stroke

ABSTRACT

Background
Basic stroke features are hardly known in sub-Saharan countries, and no data are available in Uganda.

Objective
To characterize patients presenting with clinical stroke to Mulago Hospital.

Design
Descriptive epidemiological study.

Setting
Mulago National referral Hospital in Kampala, Uganda.

Participants
Patients presenting with clinical stroke from 1st July to 30th November 2006. Patients with confirmed stroke had comprehensive assessments for stroke risk factors.

Results
Among 139 patients presenting with clinical stroke, 127 had a non-contrast head CT scan and 12 died prior to scan. Eighty five patients were confirmed to have stroke while 42 had non stroke lesions. Among patients with confirmed stroke, 77.6% had ischemic stroke while 22.4% had hemorrhagic stroke. The mean age for all stroke patients was 62.2 ± 16.2 yrs and 51.8% were men. The incidence of both ischemic and hemorrhagic stroke increased with age. Atherosclerotic stroke was the most common ischemic stroke etiology, observed in 43.5% patients with ischemic stroke, while intraparenchymal hemorrhage was the most common hemorrhagic stroke etiology, observed in 78.9% of patients with hemorrhagic stroke. Hypertension was the commonest risk factor with more than 50% of all stroke patients reporting a history of hypertension, and more than half found to have blood pressure greater than 140/90 mm Hg. Physical inactivity and hypercholesterolemia were encountered in more than 36% and 30% of patients with ischemic and haemorrhagic strokes respectively.

Conclusions
Hypertension was the main risk factor for both Ischemic and hemorrhagic strokes in this study. This study provides important primary data on stroke in an African population and emphasizes the relevance of CT scan in stroke diagnosis.

INTRODUCTION

Stroke is recognized as a common cause of morbidity and mortality worldwide, and acute stroke has been recognized to have a particularly high mortality rate in African populations (2, 4, 9, 15, 21). Post-stroke complications such as infection, bedsores and lack of rehabilitation contribute to the high mortality rate, found to be as high as 62% at one year (5, 6, 15, 17). Despite this, there are very limited data on stroke in Sub-Saharan Africa, and to the best of our knowledge there are no published data on stroke in Uganda. In this study, we characterize a series of consecutive patients presenting with clinical stroke to Mulago Hospital in Kampala, Uganda.

METHODS

Setting:
Mulago Hospital is Uganda's national referral hospital and Makerere University School of Medicine teaching hospital. It is located in Kampala, and has an estimated 1,500 hospital beds in addition to operating rooms, a clinical laboratory, and Radiology Department, with highly trained personnel including Cardiologists and Radiologists.

Study period:
During a five month period from 1st July to 30th November 2006, 139 patients, 18 years and above, presented to Mulago Hospital's emergency and general medical wards with focal neurologic deficits reminiscent of acute stroke (20) and informed consent for participation in the study was obtained.
All patients were offered a free screening non-contrast head CT scan. 12 patients died prior to screening, suspected but not confirmed to have intracranial hemorrhage. 127 patients had a non-contrast head CT scan, typically performed on an average of two days post ictal. For those patients with a normal CT scan performed within 12 hours of symptom onset, a repeat CT scan was performed at 7 days to confirm diagnosis.

Ischemic strokes were classified according to the Trial of ORG 10172 in Acute Stroke Treatment or TOAST as, atherosclerotic, cardio-embolic, or other etiology to include lacunar and unspecified stroke subtypes (1). Hemorrhagic strokes were classified according to medical disability guidelines for definition of hemorrhagic stroke on non-contrast CT scan as intraparenchymal hemorrhage or subarachnoid hemorrhage (18).

Among patients found to have evidence of acute or subacute stroke on CT scan, comprehensive assessments for risk factors were obtained.

Regarding medical history from the patient or the attendant (The first choice of proxy was the spouse, live in companion, followed by a daughter/son (>18years), parent, sibling, or close friend of the patient), information sought for included selected socio- demographic characteristics, past medical/family history of stroke/TIA, diabetes, hypertension, high blood cholesterol, heart disease. Past medical history of the patient's HIV/AIDS status, past and current medications such as antihypertensive and antiplatelet drugs were also obtained. A physician's diagnosis of the aforementioned medical conditions made during previous clinic visits or hospital admissions was accepted. Lifestyle/social activities namely current smoking, alcohol consumption and physical inactivity were also obtained. Current smoking was determined as the number of cigarettes smoked per day, which was divided into 3 groups (5-15, 16 to 20 and >21 per day). Leisure time physical activity was categorized according to the exercises frequency into 3 categories of "never/rarely", "1 to 2 times per week", and "> 3times per week".

Alcohol consumption was based on the CAGE system (categorized as 1) no suspected alcohol problem, 2) Suspected alcohol problem 3) Alcohol abuse/dependency (3). Physical examination, included cardiovascular examination for irregular pulse, and anthropometry (waist circumference and hip circumference to obtain the waist-hip ratio), blood pressure measurements which were done twice at 5 minutes interval and the average values obtained classified according to the National Clinical Guidance Centre NICE, clinical guideline 34 (19).

Further risk factor assessment was obtained from laboratory testing. Blood samples were obtained every morning after patients had fasted for at least 8 hours overnight. Investigations done included fasting lipid profile and the values obtained were classified according to ATP III criteria of classification of lipids. Fasting blood sugar, treponema pallidum haemagglutination test were obtained from all patients. HIV serostatus of patients was obtained from the HIV routine counseling and testing programme on all medical wards.

Transthoracic echocardiography to exclude a cardio-embolic source (for example akinetic wall segment, mural thrombi, vegetations, and an ejection fraction of < 35%) and Doppler ultrasound of the carotid arteries to confirm or exclude presence of carotid stenosis and determine the degree, were also performed by a cardiologist with experience in this field, using the Phillips Sonos 4,500 machine.

This study was approved by the Makerere University Department of Medicine and the Makerere University Institutional Review Board. Partial funding for this study was provided by Uganda Heart Institute post-graduate research grant, as well as from Mulago Hospital.

RESULTS

The study population was derived from 139 consecutive patients presenting to Mulago Hospital with clinical stroke. Among these patients, 127 had a non-contrast head CT scan, and 12 died before a CT scan could be obtained. 85 patients were confirmed to have an acute or subacute stroke. 15 patients (10.8%) presenting with clinical stroke died during their hospitalization.

Regarding the patient population, 30 patients lived in Kampala district, 18 lived in Wakiso district and 37 lived in 18 other districts. 60% self-identified as part of the Ganda tribe. 34% were subsistence farmers, 25% had a small business, 19% performed housekeeping and 22% had other occupations or were not employed. 20 patients never attended school, 45 patients had only a primary level of education, 12 completed secondary education, and 8 completed college-level education. 40 patients self-identified as Protestant, 20 as Catholic, 17 as Muslim, and 8 as other religions.

Regarding stroke type, 77.6% had ischemic stroke while 22.4% had hemorrhagic stroke confirmed on head CT scan. The mean age for all stroke patients was 62.2 +16.2 yrs and 51.8% were men. The incidence of both ischemic and hemorrhagic stroke increased with age. Atherosclerotic stroke was the commonest ischemic stroke etiology, observed in 43.5% patients with ischemic stroke, while intraparenchymal hemorrhage was the most common hemorrhagic stroke etiology, in 78.9% of patients with hemorrhagic stroke. The incidence of stroke subtypes is presented in Table 1.

39 patients were determined to have stroke mimic and 3 patients had normal repeat imaging, with CT scan findings presented in Table 2.

Physical examination, laboratory and ultrasound findings are presented in Table 3.

More than 50% of patients with either ischemic or hemorrhagic stroke reported a history of hypertension, and more than half of patients were found to have a blood pressure greater than 140/90 mm Hg. However, only 27 patients (32%) reported sporadic use of anti-hypertensive medications, and only 7 patients (8%) reported regular medication use. Only 3 patients reported regular use of aspirin, and they all presented with an ischemic stroke. 16 patients were found to have an irregularly irregular pulse, but none of these patients were aware of a previous diagnosis of atrial fibrillation or were taking warfarin. 38 patients were found to have a fasting blood glucose greater than 126 mg/dl, consistent with a diagnosis of diabetes mellitus, but only 9 patients had a known previous diagnosis of diabetes. Atherosclerosis in the carotid arteries and cardiac left ventricular hypertrophy were commonly found on examination. 26 patients were found to have reactive serology for syphilis, and only 5 patients were found to have HIV.

DISCUSSION

Stroke is a relatively common presenting diagnosis to Mulago Hospital. In this study, diagnosis was based on non-contrast head CT scan, and 28% of patients presenting with a suspected stroke were found to have a non-stroke diagnosis a value much lower than 43% found in a study done in Nigeria (13) but still emphasizes the relevance of CT scan as gold standard in stroke diagnosis (11,13,15). The ratio of ischemic to hemorrhagic stroke was similar to other studies in African populations (12,14,15).

Commonly recognized risk factors, such as hypertension, hypercholesterolemia, and physical inactivity were frequently found in our population. Stroke was also more common in older individuals. 18 patients had a suspected cardio-embolic stroke, with 16 patients (18.8%) found to have an irregularly irregular pulse and two patients found to have severe valvular heart disease, making atrial fibrillation an important under-recognized cause of stroke in African populations (10,16).

A limitation of this study was that it is hospital-based, and our observations may not be representative of all strokes occurring in the community. Patients were either referred from a primary health care center or directly presented to the hospital. In addition, outcome data following hospitalization was not collected.

In the future, the global burden of cardiovascular disease and stroke will continue to rise, as life expectancy continues to increase. In developing nations such as Uganda, barriers to cardiovascular disease recognition and treatment include low educational levels and poverty. These factors can lead to difficulty with risk factor modification, and have likely contributed to the overall increase in stroke incidence by 20% in low and middle income countries compared to high income countries from 2000 (7, 8).

CONCLUSION

Commonly recognized risk factors, such as hypertension, physical inactivity and hypercholesterolemia, were frequently found in our population. Atrial fibrillation as an important cause of under-recognized stroke in African populations was also common among patients with cardio-embolic stroke. Clinical misdiagnosis of stroke still emphasizes the relevance of CT scan as the gold standard in stroke diagnosis. This study provides important primary data on stroke in an African population, and future studies should be directed towards increasing public recognition and treatment of cardiovascular disease and stroke risk factors in an effort to decrease morbidity and mortality from stroke.

Table 1: Incidence of ischemic and hemorrhagic stroke per gender and age group

	Ischemic stroke						Hemorrhagic stroke			
	Male N=35			Female N=31			Male N=9		Female N=10	
Age(y)	AS	CE	O	AS	CE	O	IPH	SAH	IPH	SAH
21-30	0	3	1	0	0	0	0	0	0	0
31-40	1	0	0	0	0	3	1	0	0	0
41-50	2	1	0	1	2	0	1	1	1	1
51-60	7	1	1	1	2	2	1	0	1	1
61-70	3	2	2	5	3	2	2	0	3	0
71+	7	0	4	5	4	1	2	1	3	0
Total	20	7	8	12	11	8	7	2	8	2

Legend:
Stroke subtypes are classified by the following abbreviations: AS, atherosclerotic; CE, cardio-embolic; O, other; IPH, intraparenchymal hemorrhage; SAH, subarachnoid hemorrhage.

Table 2: Non-contrast head CT scan findings among all patients

Non-contrast head CT scan finding	N (%)
Ischemic Stroke	66 (52.0)
Hemorrhagic Stroke	19 (15.0)
*Neoplasm	8 (6.3)
Severe brain atrophy	8 (6.3)
*Subdural hematoma	6 (4.7)
*Brain abscess	4 (3.1)
Toxoplasmosis	4 (3.1)
Normal repeated CT scan on day 7	3(2.4)
Intracranial hypertension	3(2.4)
Extensive calcifications	2(1.6)
Pan-sinusitis	1(0.8)
Meningoencephalitis	1(0.8)
Tuberculosis choroiditis	1(0.8)
*Chronic epidural hematoma	1(0.8)

*Surgically correctable
Legend:
127 patients underwent CT scan. N, number of patients with a given non-contrast head CT finding; %, percentage of all patients.

Table 3: Physical examination, laboratory and ultrasound studies of common stroke risk factors

Stroke subtype		
	Ischemic	Hemorrhagic
Past Medical History		
Hypertension	57.6	68.4
Physical inactivity	40.9	36.8
Diabetes mellitus	12.1	5.2
Current Smoking	7.6	5.2
Alcohol	18.2	21.1
Examination findings		
Irregularly irregular pulse	22.7	5.3
Syst >140mmHg	47	73.7
Diast >90mmHg	36.4	68.4

Laboratory findings		
Total cholesterol >200mg/dl	31	39
LDL cholesterol >110mg/dl	43.1	33.3
HDL cholesterol<40mg/dl	38	17
Triglycerides >150mg/dl	23.1	33.3
FBS >126mg/dl	43.1	55.6
Reactive TPPA	26.2	50
Reactive HIV serology	7.7	0
Ultrasound findings		
Atherosclerosis on CUS	46	46.7

Legend:
Values are a percentage of patients found to have ischemic and hemorrhagic stroke. Past medical history and examination findings were performed on 66 patients with ischemic stroke and 19 patients with hemorrhagic stroke, laboratory findings on 65 patients with ischemic stroke and 18 patients with hemorrhagic stroke, and ultrasound findings on 63 patients with ischemic stroke and 15 patients with hemorrhagic stroke.

Conflict of Interest/Disclosures
The author and co-authors have no conflicts of interest to disclose.

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