Stroke Burden in Rwanda: A Multicenter Study of Stroke Management and Outcome

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■ BACKGROUND: Cerebrovascular accidents or stroke constitute the second leading cause of mortality worldwide. Low- and middle-income countries bear most of the stroke burden worldwide. The main objective of this study is to determine the burden of stroke in Rwanda.

■ METHODS: This was a prospective observational study in 2 parts: 6 months baseline data collection and outcome assessment sessions at 1 year.

■ RESULTS: A total of 96 patients were enrolled in our series. Stroke constituted 2100 per 100,000 population. Of all patients, 55.2% were male and most (60%) were 55 years and older. Of all patients and/or caretakers, 22% were not aware of their previous health status and 53.5% of hypertensive patients were not on treatment by the time of the event. Median presentation delay was 72 hours for patients with ischemic stroke and 24 hours for patients with hemorrhagic stroke. Most patients had hemorrhagic stroke (65% vs. 35%), and more patients with hemorrhagic stroke presented with loss of consciousness (80% vs. 51%). Many patients (62% ischemic group and 44% hemorrhagic group) presented with severe stroke scores, and this was associated with worst outcome ($P = 0.004$).

At 1 year follow-up, 24.7% had no or mild disability, 14.3% were significantly disabled, and 61% had died.

■ CONCLUSIONS: Our results show that stroke is a significant public health concern in Rwanda. Risk factor awareness and control are still low and case fatality of stroke is significantly high. The significant delay in presentation to care and presentation with severe stroke are major contributors for the high mortality and severe disability rates.

BACKGROUND

Cerebrovascular accidents or stroke constitute the second leading cause of mortality and a significant cause of disability worldwide.[1] However, for the last 20 years, positive trends in outcome have been increasingly reported in high-income countries (HICs), where this problem has been addressed with nationwide awareness programs and timely advanced management strategies.[2] Despite this encouraging trend in disease control in the developed world, there is still a significant disease burden of stroke and its aftermath worldwide, and low-income countries are most hit.[1,3]

Despite the prevalent mortality and morbidity associated with stroke, there are limited data on stroke in sub-Saharan Africa. Most stroke studies in the region are community-based retrospective studies.[4]

About 16.8 million people have a new stroke annually. Low- and middle-income countries (LMICs) account for most of the burden of stroke-related mortality and disability-adjusted life years lost.[1]

This study is a first attempt to highlight the magnitude of stroke burden in Rwanda by determining stroke proportion and assessing hospital stroke management and 1-year outcome.

Key words
- Africa
- Hemorrhagic stroke
- Ischemic stroke
- Modified Rankin Scale
- Neurosurgical stroke series
- Rwanda
- Stroke outcome

Abbreviations and Acronyms
ER: Emergency room
HIC: High-income country
ICH: Intracranial hemorrhage
LIMC: Low- and middle-income country
LOC: Loss of consciousness
mRS: modified Rankin Scale

NIHSS: National Institutes of Health Stroke Scale
WHO: World Health Organization

This was a 2-centered study, based in both neurosurgical centers of the country; King Faisal Hospital, Kigali, and Centre Hospitalier Universitaire de Kigali.

METHODS

This was a prospective observational study in 2 parts. The first part was a 6-month prospective collection of descriptive data, in which all patients presenting to emergency departments at both study centers (King Faisal Hospital, Kigali, and Centre Hospitalier Universitaire de Kigali) with a definitive diagnosis of stroke were enrolled. Patients' data were recorded using the designed study data sheet. This phase of the study started on October 1, 2015 and ended on March 31, 2016. (See **Figure 1** for enrollment process flowchart).

The second part was outcome assessment sessions performed after 1 year. We carried out interviews of the previously enrolled patients from December 15, 2016 to January 15, 2017.

Inclusion

All age groups.

New-onset spontaneous cerebrovascular events as per World Health Organization (WHO) clinical definition of stroke.

Clinical presentation of stroke and radiologic confirmation of the diagnosis.

All stroke subtypes (ischemic and hemorrhagic).

Exclusion

Refusal of the patient or caretaker to be enrolled in the study.

All intracerebral hemorrhage secondary to neoplasm.

Dural sinus thrombosis without venous infarction.

Aneurysmal subarachnoid hemorrhage.

Data Analysis

The prospective descriptive data were logged in Epidata version 3.1. These data were later exported to STATA version 13.0. With this database, descriptive statistical analysis was performed. We performed comparative analysis of both study groups; patients with hemorrhagic and ischemic stroke using the χ^2 test. The limit for statistical analysis was set at $P < 0.05$.

Using modified Rankin Scale score at 1 year follow-up, we performed bivariate and multivariate analysis to identify factors associated with outcome.
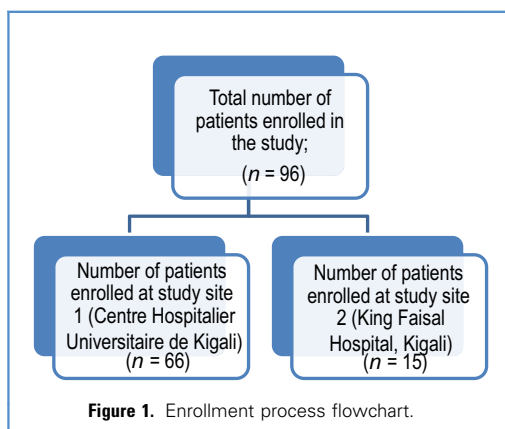
Ethical Considerations. This study protocol was approved by the ethics committees in both study centers (King Faisal Hospital, Kigali, and Centre Hospitalier Universitaire de Kigali). Before any enrollment in the study, the patients and/or their caretaker(s) were educated about the study and consented to voluntary participation.

Confidentiality precautions were rigorously followed.

RESULTS

Demographic Data, Stroke Proportion

The prospective part of the study enrolled 96 eligible patients with stroke during the study period. During this period, both study centers had a total of 4473 emergency admissions. This figure accounts for an overall hospital stroke proportion of 2.1%.

The mean age on presentation to the emergency room (ER) was 59.7 years, ranging from 23 to 91 years. Of these patients, most (60%) were 55 years and older, with the highest occurrence of ischemic stroke (71% vs. 57.4% for hemorrhagic stroke) in that age group.

There was a male predominance (55.2% vs. 44.8%). **Table 1** summarizes demographic data and baseline characteristics from the 96 patients included in the study.

Types of Stroke and Their Clinical Presentation

There were a strikingly high proportion of patients with hemorrhagic stroke compared with ischemic stroke; of the 96 patients, 63.5% had hemorrhagic and 36.5% had ischemic stroke (**Figure 2**).

Patients with hemorrhagic stroke presented more with loss of consciousness (LOC) and seizures than did patients with ischemic stroke (80% vs. 51% and 25% vs. 14% respectively). The difference was statistically significant ($P < 0.01$).

Other common presenting features prominent for both stroke types included hemiparesis (82% ischemic vs. 70% hemorrhagic), disturbed speech/aphasia (65% ischemic vs. 50% hemorrhagic) and headache (48% ischemic vs. 43% hemorrhagic) (**Figure 3**).

Risk Factors Assessment

Of patients and/or caretakers, 22% were not aware of their previous health status and as many as 53.5% of hypertensive patients were not on any form of treatment by the time of the event. Only 4 patients reported to have diabetes and 3 of them had an ischemic stroke. Other known stroke risk factors were also represented in our study population.

Overall, 16.8% had a positive history for transient ischemic attack. This risk was stronger in the ischemic stroke group, in which 28.6% of all patients who presented with ischemic stroke reported previous transient ischemic attack versus 10% in the hemorrhagic stroke group. See **Table 1** for risk factors.

There was a significant low level of awareness for most patients and caretakers about common stroke risk factors (e.g., 45% did not know their lipid profile status).

Furthermore, most patients with hemorrhagic stroke in our study (75%) had a proxy respondent (next of kin or caretaker) who knew the patient's previous health status; however, only 41% reported knowing that stroke was one of the complications of uncontrolled hypertension (**Table 2**).

Figure 1. Enrollment process flowchart.