Early Mortality and Associated Factors among Patients with Stroke Admitted to a Large Teaching Hospital in Tanzania

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Background: Stroke is a major cause of death worldwide and 85.5% of stroke deaths occur in low- and middle-income countries due to stroke. The aim of this study was to investigate correlates and predictors of 30-day mortality in stroke patients in urban Tanzania. *Methods:* A prospective 30-day follow-up study was conducted at the Muhimbili National Hospital, Dar es Salaam, Tanzania. We recruited all patients with stroke seen at the Emergency Medicine Department and medical wards. Patients underwent medical history and physical examination including full neurological examination. For those who met the criteria for the diagnosis of stroke according to the World Health Organization, further data were collected, including cholesterol, creatinine, fasting blood glucose, full blood picture, human immunodeficiency virus serology, and electrocardiogram. Patients were followed up at 30 days from the date of stroke onset. The date and the cause of death of those participants who died within 30 days of stroke onset were recorded. *Results:* A total of 224 patients were recruited into the study, with follow-up data available on 186 (83.0%). At 30 days post stroke, 124 patients (66.7%) were still alive. Mortality was significantly higher among stroke patients who were over 65 years of age. Of the 62 who died, 54% died of aspiration pneumonia and 21% of septicemia. Patients with infection were 4.4 times more likely to die than those

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Ethical approval and consent to participate: Ethical clearance to conduct the study was obtained from Muhimbili University of Health and Allied Sciences Ethical Review Board, and permission to do the study was obtained from the Muhimbili National Hospital management. Patients gave informed consent to participate in the study, or had a next of kin to provide consent for them, and then were recruited. Consent for HIV testing was obtained from those who could give consent and assent was obtained for unconscious patients.

Consent for publication: Consent for publication was obtained from all participants.

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without (P = .001). *Conclusions:* Poststroke mortality rates were high. Many deaths were potentially preventable. **Key Words:** Tanzania—stroke—mortality—case fatality—aspiration pneumonia—sub-Saharan Africa.

Introduction

Rates of stroke mortality have decreased worldwide in the past 2 decades.[1] However, the absolute number of people who have a stroke every year and live with the consequences of stroke or die from their stroke is increasing, most notably in low- and middle-income countries.[2] Mortality among stroke patients is highest in the first 30 days following stroke onset.[3]

Possible risk factors for early stroke mortality include delay in recovery of consciousness, new-onset acute myocardial infarction or congestive cardiac failure, aspiration pneumonia, and size of lesion.[4] However, mortality rates and risk factors for mortality are likely to vary widely from country to country, depending on genetic and lifestyle factors and levels of health-care provision. Although much is understood about predictors of stroke survival in high-income countries, there is much less data from low- and middle-income countries, and data from sub-Saharan Africa (SSA) are particularly sparse.[1] Hospital-based studies from Nigeria and Congo identified stroke severity, stroke type, and poststroke complications as predictors of short-term case fatality.[5,6] A large hospital-based study from Yaoundé, Cameroon, identified stroke severity, swallowing problems, high systolic blood pressure, and fever as predictors of 1-month case fatality.[7]

In the present study, we aimed to determined early stroke case-fatality rates and associated factors at the Muhimbili National Hospital, Dar es Salaam, Tanzania.

Methods

A prospective 30-day follow-up study was conducted at the Muhimbili National Hospital, Dar es Salaam, Tanzania. The Muhimbili National Hospital receives patients who are referred from all over the country and in most cases several days post stroke. The patients have therefore already survived to admission, but are typically disabled. The health-care system in Tanzania operates through dispensaries in villages, health centers in local government wards, and a series of district, regional, and zonal hospitals. There are 3 zonal hospitals that can refer to the Muhimbili National Hospital, the largest referral hospital in Tanzania. Around 3 stroke patients are admitted to the Muhimbili National Hospital per day. The cost of admission is usually met partly through government subsidy or through health insurance. For the present study, those who could not afford treatment were seen free of charge.

All patients aged 18 years and above, who had had a stroke within 30 days, were seen at the Emergency Medicine Department and the Mwaisela medical wards during a period of 6 months from January to June 2013. All participants gave informed consent or had a next of kin to provide assent.

The patients underwent medical history and physical examination, including full neurological examination by a doctor. For those who met the criteria for the diagnosis of stroke based on history and clinical findings according to the World Health Organization criteria for stroke definition, data were collected using a structured questionnaire, including demographics and relevant past medical history.[8] Age was calculated based on reported date of birth, and this was checked with relatives. Hypertension was defined as present if the patients had been taking antihypertensive medication or if their admission blood pressure was greater than 140/90 mm Hg. Diagnosis of diabetes was based on a known history.

An electrocardiogram was obtained along with blood samples for fasting serum cholesterol, serum creatinine, fasting blood glucose, full blood picture, and human immunodeficiency virus (HIV) serology. Consent for HIV testing was requested from those who could give consent and assent was requested for unconscious patients.

The patients had their temperature checked twice daily and fasting blood glucose every morning until they were discharged from the hospital. Hyperglycemia was defined by a fasting blood glucose level of 7.0 mmol/L or higher and a random blood glucose level higher than 11.1 mmol/L in nondiabetic patients, and a random blood glucose level of 8.5 mol/L or higher in diabetic patients.

All patients were given an appointment to attend the neurology outpatient clinic at 30 days from the onset of stroke. Patients who did not attend the neurology outpatient clinic were contacted by phone. Deaths within 30 days of stroke onset were recorded. For those patients who died outside the hospital, a verbal autopsy (VA) questionnaire was administered to a close relative who was present around the time of death. Cause of death was classified using the International Classification of Diseases, version 10, by 2 independent coders (the principal investigator and a professor in neurology).[9] A third coder adjudicated in case of disagreement on diagnosis. For those patients who died at the hospital, the probable cause of death was obtained from the patient's case notes and the burial permit. In cases where the primary cause of death was uncertain (e.g., patient dying with pneumonia and septicemia), medical notes were accessed and any