Long-Term Outcomes of Stroke in a Ghanaian Outpatient Clinic

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Background: Compared with high-income countries, sub-Saharan African (SSA) countries experience a comparatively higher early mortality from stroke. However, data on long-term mortality from stroke in SSA are lacking. *Objective:* Our aim is to assess long-term outcomes of stroke in an SSA setting. *Methods:* We conducted a retrospective analysis of longitudinal data involving 607 consecutive stroke survivor encountered at an outpatient clinic in Kumasi, Ghana, between January 2012 and June 2014. Data were closed for analysis in June 2016. Data on demography, presence of vascular risk factors, stroke type, and functional status were evaluated. We followed up subjects who were no longer attending clinic by phone to assess their vital status. Primary outcome was death after initiation of clinic care, and its predictors were determined using a Cox proportional hazards regression model. *Results:* Mean ± standard deviation (SD) age of cohort was 59.9 ± 13.9 years and 50.3% were female. Of the 607 stroke survivors, 377 (62.1%) were still alive, 59 (9.7%) were confirmed to have died, whereas 171 (28.2%) were lost to follow-up at the clinic. Mean ± SD observation time for the cohort was 32 ± 30 months. Upon adjustment for confounders, the independent predictors of mortality were age (adjusted hazard ratio [aHR] of 1.41 [95% confidence interval 1.15-1.73] for a 10-year increase in age) and diabetes mellitus (aHR of 2.24 [1.32-3.80]). *Conclusions:* Diabetes mellitus, a modifiable risk factor for stroke, is associated with an increased risk of mortality among West African stroke survivors over the long term. **Key Words:** Diabetes mellitus—Ghana—long-term outcomes—stroke—survival.

Introduction

More than four-fifths of the global burden of stroke is borne by populations living in low-and-middle-income countries (LMICs) to which all countries in sub-Saharan Africa (SSA) belong.[1-3] In these regions, stroke is characterized by a younger age of onset and is associated with high mortality rates in the immediate poststroke period.[4,5] The current surge in stroke burden in these settings is the result of rapid urbanization and adoption of Western lifestyles culminating in high rates of vascular risk factors, cardinal of which are hypertension, diabetes mellitus, dyslipidemia, and obesity.[6] Short-term mortality rates of stroke usually measured at 30-day poststroke onset have been reported and its predictors have been characterized in SSA, but there is a dearth of data on the predictors of long-term outcomes of stroke survivors on the continent.

Community-based studies on the trajectory of stroke survival would be ideal to assess long-term outcomes of strokes; however, such studies are difficult to

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implement in LMICs. One such prospective community-based study involving 130 stroke cases in Tanzania reported case fatality rates of 23.8% at 28 days, 60.0% at 3 years, and 82.3% at 7-10 years.[7-9] In another community-based study in Lagos state, Nigeria, involving 160 stroke cases, 30-day mortality was reported at 16.2%.[10] The remainder of such studies has been hospital based with short- to medium-term follow-up.[11-14] For instance, among 200 hospitalized South African subjects with ischemic stroke followed up for 12 months, case fatality was reported to be 38%,[11] similar to a report from Maputo, Mozambique.[12] All the cited studies did identify markers of stroke severity and age as independent predictors of stroke.[7-14] However, the hospital-based studies have had short- to medium-term follow-up periods and indeed none of the studies have evaluated the associations between vascular risk factors and long-term outcomes of stroke survivors under routine care settings.

A key guideline recommendation in prevention of adverse outcomes after stroke is vascular risk factor control, which should be implemented early and monitored rigorously to prevent stroke recurrence and other cardiovascular disease (CVD) events.[15] It is not clear from the literature which cardiovascular risk factors are associated with poor poststroke outcomes among African stroke survivors. This information is needed to craft culturally tailored interventions that would inform practice and help plan for resource allocation for stroke care, which is predicted to burgeon over the next few decades. This study aims to present data on all-cause mortality and its determinants among 607 stroke survivors who enrolled into the neurology clinic in Kumasi between 2011 and 2014. All-cause mortality was ascertained through verbal autopsies obtained from relatives of stroke survivors or medically certified deaths.

Methods

Study Settings

This retrospective study was approved by the Committee on Human Research Publication and Ethics of the Kwame Nkrumah University of Science and Technology. The study was conducted at the Neurology Clinic of the Komfo Anokye Teaching Hospital (KATH) in Kumasi, Ghana. Situated in the middle belt of Ghana, the KATH Neurology Clinic was established in 2011 to serve an estimated population of 15 million Ghanaians and receives referrals from 6 of 10 administrative regions of the country.[16] Approximately 65% of all patients in the neurology clinic are stroke survivors.[16] Stroke survivors are referred to the neurology clinic upon discharge from the ward as inpatients or from surrounding hospitals and clinics for follow-up care with a focus on secondary prevention and rehabilitation. At enrollment into the clinic, patient charts from inpatient are used at the neurology clinic for follow-up. Typically patients with stroke are scheduled for follow-up visits on months 1, 3, 6, and 12 with nonscheduled visits where necessary within the first year of enrollment. In subsequent years, follow-up visits to clinics are longer typically every 6 months.

Data Collection

Data were collected onto a questionnaire designed for the present analysis by a medical officer (G.K.). Variables collected included age, gender, marital status, occupation, religion, type of stroke, functional status of stroke survivors assessed using the modified Rankin scale, blood pressure measurements on admission and discharge as inpatients, and vascular risk factors. The following vascular risk factors were collected from patient folders: hypertension, diabetes mellitus, dyslipidemia, cigarette smoking history, alcohol use, and history of cardiac disease. Stroke types were determined based on cranial computed tomography (CT) scans performed within 10 days after stroke. The following definitions were used for vascular risk factors:

- Hypertension: A blood pressure cutoff of higher than or equal to 140/90 mm Hg for up to 72 hours after stroke, a history of hypertension, or use of antihypertensive drugs before stroke were regarded as indicators of hypertension.
- Diabetes mellitus was defined based on history of diabetes mellitus, use of medications for diabetes mellitus, an HBA1C greater than 6.5% or a fasting blood glucose levels greater than 7.0 mmol/L measured after the postacute phase due to the known acute transient elevation of glucose as a stress response after stroke.[17]
- Dyslipidemia was defined as total cholesterol higher than or equal to 5.2 mmol/L, high-density lipoprotein cholesterol lower than or equal to 1.03 mmol/L, triglycerides higher than or equal to 1.7 mmol/L, low-density lipoprotein higher than or equal to 3.4 mmol/L, or use of statin before stroke onset.[18]
- Cigarette smoking: Smoking status was defined as current smoker (individuals who smoked any tobacco in the past 12 months) or never or former smoker.[19]
- Alcohol use: Alcohol use was categorized into current users (users of any form of alcoholic drinks) or never or former drinker.
- Cardiac disease: Cardiac disease was defined based on a history or current diagnosis of atrial fibrillation, cardiomyopathy, heart failure, ischemic heart disease, rheumatic heart disease after evaluation using electrocardiography and echocardiography.

Follow-Up

The present analysis involves 607 consecutive stroke survivors who enrolled into the neurology clinic between January 2012 and June 2014, and data were closed for