Stroke Presentation and Outcome in Developing Countries
A Prospective Study in The Gambia

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Background and Purpose—Despite increasing burden of stroke in Africa, prospective descriptive data are rare. Our objective was to describe, in The Gambia, the clinical outcome of stroke patients admitted to the Royal Victoria Teaching Hospital in the capital Banjul, to assess mortality and morbidity, and propose preventive and therapeutic measures.

Methods—Prospective data were collected on consecutive patients older than 15 years old admitted between February 2000 and February 2001 with the diagnosis of nonsubarachnoid stroke. Risk factors, clinical characteristics, and social consequences were assessed using a modified National Institutes of Health Stroke Scale (mNIHSS), the Barthel Activity in Daily Living scale, the Siriraj score for subtypes, and the Bamford criteria for location/extension. Patients were followed-up at home up to 1 year after discharge.

Results—Ninety-one percent (148/162) of eligible patients were enrolled and followed-up. Hypertension and smoking were the most prevalent risk factors. Severity was high at admission, especially in women, and was strongly correlated to the outcome. mNIHSS and consciousness level on admission were strong predictors of the mortality risk. Swallowing difficulties at admission, fever, lung infection, and no aspirin treatment were, independently, risk factors for a lethal outcome susceptible to being addressed by treatment. Mortality was 41% in-hospital and 62% after 1 year. In survivors, autonomy levels improved over time. Drug compliance was poor. At home, family members provided care. Long-term socioeconomic and cultural activities were affected in most patients.

Conclusions—Case-fatality was high compared with Western cohorts. Preventive measures can be developed. Rational treatment, in the absence of head imaging for initial assessment, requires adapted protocols. Providers should be trained, both at hospital and community levels. (Stroke. 2005;36:1388-1393.)

Key Words: Africa ▪ developing countries ▪ prognosis ▪ recovery of function ▪ social support ▪ stroke ▪ stroke outcome

In industrialized countries, stroke is the most important single cause of severe disability and the third most common cause of death after coronary heart disease and cancer. In developing countries, increased life expectancy has modified the pattern of cause-specific mortality, with a higher burden of cardiovascular diseases. Community-based studies in African countries have shown that cerebrovascular diseases represent up to 5% to 10% of the causes of death, and that the prevalence of important risk factors for stroke (hypertension, diabetes, smoking) is increasing. High stroke case-fatality rates in resource-poor settings in Africa have been reported, but further studies are needed to define optimal management and limit short-term and long-term morbidity and mortality.

The purpose of this study was to investigate, in a West African urban setting, the characteristics of stroke patients during and after hospital admission, and the outcomes during the first year after the stroke. The assessment and description of the clinical situations and of the resulting disabilities and their social consequences, the study of the prevalence of known risk factors, and of the mortality rates aim to support rational life-saving and sequel-decreasing strategies.
or lasting more than 24 hours, with no apparent cause other than vascular origin.” Medical histories were obtained within 24 hours by the study investigators, whose role was strictly observational. RVTH medical staff were solely responsible for treatment and care. Clinical presentation on admission and evolution were described using standardized tools. Risk factors, sociodemographic, and systematic physical and neurological examination data were recorded. Age, when unknown, was approximated. The swallowing function was assessed by asking the seated patient to drink from a glass, and classified as normal or abnormal. After discharge, the patients were revisited at home at 1, 3, 6, and 12 months after stroke onset to assess residual disabilities and social consequences. The study was approved by the Gambia Government/Medical Research Council (MRC) Ethics Committee. Written informed consent was obtained from patient or family after discussion in local language.

**Risk Factors**

Hypertension, diabetes, smoking, and atrial fibrillation were considered. Patients were defined hypertensive when already treated on admission or when systolic blood pressure was >140 mm Hg and/or diastolic >90 mm Hg twice, >1 week after the stroke onset.

**Clinical Classification Scales**

The severity of the neurological deficit was assessed using the National Institutes of Health Stroke Scale (NIHSS). Higher figures correspond to higher severity. In industrialized countries, the NIHSS score has been correlated with the outcomes of both ischemic and hemorrhagic stroke. Two NIHSS items were modified: “what is the season?” and “who is the head of your compound?” replaced asking a patient his/her age and the current month.

Autonomy was assessed using a modified “Barthel Scale of Activity in Daily Living” (mADL). The modification consisted of replacing “the ability to walk up and down stairs” with “the ability to reach household facilities in separate buildings.” The mADL scale was used retrospectively for documenting possible prestroke disabilities and prospectively at discharge and follow-up visits.

In the absence of CT scan in the country, the stroke subtypes (hemorrhagic, ischemic, or undetermined) were classified using the Siriraj score, which uses as markers atheroma signs, the level of consciousness, and the diastolic blood pressure on admission, and the diastolic pressure on admission or when systolic blood pressure was >140 mm Hg and/or diastolic >90 mm Hg twice, >1 week after the stroke onset.

**Outcomes and Social Consequences**

Each patient’s economic and sociocultural activities were evaluated using a standardized questionnaire, retrospectively for the prestroke situation and prospectively during follow-up. In case of death, a standard verbal autopsy was performed with kin and relations. Four subgroups of primary cause of death were used: “irreversible coma,” “sudden death,” “stroke recurrence,” and “other.”

**Data Analysis**

Data were analyzed using Epi Info and SPSS. Student t test was used to compare means. Proportions were compared using χ² or exact Fisher test. Friedmann test was used to compare the medians of the mADL scores at different time points. Evolution of the mNIHSS scores was evaluated using a multivariate analysis of variance for repeated measures. Survival curves were estimated using Kaplan–Meier method and compared with the logrank test. Cox model was applied to derive crude and adjusted relative risks of mortality and their 95% confidence intervals (95% CIs). Relative risks were adjusted for severity at admission (mNIHSS) for each risk factor except for severity itself and “consciousness level,” a component of the mNIHSS. Probability values presented in Table 4 are those corresponding to Wald χ².

**Results**

**Patients and Follow-up**

Out of 162 eligible patients, 148 (91%) were enrolled: 3 (2%) declined to take part, 8 (5%) died, and 3 (2%) were discharged before enrollment; 143 of 148 (97%) were followed-up until their death or over a 1-year period. One subject was lost to follow-up after 3 months; 3 left the country after 6 months; and 1 lived abroad during the study period but was alive 1 year after his stroke. Occasionally, because of missing data, figures corresponding to <148 patients are noted in the results.

**TABLE 1. Clinical Characteristics of Stroke Patients on Hospital Admission**

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>P</th>
<th>All Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. right/No. left weakness</td>
<td>37/30</td>
<td>37/32</td>
<td>NS</td>
<td>74/62</td>
</tr>
<tr>
<td>Mean mNIHSS±SD (no.)</td>
<td>14.7±7 (72)</td>
<td>18.7±7 (74)</td>
<td>0.002</td>
<td>16±7 (146)</td>
</tr>
<tr>
<td>Consciousness level</td>
<td></td>
<td></td>
<td>0.030</td>
<td></td>
</tr>
<tr>
<td>Fully conscious, no. (%)</td>
<td>47 (64)</td>
<td>32 (43)</td>
<td>79</td>
<td>53 (53)</td>
</tr>
<tr>
<td>Drowsy or stuporous, no. (%)</td>
<td>20 (27)</td>
<td>30 (40)</td>
<td>50</td>
<td>34 (34)</td>
</tr>
<tr>
<td>Comatose, no. (%)</td>
<td>6 (8)</td>
<td>12 (16)</td>
<td>18</td>
<td>12 (12)</td>
</tr>
<tr>
<td>Clinical syndrome (Bamford)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PACS, no. (%)</td>
<td>17 (25)</td>
<td>18 (29)</td>
<td>35</td>
<td>27 (27)</td>
</tr>
<tr>
<td>TACS, no. (%)</td>
<td>23 (34)</td>
<td>23 (37)</td>
<td>46</td>
<td>35 (35)</td>
</tr>
<tr>
<td>Lacunar, no. (%)</td>
<td>11 (16)</td>
<td>7 (11)</td>
<td>18</td>
<td>14 (14)</td>
</tr>
<tr>
<td>POCS, no. (%)</td>
<td>4 (4)</td>
<td>2 (3)</td>
<td>6</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Undetermined, no. (%)</td>
<td>12 (18)</td>
<td>13 (21)</td>
<td>25</td>
<td>19 (19)</td>
</tr>
<tr>
<td>Type of stroke (Siriraj score)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischemic, no. (%)</td>
<td>25 (37)</td>
<td>17 (24)</td>
<td>42</td>
<td>30 (30)</td>
</tr>
<tr>
<td>Hemorrhagic, no. (%)</td>
<td>26 (39)</td>
<td>37 (52)</td>
<td>63</td>
<td>46 (46)</td>
</tr>
<tr>
<td>Undetermined, no. (%)</td>
<td>16 (24)</td>
<td>17 (24)</td>
<td>33</td>
<td>24 (24)</td>
</tr>
<tr>
<td>Swallow difficulty, yes/no (%)</td>
<td>39/29 (57)</td>
<td>51/18 (74)</td>
<td>0.040</td>
<td>90/47 (65)</td>
</tr>
</tbody>
</table>
Sociodemographic Characteristics at Admission

There were no statistically significant gender differences in sociodemographic characteristics of the cohort (73 men, 75 women). Median age was 64 (range, 24 to 96). Most patients were Muslims (93%) and right-handed (95%); 53% patients were economically active (contributed to the family income) before the stroke.

Stroke-Related Risk Factors

Out of 148 patients, 18 (12%) had another stroke previously. The prevalence of other risk factors was as follow: hypertension was found in 48% patients, excluded in 17%, unknown in 35%, diabetes in 5%, and atrial fibrillation in 4%. The only gender-dependent risk factor was smoking (less frequent in women [13%] than in men [52%]; \( P < 0.001 \)).

Clinical Characteristics

Most patients were admitted \(< 48\) hours after stroke onset. Median (quartiles) length of hospital stay in days was \( 9.4–13 \). The main clinical characteristics are presented in Table 1. The mNIHSS severity scores were significantly higher in women than in men. Eighteen patients (12%) were comatose at admission. The Bamford classification revealed, without gender differences, a high proportion of total anterior circulation strokes (TACS) compared with partial anterior circulation (PACS) and lacunar strokes. Based on the Siriraj score, hemorrhagic stroke was the most frequent subtype. Swallowing difficulties were frequent at admission, and more common among women than men. During hospitalization, 71% patients received aspirin medication. Physiotherapy was not systematic: only 47% patients had met a physiotherapist during admission, and available facilities were not used once discharged. On hospital discharge, 65% patients were on antihypertensive treatment.

Outcome

The complications were not gender-dependent. Fever (28%), lung infections (18%), and bedsores (7%) were the most prevalent; epilepsy occurred in 3 patients, and deep venous thrombosis occurred once. Sixty-one patients (41%) died during hospitalization. As shown in the Kaplan–Meier survival curve (Figure), most deaths occurred early after stroke onset. One, 3, 6, and 12 months later, 54%, 48%, 42%, and 38% of the patients were alive, respectively. Recorded causes of death included irreversible coma directly related to the initial stroke (33%), stroke recurrence (9%), and sudden death (5%). The other deaths were mainly caused by secondary infections and other decubitus complications. Among patients alive after 1 year, the mNIHSS scores revealed that the neurological deficits decreased significantly over time \( (P < 0.001; \text{Table 2}) \). The autonomy levels at hospital discharge were dramatically lower as compared with the pre-stroke figure and then progressively increased.

Treatment compliance was poor. Two-thirds of the patients had hypertension treatment at hospital discharge, and only
Enrollment and follow-up rates were high. The collection was aware, to have included long-term community-based follow-up. It is only the second study, as far as we are aware, to have included long-term community-based follow-up in an African setting. It is only the second study, as far as we are aware, to have included long-term community-based follow-up. It is only the second study, as far as we are aware, to have included long-term community-based follow-up. It is only the second study, as far as we are aware, to have included long-term community-based follow-up. It is only the second study, as far as we are aware, to have included long-term community-based follow-up. It is only the second study, as far as we are aware, to have included long-term community-based follow-up. It is only the second study, as far as we are aware, to have included long-term community-based follow-up.

Prognostic Factors

As shown in the lower part of the Figure and in Table 4, the mNIHSS at admission was highly predictive of the long-term mortality risk. Age was not a mortality risk factor. Being a woman increased the mortality risk, and this was because of increased stroke severity at admission, because it did not remain significant after adjustment for severity. The risk of dying after hemorrhagic stroke (Siriraj score classification) was higher than after an ischemic stroke (risk ratio, 2.5; 95% CI, 1.4 to 4.2; \( P=0.001 \)). Consciousness level at admission, one of the components of the mNIHSS score, was only slightly less predictive of dying than the whole mNIHSS score. Swallowing difficulties at admission constituted a significant risk factor for death, as well as for lung infection (not shown). Statistically significant prognostic factors for death recorded during hospitalization included fever, lung infection, and absence of aspirin treatment.

Discussion

This is a prospective observational study of stroke patients in an African setting. It is only the second study, as far as we are aware, to have included long-term community-based follow-up. Enrollment and follow-up rates were high. The collection of morbidity and mortality data allowed statistical analysis of predictive factors. Socioeconomic and cultural consequences of stroke were addressed. Possible sources of bias need to be considered. As a hospital-based study, the observations made may not be representative of all strokes occurring in the community. Most patients were either referred from a primary health care center without hospitalization facility or directly presented themselves to the hospital. In the absence of many other options for hospitalization in the study area, our data reflect the evolution of hospitalized stroke patients in The Gambia, whereas less affected patients remain at home and probably have a different outcome.

Our findings about risk factors are consistent with a previously observed high rate of hypertension and smoking in The Gambia. These factors are susceptible to preventive measures, but little is presently performed to put these in place.

The severity of the disease on admission was usually very high and associated to high mortality rates (41% during hospitalization; 62% at 1 year); 15% to 44% range of case-fatality rates in hospital have been found in other African hospital cohort studies, which is higher than in European countries. High severity on admission may be more severe in women for unexplained reasons. An increased proportion of hemorrhagic and TACS strokes, known to be more severe than ischemic and PACS ones, may also contribute to the high severity on admission. This contrasts with studies in developed countries and China, where PACS strokes outnumbered TACS ones. Studies have shown that compared with whites, Africans, and blacks have more hemorrhagic strokes. Other investigators have found all stroke categories to be more frequent in blacks than in...
CT scan studies in Africa have shown 5% to 7% misdiagnosis rates between stroke and mimicking diseases. Positive predictive values of the Siriraj score to classify ischemic and hemorrhagic stroke types are 61% to 93% and 63% to 97%, respectively. Further studies with CT scan confirmed stroke type diagnosis are needed in sub-Saharan Africa.

The 1-year Kaplan–Meier survival curve demonstrates the progressive diminution of case-fatality rate with time. Mortality was highest during the early poststroke period: ≈75% of deaths occurred during the first month after onset. After a dramatic initial decline in neurological function and autonomy levels, slow progress was noted in surviving patients; 78% of the survivors had, after 1 year, a mADL score ≥15, a figure similar to that found in a European study. Stroke-disabled patients often lived a quite isolated life, with less than half of the survivors going to social gatherings, mosque, or market. Participation in family life remained better: a majority resumed activities such as caring the children and attending family ceremonies. Less than half of the patients economically active before the stroke had 1 year later resumed a paid activity. Although patients had no access to formal rehabilitation therapies or public assistance, family members often dedicatedly provided home care (only few bed sores were observed).

The study confirms the predictive value on mortality of risk factors previously identified in industrialized countries. Simple measures, such as consciousness level and severity (mNIHSS score), are highly predictive of case fatality. Swallowing difficulties, lung infection, fever, and absence of aspirin treatment are other negative prognostic factors. A higher number of patients need to be studied to determine the role of bed sores as an independent mortality risk factor. Adequate initial and inpatient care are important factors for survival. Early control of nutrition and prevention of dehydration in cases of swallowing impairment are priorities. Infection prevention, prompt reaction to fever, and antibiotic treatment of infections, especially pneumonia, may significantly reduce mortality. Irreversible coma, directly related to the initial stroke, is a frequent circumstance of death almost out of therapeutic reach.

A surprising finding in the present study was the association of aspirin use, prescribed without clear clinical criteria by the local doctor-in-charge, with a significantly lower mortality rate. This observation appears to be in contradiction with the indication that hemorrhagic stroke was most common. Aspirin, as an anti-aggregant, is effective in the acute stage of ischemic stroke, but little is known about its effect in hemorrhagic stroke. In the CAST and IST studies, 800 noncomatose patients with reported ischemic stroke but with a final diagnosis of hemorrhagic stroke were given aspirin, without increased incidence of adverse effects. Given the low sample size of this study, the effect of aspirin treatment has to be considered with caution. Further investigation on aspirin use in stroke patients in whom CT scan is not available is warranted.

In developing countries, family participation in hospital and home care is essential for survival and quality of life after stroke. Because the medical system does not provide posthospitalization care, family members, often women, play essential roles in vital issues (fluid and food intake, body mobilization). Skilled community nurses could train these caregivers in essential routine tasks such as ensuring correct position during oral nutrition, avoiding inhalation, using simple physiotherapy, and avoiding/treating bed sores.

This study outlines the poor outcome of stroke patients hospitalized in The Gambia. Compared with what was found in a study conducted in 1990 in the same hospital, the high 1-month mortality rate has not decreased, and no substantial progress has been made. New preventive and therapeutic measures should be promoted to decrease the incidence of stroke, improve the outcomes, and maintain the survivors’ quality of life in The Gambia and similar sub-Saharan countries. Areas open to improvement include stimulation of early health-seeking behavior, correct treatment of complications (especially swallowing impairment, infections, and hypertension), adequate bed and home care, and compliance to treatment. The role of aspirin should be studied. The cost-effectiveness and feasibility of creating stroke units with specially trained staff should be assessed. Standardized protocols adapted to the local conditions should be developed, tested, and disseminated to health care providers and family members. This study is one of the few African ones currently available that can be used for promoting changes at the facility and the home levels for improving stroke care.

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References


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