ORIGINAL ARTICLE

Stroke recovery and its predictors in a Nigerian Teaching Hospital

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ABSTRACT
Background: The mortality rate from stroke in sub-Saharan Africa has been shown to be high. Not much, however, is known of recovery rate, thereafter.
Objective: To examine the degree of recovery after stroke.
Methodology: This is a prospective study that was carried out in Jos University Teaching Hospital, Nigeria. Fifty stroke survivors were followed up for 3months. Their degrees of recovery were assessed at 6weeks and 3months. Assessment tools were the *Barthel Index* and the *Modified Rankin Scale.* Statistical analysis was with Pearson's *Chi square.*
Results: There were 120 acute stroke patients that presented within the period. Seventy-eight (65%) of these survived. Fifty of these survivors (64.1%) were followed up, and at the end of the observation, at least 60% of them had good recovery. Few had functional dependence (disability). The only predictor of functional recovery was the National Institutes of Health Stroke Scale (NIHSS) score.
Conclusion: The recovery rate from stroke was good in this study despite a high mortality rate. The predictor of recovery was low NIHSS score, which emphasizes the impact of the degree of severity on recovery.

Keywords: Degree, disability, severity, survivors

INTRODUCTION

Stroke remains one of the major public health problems in the world today. It is the third leading cause of death after ischaemic heart disease and cancer.[1,2,3] Although stroke has been recognized as an important cause of death for many years, its importance in low income countries has only been recently emphasized. Stroke and other vascular diseases have been shown to increasingly contribute to the burden of disease in sub-Saharan Africa.[4] The endpoint of stroke is either mortality or survival.

Of the survivors, there will be varying degrees of recovery. The rule of "thirds" is used in stroke as a clinical guide: one third of the patients who have a stroke recover, either completely or with minimal residual disability; one third recover with residual disability; and about one third die.[5] It is estimated that 87% of stroke deaths occur in the developing countries.[6]

Stroke is the second most common cause of disability and low productivity as measured by "Disability Adjusted Life Years" (DALYs). It includes years of productivity lost to either death or varying degrees of disability.[1,2] In 1990, cerebrovascular disease caused 38.5 million DALYs throughout the world.[7]

Disability is defined as "any restriction or lack of ability to perform an activity in a manner or within the range considered as normal for a human being".[8]Functional independence (recovery) is the ability to carry out self-care tasks while functional dependence (disability) is the inability to carry out self-care tasks. The basic self-care tasks are feeding, grooming, dressing, talking, toileting including sphincteric control and mobility. These are called basic activities for daily living (BADL).

Independence in BADL could enable the stroke patient to live at home with help from family or community providers for meals and other household tasks as needed. *Barthel Index* and *Modified Rankin Scale*, amidst other assessment tools, are used to assess BADL.

Recovery from stroke is most rapid in the first three months following stroke. Continued improvement may still be seen beyond the first year. Motor recovery tends to reach a plateau more quickly than functional recovery with little change seen after 8-12weeks.[5]A study of 1197 patients with acute stroke showed that functional recovery was completed within 12.5weeks from the onset in 95% of the patients. However, 80% had

reached their best ADL function within 6weeks.[9]The authors concluded that a reliable prognosis can be made in all stroke patients within 3weeks of onset. Neurological and functional recovery should, therefore, not be expected after 5months. Recovery, however, can occur in stroke survivors in spite of extreme CNS damage and advanced age.

The neurophysiologic mechanism of recovery is not fully understood. Early recovery is often attributable to resolution of oedema and return of circulation to the ischaemic brain following stroke. Thereafter, there is neuroplasticity which is the ability of the central nervous system to modify its own structural organization and function.[10]Neurologic and functional recovery are both dependent on a large variety of factors such as initial stroke severity, body temperature and blood glucose in the acute phase of stroke, stroke in progression, and treatment and rehabilitation on a dedicated stroke unit.[9] The prognosis of patients with mild or moderate stroke generally is excellent. The time course of functional recovery is noted to be strongly related to initial stroke severity.[11]

The primary concern immediately after a stroke for the patients, relatives and caregivers is the prospect of recovery and quality of life, thereafter. In order to address this concern, studies in recovery are needed. The patient's recovery has important implications for the cost of care, length of hospital stay and caregiver adjustment.

Data on stroke mortality shows a high mortality all over the country ranging 21-45%.[4,12,13,14,15] Not much, however, has been done on recovery after a stroke in Nigeria. This may be largely due to the difficulty in the follow-up of patients after discharge in Africa.

We, therefore, undertook this study to examine the degree of functional recovery and its predictors after stroke, in our patients.

METHODOLOGY

This is a prospective study carried out in the Jos University Teaching Hospital (JUTH) in Nigeria to examine stroke recovery and its predictors. Jos is the capital of Plateau State. It is located in the North-Central Zone of Nigeria. The hospital serves as the referral centre in the State and also, for nearby States in North-Central Nigeria. The study was carried out between January 2006 and April 2007.

The participants were 50 stroke survivors who were followed up in the medical outpatient department for three months. All consecutive stroke survivors who were managed for acute stroke in JUTH and had given an informed consent were recruited for the study.

Stroke survivors who were managed elsewhere were excluded from the study. Persons who had transient ischaemic attacks or head trauma, patients with prior neurological diseases and consequent neurologic deficits, patients who had been deaf and mute from birth, and patients with prior diagnosis of dementia, were all excluded. Those with frequent seizures, recovery of all symptoms after correction of hypoglycaemia and gradual progression of neurological deficits were adjudged to have stroke-like syndromes, and excluded.

Stroke was defined as "rapidly developing signs of focal or global neurological disturbance of function, leading to death, or lasting longer than 24hours with no other cause other than vascular".[16]The diagnosis of stroke was made clinically with patients who had a history of sudden focal or global neurological deficits and examination features. The features included hemiparesis, aphasia, cranial nerve deficits, dysarthria and loss of consciousness. As at the time of the study, the centre did not have facilities for brain imaging, but, a few of the patients who could afford brain computed tomographic (CT) scan were sent to nearby centres for it. Only seven of the participants could afford it.

All the participants had a full neurological examination at the entry level and the National Institutes of Health Stroke Scale (NIHSS) score was recorded. The NIHSS stroke scale is an objective clinical tool used in the evaluation of stroke severity. It is designed to be simple and reliable and comprises 15 items of neurological examination. Neurological domains assessed are levels of consciousness, language, neglect, visual field loss, extra ocular movement, motor strength, ataxia, dysarthria and sensory loss.

The lowest score for each parameter is 0 and the highest may be 2, 3 or 4. Persons with a low score have less severe strokes while those with a high score have more severe strokes. High NIHSS score, therefore, signifies severe stroke and has been shown to be the best predictor of outcome. A sum of ≥16 forecasts a high probability or severe disability and a score of <16 forecasts good recovery.[17]

The participants had similar management protocols which were mainly supportive. No participant was commenced on antihypertensive medications within the first 2weeks of a stroke. Nobody had need for intravenous emergency blood pressure control, hence, there was no administration of intravenous antihypertensive drugs, and none was admitted into the intensive care unit. All survivors started physiotherapy within the first week of stroke which was continued after discharge. Antihypertensive drugs were commenced after 2weeks for those with hypertension. Other medications included insulin for those with high plasma

glucose, and aspirin 300mg was given to those with ischaemic stroke.

Secondary prevention included managing the risk factor, aspirin 150mg and lifestyle modification. The survivors were re-assessed at 6weeks and 3months. Assessment tools used were the *Barthel Index* and *Modified Rankin Scale (*m-RS*)*. Disability (functionally dependent state) was taken as a *Barthel Index* of<90 or an m-RS score of >1, while, recovery (functionally independent state) is taken as a *Barthel Index* ≥90 or m-RS score ≤1.

The data collected was recorded on a spreadsheet of *Microsoft Excel* and analyzed using SSPS version 20 statistical package. A multivariate logistic regression model was employed in determining the independent predictors of mortality, and *p-value <0.05* was taken as significant. Ethical Approval was obtained from the Ethical Committee of the hospital. An informed consent was obtained from each of the patients, and where it is not possible, from a responsible caregiver.

RESULT

A total of 132 stroke patients were admitted into the medical wards of the Jos University Teaching Hospital within the period of the study (July 2006 and March 2007). Of these, 120 patients met the inclusion criteria and were recruited for the study.

There were 74 (61.7%) males and 46 (38.3%) females. Forty-two (35%) patients died, while 78 (65%) survived. Thirty-one of the 74 males (41.9%) died while 43 (58.1%) survived. Eleven (23.9%) of the females died while 35 (76.1%) survived.

The Glasgow Coma Score (GCS) was <10 in twenty-nine (24.2%) and ≥10 in ninety-one (75.8%) patients. As much as 20 (69%) of the 29 with GCS <10 died, while 9 (31%), survived. Of the 91 patients who had a GCS

score ≥10, 22 (24.1%) died, while 69 (75.9%) survived (*p<0.001*).

The NIHSS score was <16 (low) in 64 (53.3%) and ≥16 (high) in 56 (46.7%) patients. Eight (12.5%) of the 64 patients with a low NIHSS score died while 56 (87.5%) survived. Thirty-four (60.7%) of the 56 patients with high NIHSS score died while 22 (39.3%) survived (*p<0.000*).

Of the 78 survivors, 5 were left the hospital against medical advice, whereas 73 were formally discharged. Only 50 patients, comprising 24 (55.81%) males and 28 (80%) females, had regular follow-up, *p=0.000.*

The *Barthel Index* assessed after 3months of observation was ≥90% in 41 (82%). The m-RS was ≤1 in 30 (60%) of the participants. Twenty-five patients (50%) had complete recovery with no residual deficits (*Barthel Index* of 100 and m-RS of 0). Forty-two patients (84%) had good recovery with a m-RS ≤1 and / or *Barthel Index* ≥ 90%.

Multivariate analysis showed NIHSS score as the only independent predictor of recovery after adjusting for the effect of age, gender, history of previous stroke, fever, stroke type and hyperglycemia (Table 1). Age, sex, educational status, type of stroke, fever, hyperglycaemia and loss of consciousness were not predictors of functional recovery.

DISCUSSION

The survival rate in our study was 65%. Our study showed that most of these survivors had functional independence (recovery). The *Barthel Index* was ≥90 in 82% of the survivors. The *m-RS* score was <1 in 60% of the survivors, which was indicative of recovery, also. The percentage of those with recovery in this study, however, differs from what is shown in similar studies on outcome.[18]The difference may be because of the different end points used by different studies. For the

Barthel Index, the endpoint ranges from 50-95 in different studies.[17,18]

Age, sex, educational status, fever, hyperglycaemia, the presence of comorbid conditions and complications were not predictors on univariate analyses. The type of stroke was not also a predictor of recovery. In essence, those with less severe stroke will make good recovery, irrespective of the type of stroke.

Two of the survivors had a repeat stroke within the period of observation. This repeat stroke greatly altered the outcome of the stroke. A previous stroke is an independent risk factor for stroke which may be largely due to the continued impact of the predisposing uncontrolled risk factor. Other Nigerian studies have found a previous stroke to be a risk factor for stroke.[13,19]

The participants who were withdrawn from the hospital against medical advice cited lack of funds was their main reason. But based on previous experiences and reports, it is possible that the relatives wanted to try alternative medicine. This finding, however, is a marked improvement from a previous study in Nigeria which showed that as much as 19% stroke patients were withdrawn from the hospital against medical advice.[15]

Anecdotal reports have shown that stroke is generally believed to be a spiritual disease in Africa. Africans seek health care from alternative health practitioners like churches and traditional healers.[20]

We, also, noted a high attrition rate in our participants. Seventy-eight patients survived the stroke, with a high percentage of the women surviving. Surprisingly, we found that women were more likely to come for follow-up than men. This finding is interesting and calls for further studies, because, as much as 21(26.9%) were lost to follow-up. This degree of attrition greatly influenced on our study.

Some of our patients lived in the rural areas and are brought to the hospitals in the cities by their relatives, and at discharge, they usually travelled back to their homes. Follow-up for such patients was hampered by ignorance, distance and care-giver unavailability, aside lack of funds, poor accessibility of the healthcare facility and communication breakdown.

A much earlier study in Nigeria with 318 participants noted an attrition rate of 47% out of the 76 survivors. The conclusion from that study, which is replicated here, was that it was difficult to follow-up African patients after discharge.[21] Further studies on recovery after stroke will be needed in other centres in the country considering the fact that recovery is a grey area.

The main limitation of this study was the unavailability of CT scan in JUTH at the time of study and patients had to be sent to nearby centres. Predictably, only 7 patients underwent the investigation because of cost.

CONCLUSION
In spite of the high stroke mortality seen in Nigeria, recovery as measured by the *Barthel Index and Modified Rankin Scale* is good. Our patients had functional independence after 3months. The only predictor of the degree of recovery was the NIHSS score. This good outcome for the survivors was mostly because they had milder strokes. In essence, the less severe the stroke, the more likely it is to survive and recover, irrespective of all other factors.

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