

ORIGINAL ARTICLE

Pre- and Intra-hospital Delays to Acute Stroke Treatment in a Tertiary Hospital in North-East Nigeria

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ABSTRACT

Background: Recombinant tissue plasminogen activator (rtPA) was approved a decade ago for the treatment of acute ischaemic stroke. The guidelines for its use include stroke onset within 3 hours of intravenous drug administration, preceded by a computed tomographic (CT) scan to exclude the presence of haemorrhage, which is a contraindication to the use of the drug. Thrombolytic therapy in acute ischaemic stroke is currently not in use in Nigeria.

Objective: We sought to study the time, pattern of presentation of acute stroke patients to emergency room and intra-hospital delays in a Nigerian tertiary hospital.

Methodology: A cross-sectional study was carried out between February and November 2015 at the Accident and Emergency room of Federal Medical Centre, Gombe. Eighty-five consecutive patients aged 18 years and above with symptoms and/or CT findings consistent with stroke were recruited. Patients who could communicate or their identified care givers were interviewed within 48 hours of admission using a structured questionnaire.

Results: Forty-five (52.9%) were males. The mean age was 62.1±13.0. Six patients (7%) presented within 3 hours, and the median arrival time for all subjects was 50.9 hours. Consultation at another hospital ($p=0.00$), past history of stroke ($p=0.05$), and increasing distance from hospital (0.05) were associated with delayed presentation.

Conclusion: Majority (>90%) of acute stroke patients presented after first 3 hours. A minority of patients met the time criteria for thrombolytic therapy. There is a need to increase the awareness regarding early recognition, presentation and diagnosis of stroke for timely intervention in Nigeria.

Keywords: Computed tomography, pre-hospital delay, outcome, stroke onset, treatment

INTRODUCTION

Stroke or cerebrovascular disease is a syndrome caused by the impediment or cessation of blood flow to a part of the brain or it could result from the rupture of blood vessels nourishing the brain. Worldwide, it is the second leading cause of death and the

leading cause of adult disability, with over two-thirds of these deaths occurring in developing regions of the world, such as sub-Saharan Africa (SSA).^{1,2}

African countries are undergoing an epidemiological transition driven by socio-

demographic and lifestyle changes.³ It is likely to worsen over the next two decades based on the projections by the World Health Organization (WHO). The incidence of stroke in developing countries like Nigeria is expected to rise in the future as the population undergoes a "health transition", from less of infectious diseases, and diseases related to poverty and malnutrition to more of non-communicable diseases. A stroke study in an urban community in Lagos, South-West Nigeria, revealed an overall crude prevalence rate of 1.14 per 1000.⁴

The diagnosis and determination of stroke type requires neuroimaging with computed tomography (CT) of the brain. A brain CT is usually the first line imaging modality required to differentiate ischaemic from haemorrhagic stroke. With the increasing availability of CT scanners in Nigeria and increased scanner sensitivity for ischaemic stroke, it is recommended that a suspected stroke patient should have a MRI within 3 hours of symptom onset to allow for appropriate intervention to arrest progression of neurological deficits.⁵

Prompt treatment of acute ischaemic stroke with intravenous thrombolysis using alteplase is the only approved treatment in highly selected individuals when administered between 3 and 4.5 hours of stroke onset.⁶ Albeit, a lack of recognition of the warning signs of stroke is a global problem; early stroke presentation in developing countries, within this limited time window is extremely difficult for several reasons; ranging from poor stroke recognition to limited socio-economic and infrastructural facilities.⁷⁻¹⁰ In developing countries like Nigeria, there is dearth of data on the presentation time of stroke patients for imaging and delays in imaging are not uncommon even in developed countries.^{7, 8, 11, 12}

Thus, we set out to determine the time lag between stroke onset and acquisition of brain CT in patients presenting to determine the delay from onset of acute stroke and the

proportion of acute stroke patients presenting within three hours to the Emergency Room.

METHODOLOGY

This was a cross-sectional study carried out between February and November 2015 at the Emergency Room (ER) of this facility. It was approved by the Ethical Committee of Federal Teaching Hospital Gombe, Nigeria, and an informed consent was obtained from each patient or identified care givers. Eighty-five Black Nigerian Africans aged 18 years or above with symptoms of stroke based on WHO clinical definition and neuro-imaging using CT brain scan consistent with stroke were included. Patients who developed stroke in the hospital were excluded from the study.

All patients who presented at the ER of the facility with symptoms of stroke were evaluated by a neurologist who is the lead investigator. A thorough clinical examination was conducted. Time of stroke onset was defined as the time the patient or an observer first noted a neurological deficit. If the symptoms were present on awakening, it was assumed that stroke had occurred during the night and the time of onset was taken when the patient was last seen without symptoms. The exact time of arrival at hospital is routinely marked on the form of ER. Delay was considered if the time of arrival at hospital was more than three hours from the time of onset of symptoms based on the American Heart Association and American Stroke Association criterion. The length of delay from onset to admission was calculated on the basis of the exact or estimated hour of onset and the time of arrival in the ER.

A standard structured questionnaire was completed for every patient by interviewing the patient (if possible) and accompanying attendant/relative, after obtaining a verbal consent. The questionnaire documented the patient's age, sex, past history of stroke, educational level and occupation (financial support), and also, whether the patient lived with a relative or alone. The patient/attendant was asked whether he believed that the symptoms would improve

spontaneously (low threat perception), and if he had first contacted his local doctor or tried an alternative medicine. For the purpose of this study, time elapsed between onset and casualty arrival was taken as an outcome variable.

We used the software package, SPSS for Windows version 16.0 (www.spss.com). Baseline demographic characteristics were summarized using mean \pm SD for continuous variables and proportions for categorical variables. Mean age was compared between males and females using the Student's t-test. The average delay before presentation was calculated as the median (in hours) of the individual delay determined for all the participants. The proportions arriving within 3, 6, and 24 hours were calculated as percentages of the total number of patients who arrived within these time periods, respectively. Intra-hospital delay was estimated by two parameters, namely median delay from presentation to first contact with the medical team, and median time delay from presentation to performance of brain CT scan.

RESULTS

The mean age, educational attainment, gender and occupation of the participants are shown in *Table 1*. Eighty-five stroke patients were recruited for the study. The mean age was 62.1 ± 13.0 years. There was doubt about the onset time of symptoms for one patient and was excluded from further analysis. Of the remaining 84 patients, 69 (82.1%) had ischaemic and 15 (17.9%) had haemorrhagic stroke. Of these 84, delay from symptom onset to presentation ranged from 26 minutes to 888 hours, with a median value of 50.9 hours. Only 6 (7.1%) presented within 3 hours, 12 (14.3%) within 6 hours, and 38 (45.2%) within 24 hours of symptom onset. All the patients were first attended to by the casualty officers on duty before the medical team was invited to review.

The time spent at the Emergency Room, ER, before the first review by casualty officers ranged from 0 to 7 hours, with a median delay

of 25 minutes. The total time lost from arrival in the ER to final review by the medical team ranged from 15 minutes to 15.4 hours, with a median value of 4.9 hours. The delay from arrival to performance of brain CT scan ranged from 4 hours to 528 hours with a median delay of 48 hours. The mean distance from the residence to the hospital was 22.5 ± 8.2 km. All patients were conveyed to the ER by public/private vehicles.

Factors that contributed to early hospital consultation included living in the city, domicile at distance of 10 km or less from the tertiary hospital, relatives with higher educational attainment, deeply unconscious patients and symptom recognition.

Table 1. Demographic characteristics of the participants

Age group (yrs)	Males N=45, (%)	Females N=40, (%)
18-30	-	-
31-40	4 (8.9)	2 (5.0)
41-50	7 (15.6)	6 (15.0)
51-60	9 (20.0)	10 (25.0)
61-70	14 (31.1)	14 (35.0)
71-80	8 (17.8)	6 (15.0)
81-90	3 (6.7)	2 (5.0)
Marital Status N=85, (%)		
Single		2 (2.4)
Married		59 (69.4)
Divorced		-
Widow/Widower		24 (28.2)
Formal Education N=85, (%)		
None		55 (64.7)
Primary		13 (15.3)
Secondary		5 (5.9)
Tertiary		12 (14.1)
Occupation N=85, (%)		
Manual Workers		23 (27.1)
Non-manual Workers		37 (43.5)
Economically inactive		25 (29.4)

DISCUSSION

The findings of this study indicate that majority of our population of Black Nigerian patients of stroke had some delay in seeking treatment in hospital. This is in agreement with most previous reports from other developing countries in Africa, Asia and

some developed countries, with similar experimental designs. In a comprehensive review of pre-hospital and in-hospital delay times in acute stroke care, the majority of the delay to treatment is attributable to the pre-hospital portion consistent with what others have reported.¹³

Addo and colleagues reported a median time to presentation of 4.73 hours and 39.5% of multi-ethnic south London population presented within 3 hours of symptom onset; and patients of black ethnicity had increased odds of delay whereas those with more severe strokes had reduced odds of delay.¹⁴ In a study from India, the median time to ER arrival was 7.66 hours with 25% of cases arriving within 3 hours and 49% within 6 hours.¹⁵

A lack of recognition of the warning signs of a stroke is a global problem. In an Australian study, 32% of patients with acute stroke did not present in the first 12 hours.¹⁶ In the United Kingdom, it was estimated that 70% of all patients with strokes were managed at home and never were admitted to the hospital.¹⁷ A published report by Duke University conducted between 1985 and 1987; found that only 37% of patients with strokes presented within 24 hours.¹⁸ Ogbole and co-workers, in a retrospective study from South-West Nigeria, reported that none of their stroke patients sought neuroimaging within 3 hours, while 6 (7.2%) had CT brain within six hours of onset of stroke symptoms.¹⁹ Majority of their patients had cerebral infarction that, otherwise, qualified but, could not have received therapy with rtPA.

While the reasons purported for early arrival to hospital were similar to those reported in other studies, we found that low educational attainment played an important factor in delayed presentation to hospital in our population.²⁰ Patients with haemorrhagic strokes experienced reduced delays than those who had ischaemic stroke. These findings imply that the perceived urgency due to severity of the condition may be a factor contributing to decreased pre-hospital

delay. Similar findings were reported in studies using different measures of stroke severity.^{21,22}

Factors causing early arrival of patients with stroke vary across different countries. It seems that arrival by ambulance, sudden onset of symptoms, and severe stroke are factors leading to early arrival in most of the developed nations. Studies from other Asian countries have shown that contact with a local doctor, lack of knowledge of stroke symptoms, intracerebral haemorrhage, younger age, transfer by ambulance, and history of coronary artery disease were reasons for delayed consultation.^{23,24} The factors for early presentation to our study population are slightly different from the European and Asian studies. This can be explained by variation in geographic, demographic, and organizational factors.

The developing world carries the highest burden of stroke mortality and stroke-related disability. The number of stroke patients receiving r-tPA in the developing world is extremely low; and indeed, none in Nigeria.

It is evident from this and other studies in Nigeria that ischaemic stroke is the most common type of stroke; and those who had presented to hospital within 3 hours could have been candidates for thrombolysis. There are also cultural and religious barriers that impede early presentation, even when stroke is recognized. Stroke thrombolysis is currently used in few developing countries like Brazil, Argentina, Senegal, Iran, Pakistan, China, Thailand, and India.²⁵

We, duly, acknowledge the limitations in our study being a single-centre study, using a small sample size. But this study provides a useful, representative picture of the current issues of pre-hospital delay of acute stroke in northeast Nigeria. Though the cost and non-availability of thrombolytic agents are major drawbacks of our current system of acute stroke care, we are faced with more pervasive issues as late presentation and unnecessary delays in ER.

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