ACUTE STROKE ONSET TO PRESENTATION AND COMPUTED TOMOGRAPHY IN A TERTIARY HOSPITAL, NORTH CENTRAL NIGERIA

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ABSTRACT

Background: The burden of stroke is immense. Timely presentation and interventional treatment options have shown promising outcomes in acute stroke patients. This is a luxury that the developing world is yet to see being practiced routinely. Patients need to present early enough for targeted treatment to be instituted, this however, is yet to be achieved in many parts of the developing world.

Objective: To study the duration from acute stroke onset to presentation to the hospital and the time it takes patients to get a brain Computed Tomography (CT) scan with a view to relating it with patient outcome.

Methods: This study was conducted between April 2014 and September 2015 on acute stroke patients that presented at the emergency unit and had CT within one week of ictus. Duration from acute stroke onset to presentation at the hospital and duration from ictus to performing CT scan were noted, this was related with the modified Rankin scale(mRS) assessment outcome. Collected data were analyzed with Statistical Package for Social Sciences (SPSS) version 20.0 and statistical level of significance was set at $P \leq 0.05$.

Results: One hundred and fifty-three acute stroke patients were observed. Only 2 patients presented less than 3 hours from onset of stroke and no patient had a CT at less than 3 hours from ictus. The relationship between sex of the patient and duration from stroke onset to presentation and duration to CT were significant, while relationship between type of stroke and patient mRS outcome assessment were not significant in both categories of duration.

Conclusion: Majority of acute stroke patients present rather late to the hospital. A lot still needs to be done to improve public education about acute stroke care and the importance of early presentation.

KEY WORDS: Computed Tomography, Modified Rankin Scale, Acute, Stroke, Interventional

INTRODUCTION

Despite advances made in stroke care in more advanced parts of the world, what is obtainable in Nigeria is still sub-optimal with many limiting factors that include prehospital constraints, financial constraints and lack of infrastructure. The 2005 update of the heart disease and stroke statistics update says 700,000 patients have stroke every year and 167,000 die each year with many suffering major disability[1] The use of thrombolytic agents such as intravenous(IV) recombinant tissue plasminogen activator (rt-PA) in acute ischemic stroke is time bound as it has to be

given within 3 hours of stroke onset. Earlier administration of IV rt-PA after stroke onset has been associated with better functional recovery.[2] Studies have tried to look into how quickly patients arrive at the hospital following stroke onset. More advanced parts of the world have better health care systems and we see shorter duration of presentation to the hospital hence thrombolytic therapy can be instituted in patients that are eligible.[3] However, in the less developed world, patients do not have access to good health care, public enlightenment about stroke is still very poor and leaves much to be desired.

This study will be a background for sensitizing health institutions and the public in our setting on quick presentation to the hospital for early evaluation and CT scan to be done since only then can targeted interventional treatments be instituted so the functional recovery of the patients can be better.

Our study aimed to determine the duration from stroke onset to presenting to the hospital and also the timing to having a brain CT with a view to relating it to the type of stroke and also to patient's clinical outcome.

MATERIALS AND METHOD

This study was prospectively conducted at Jos University Teaching Hospital from April 2014 to September 2015. Approval was obtained from the Research and Ethical Committee of the institution with reference number (JUTH/DCS/ADM/127/XIX/5905 21st March 2014). Written informed consent was obtained from all the subjects or their legal representatives.

Subjects aged ≥18 years with acute stroke history of less than seven days were included in the study. Patients presenting with a repeat stroke or patients having causes of focal neurologic deficit other than stroke or stroke-like syndromes after CT had been done were excluded.

Subjects who met the inclusion criteria were recruited consecutively by the lead author.

All scans were done using a made in USA Four (4) slice General Electric (Bright speed) series CT scanner year 2006/07, model number XG001G-JS-001-GAN using the standard protocol for head scan.

Information about the time of onset of symptoms and presentation to the hospital was gotten from the patients folder as reviewed by the on-call neurologist while the time between onset of symptoms and carrying out the CT scan was extrapolated using CT console record showing the exact time and date the CT was done.

A follow up of each patient's case note was done to get the 30-day outcome. The outcome was defined using the modified Rankin scale (mRS), a functional outcome assessment scale used to assess disability with scores ranging between 0 to 6, where 0; No symptom at all, 1; No significant disability despite symptoms; able to carry out all usual duties and activities, 2; Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance, 3; Moderate disability, requiring some help, but able to walk without assistance, 4; Moderately severe disability; unable to walk without assistance unable to attend to own bodily needs without assistance, 5; Severe disability; bedridden, incontinent and requiring constant nursing care and attention and 6; Dead.[4] We defined good outcomes as mRS score of 0 through 3.

Frequency distribution and percentages for duration (in hours) were done. Likewise, the mean and standard deviation of these durations were measured. Chi-square for categorical values and correlations were used as

appropriate. The collected data were analyzed with Statistical Package for Social Sciences (SPSS) version 20.0 (Microsoft® Inc. Chicago, Illinois, USA. 2011). The statistical level of significance was set at $P \leq 0.05$.

RESULTS

One hundred and fifty-three acute stroke patients comprising of 75(49%) females. Age range of 18-90 years with mean age±standard deviation (SD) of 57.97±14.21 years. One hundred and nine (71.2%) had ischemic stroke while 44(28.8%) were hemorrhagic stroke patients.

The mean duration from onset of symptoms to presentation at the hospital was 52.7±46.4 hrs. Minimum and maximum duration before presentation to the hospital post stroke were 1 and 144 hours respectively. Only 2 patients (1.3%) presented less than 3 hours post ictus while 57 patients making up 37.3% presented after two days from onset of acute stroke symptoms (table I).

Table I: Distribution of patients by duration(hours) between onset of symptoms and presentation to the hospital

Time	Frequency(f)	Percentage (%)	Mean ± SD.
< 3 hours	2	1.3	52.7±46.4 hrs.
3 - 6 hours	17	11.1	
7 - 12 hours	27	17.6	
13 - 24 hours	27	17.6	
25 - 48 hours	23	15.0	
> 2 days	57	37.3	

(Total = 153) SD= Standard Deviation

No patient presented less 3 hours between onset of symptom and CT scan. Minimum and maximum duration post ictus before CT scan were 5 and 168 hours respectively. More than half of the patients (52.3%) presented for CT scan after 2 days. Mean presentation time between onset of symptoms and CT scan was 69.3±49.0 hours (Table II).

Table II: Distribution of patients by duration(hours) between onset of symptoms and CT scan

Time	Frequency	Percentage (%)	Mean±SD.
< 3 hours	0	0.0	69.3±49.0 hrs.
3 - 6 hours	2	1.3	
7 - 12 hours	11	7.2	
13 - 24 hours	30	19.6	
25 - 48 hours	30	19.6	
> 2 days	80	52.3	

(Total = 153) SD= Standard Deviation

More female patients (49.3%) presented less than 24 hours from onset of symptom. On the other hand, more male patients (43.6%) presented >2 days from the onset of symptom. This was statistically significant (P =0.017) (Table III).

Table III: Relationship between sex distribution and time between onset of symptoms and presentation to the hospital

Time	Sex			Chi-square	P value
	Male N (%)	Females N (%)	Total N (%)		
< 24 hours	21(26.9)	37(49.3)	58(37.9)	8.165	0.017
24 - 48 hours	23(29.5)	15(20.0)	38(24.8)		
> 2 days	34(43.6)	23(30.7)	57(37.3)		

P = 0.017   N=Number   %=Percentage

There was no significant relationship between the type of stroke and the duration between onset of symptoms and presentation. However, more ischemic stroke patients presented less than 24 hours from onset of symptom (*P* =0.446) (Table IV).

Table IV: Relationship between type of stroke and time between onset of symptoms and presentation to the hospital

Time	Types of stroke			Chi-square	P value
	Ischemic N (%)	Hemorrhagic N (%)	Total N (%)		
< 24 hours	43(39.4)	15(34.1)	58(37.9)	1.615	0.446
24 - 48 hours	24(22.0)	14(31.8)	38(24.8)		
> 2 days	42(38.5)	15(34.1)	57(37.3)		
Total	109(71.2)	44(28.8)	153(100)		

P = 0.446   N=Number   %=Percentage

The relationship between clinical outcome and time from stroke onset to presentation was not statistically significant (*P*=0.480) (Table V).

Table V: Relationship between outcome assessment and time between onset of symptoms and presentation

Time	Outcome			Chi-square	P value
	Favorable N (%)	Unfavorable N (%)	Total N (%)		
< 24 hours	15(42.9)	43(36.4)	58(37.9)	1.467	0.480
24 - 48 hours	6(17.1)	32(27.1)	38(24.8)		
> 2 days	14(40.0)	43(36.4)	57(37.3)		

P = 0.480   N= Number   (%)=Percentage

Majority (64.1%) of the male patients presented 2 days post ictus for CT scan. Similarly, of the female patients that presented for CT scan, 40.0% presented 2 days after onset of stroke symptoms. More females than males had CT at less than 24 hours post stroke. There was a statistically significant difference between sex and time to CT scan (*P*=0.001) (Table VI).

Table VI: Sex distribution of patients by time between onset of symptoms and CT scan

Time	Sex			Chi-square	P value
	Male N (%)	Females N (%)	Total N (%)		
< 24 hours	9(11.5)	28(37.3)	37(24.2)	14.815	0.001
24 - 48 hours	19(24.4)	17(22.7)	36(23.5)		
> 2 days	50(64.1)	30(40.0)	80(52.3)		

P = 0.001   N= Number   (%)=Percentage

The relationship between the type of stroke and duration from onset of symptoms and CT scan was not significant (*P*=0.078) as more patients were seen to present for CT scan more than 2 days post stroke insult. (Table VII)

Table VII: Relationship between type of stroke and time between onset of symptoms and CT scan

Time	Types of stroke			Chi-square	P-value
	Ischemic N (%)	Hemorrhagic N (%)	Total N (%)		
< 24 hours	25(22.9)	12(27.3)	37(24.2)	5.102	0.078
24 - 48 hours	31(28.4)	5(11.4)	36(23.5)		
> 2 days	53(48.6)	27(61.4)	80(52.3)		

P =0.078   N= Number   (%)=Percentage

A non-significant relationship was seen between patient mRS outcome and the time between onset of stroke symptoms and CT scan. (*P*=0.725) (Table VIII).

Table VIII: Relationship between outcome assessment and time between onset of symptoms and CT scan

Time	Outcome mRS			Chi-square	P value
	Favorable N (%)	Unfavorable N (%)	Total N (%)		
< 24 hours	8(22.9)	29(24.6)	37(24.2)	0.643	0.725
24 - 48 hours	10(28.6)	26(22.0)	36(23.5)		
> 2 days	17(48.6)	63(53.4)	80(52.3)		

P =0.725   N= Number   (%)=Percentage
Favorable outcome mRS 0-3, Unfavorable outcome mRS 4-6

DISCUSSION

Timely diagnosis of patients with acute stroke is key to instituting the correct treatment option if a favourable patient outcome is to be obtained. Most patients on our study were observed to have had their CT scan done at more than 2 days after stroke onset which is what is obtainable in most developing countries and in many parts of Nigeria.[5,6] The mean duration from stroke onset to presentation in JUTH was 52.7 hours and the mean duration from stroke onset to getting the brain CT scan was 69.3 hours, this is similar to what was observed in the study by Ogbole et al in Ibadan where the mean time to CT scan was 70 hours.[5] This however differs from other climes where median time to presentation could be as low as 2 - 3.5 hours.[7,8] A study carried out in our center years before the CT was installed found that more than 50% of acute stroke patients presented to the hospital after 3 hours but before 24 hours.[6] Our study

however, revealed that the earliest patient presented to the hospital at 1 hour post stroke and only 2(1.3%)patients presented in <3hours, 11.1% in 3-6hours and majority (37.3%) presented more than 2days post stroke. This is in sharp contrast to what is seen in more advances cities where between 48% and 77% of patients present much earlier to the hospital.[7-10] A study found 21% of patients presented in 1 hour, 52% in 4 hours and 76% in 24 hours.[7]

Even though 2 patients presented to the hospital at less than 3 hours post ictus, none of the patients had a CT within the 3-hour window. The earliest duration from ictus to CT scan was 5hours, only 2(1.3%) of the patients had CT in the time range 3-6hours with majority (52.3%) having CT at more than 2 days post ictus. This contrasts with other studies in more advanced parts of the world where 35.5% of patients had CT in within 3 hours and 53% in less than 6 hours.[8] In more developed parts of the world where a lot is being done to access good health care within the shortest possible time, patients present much earlier to the hospital in addition to the quick response to emergency cases.[8] Studies reviewing the time taken for suspected acute stroke patients to get a brain CT from the moment they present at the emergency department have been carried out in more advanced countries with a view to making it as short as possible.[3,8,11] Kalnins et al. attempted to achieve quality improvements in stroke care geared towards shortening "Stroke Code" to CT. "Stroke Code" was defined as a multistep process that involves many people from multiple departments who must perform assigned roles in a highly coordinated way to consistently achieve minimal times.[11] Their study showed duration from presentation to CT was shortened from over 20 minutes to less than 14 minutes.[11] This is commendable, as patients get tailored treatment much sooner compared to a situation where an acute ischemic stroke patient that could benefit from thrombolytic treatment doesn't get this life saving treatment because of delays that include presenting late to the hospital, administrative bottlenecks within the hospital and financial constraints to getting a CT done.[12,13] Some patients may even present to the hospital in the subacute or chronic stage of stroke when the window period for thrombolytic therapy has already elapsed. American stroke association recommends that acute ischemic stroke patients have recombinant tissue plasminogen activator (rt-PA) administered within 3 hours and no later than 4.5 hours of stroke onset.[2] This is still a far cry from what is obtainable in our center and in most parts of Nigeria. Studies have however found that patients have shown significant functional recovery following rt-PA treatment in acute ischemic stroke.[14]

This study found more females present to the hospital earlier than males, this is at variance with other studies done in Nigeria and other parts of the wold.[5,6,8] This may reflect a better health seeking attitude by women due to education and better financial status in this part of Nigeria. Women are known to play key roles in the family in some cultures and as such receive better care and attention from family members.

The type of stroke did not relate significantly with the time of presentation to the hospital nor to the duration before CT was done, this is at variance with other studies where patients with hemorrhagic stroke present much earlier.[5,8] This may be because in this environment, many factors come into play in determining how soon patients present. A poor knowledge of the disease condition and the essence of urgency is not understood by majority of the population. There is also delay in decision making on how to handle these patients since finances play a major role in the ability to access health care in Nigeria. Majority of the population pay for health services out of their pockets

and poverty is prominent in this environment. Patients and their relatives may resort to alternative medical treatment which is prominent and viewed to be a much cheaper option in this part of the world. Worthy of note is the fact that not all patients that present to the hospital get a CT due to lack of money to pay for the CT. The causes of delays in the hospital range from infrastructural decay to lack of steady power supply, break down of hospital equipments and lack of urgency in the attitude to work by hospital staff.

The relationship between patient clinical assessment outcome and duration from stroke onset to presentation to the hospital or duration before CT were not significant. This may be because of delay in presentation and hence delay in starting appropriate care. None of the ischemic stroke patients in this study got rt-PA and the hemorrhagic stroke patients were managed without any intracranial surgical intervention.

Our shortcomings in this study include the possibility of getting inaccurate timings due to the inability to tell exactly when the symptoms started in patients found to have a stroke upon waking up in the morning or poor knowledge of the patients clinical condition by a relative who wasn't present at the onset of stroke but called upon to take charge of patient care.

A better understanding of the factors leading to delayed presentation to the hospital is a necessity if early presentation is to be achieved. The need for public enlightenment about acute stroke is further revealed by our study. More hospitals must be equipped with modern imaging modalities in the diagnosis of acute stroke such as CT and Magnetic Resonance Imaging (MRI) to make accessibility much easier and faster for patients from the rural areas. Equipping hospitals with "Stroke Units" and retraining of health workers on the reduction of delays in the diagnosis and institution of early treatment options will further add to the care of

stroke patients in Nigeria. Making health care accessible for all citizens will form a basis for improved care in the nation.

CONCLUSION

Our study has shown that majority of patients do not present to the hospital early. Much more needs to be done for patients to present early and CT scan to be done within the shortest possible time for interventional treatments to be considered. Measures geared toward shortening the duration of stroke onset to presentation and having CT should be seriously put in place.

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