ORIGINAL ARTICLE

Stroke in Babcock University Teaching Hospital, Nigeria: A two-year retrospective study of CT imaging findings

Baduku TS, Yusuf A, Thompson M.

ABSTRACT

Background: Stroke is a leading cause of morbidity and mortality worldwide, most of which occur in low and middle-income countries. Neuroimaging is the cornerstone for guiding its management, and computed tomography (CT) is an established tool for its diagnosis. **Objective**: The purpose of this study was to examine recent CT brain findings among stroke patients in a rural-based, private teaching hospital in south-west Nigeria, and to compare them with previous findings within Africa. **Methods**: This is a retrospective study conducted for thirty months in the Radiology Department of Babcock University Teaching Hospital, Ilisan-Remo, Nigeria. Brain CT images and reports performed between 1st November 2019 and 30th April 2022 were retrieved, processed and analyzed. **Results**: The patients were 199 males (62.6%) and 119 females (37.4%), with a mean age of 61.7 years. The highest frequency was between the ages of 70 and 74 years. The most frequent presenting complaint was the inability to move (21.5%). Infarcts constituted the majority of lesions while the most frequent CT findings were left-sided hemispheric infarcts (13.7%). **Conclusion**: The result of the study showed a male preponderance in the incidence of cerebrovascular accidents (CVA). There is also a preponderance of ischaemic over haemorrhagic CVA. Left-sided hemispheric lesions are more frequent.

Keywords: Cerebrovascular accident, Computed Tomography, Babcock University Teaching hospital, South-West Nigeria

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Introduction

Stroke is defined as a progressive neuro-clinical event that presents as a focal or global neurological deficit, with symptoms lasting more than 24 hours as a result of vascular compromise.[1] It is one of the foremost causes of morbidity and mortality in both sexes worldwide, with serious concerns in many countries, Nigeria inclusive.[2,3] It is estimated that 15 million people worldwide suffer a stroke annually.[4,5] However, while stroke-related deaths have declined in rich nations, they remain stubbornly high worldwide.[6] The disease is recognized as a leading cause of death in Sub-Saharan Africa (SSA),[3] with an observed paucity of data regarding clinical presentations and imaging records.[1,7] Few available studies have been conducted in health facilities in the urban centres, and none has been done in the health facilities in the rural areas where the majority of Nigerians reside.[8] These inadequate facilities have negatively affected the healthcare of many developing countries, with negative socio-economic impacts.[9] In these modern times, neuro-imaging is indispensable for the diagnosis, and characterization of patterns of stroke, as well as in the exclusion of stroke mimics.[10] Our study aims at determining the radiological pattern of clinical stroke in a faith-based tertiary hospital located in a rural setting in Southwestern Nigeria.

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Methods

A retrospective study of 318 patients, who were referred for CT imaging of the brain for clinically suspected/diagnosed CVA, was conducted covering the period between 1st November 2019 and 30th April 2022. The study was carried out in the Department of Radiology, Babcock University Teaching Hospital, Ilisan-Remo, Southwestern Nigeria. The institution is a major referral centre, where some of the patients were in-patients while a sizeable number were referred from both secondary

and tertiary hospitals around the neighbouring cities since most of these hospitals don't have functional CT machines at the moment. Permission to carry out the study was obtained from the Research and Ethics Committee of Babcock University Teaching Hospital before the commencement of the study.

Images from a 160-slice multidetector Toshiba CT machine and archived reports of patients that underwent brain CT based on clinical diagnosis of stroke within the study period were reviewed and data such as age, gender, clinical information and radiological imaging findings were retrieved using a data capture sheet. Frequency tables and charts were processed and analyzed using the Statistical Package for Social Sciences (SPSS) for windows software (version 20; SPSS Inc, Chicago, IL, USA).

Results

Table 1: shows the age and sex distribution of the patients.

Age Range	Male freq.	Female freq	Total freq	Percentage freq (%)
25-29	1	2	3	0.9
30-34	11	2	13	4.1
35-39	5	5	10	3.1
40-44	18	8	26	8.2
45-49	15	5	20	6.3
50-54	23	5	28	8.8
55-59	28	5	33	10.4
60-64	20	13	33	10.4
65-69	20	15	35	11.0
70-74	23	28	51	16.0
75-79	15	13	28	8.8
80-84	15	10	25	7.9
85-89	5	8	13	4.1
Total	**199**	**119**	**318**	**100**

Table 2: shows the clinical information of the patients.

Clinical findings	Frequency	Percentage
Inability to move	134	21.5
Right-sided limb weakness	111	17.8
Hypertensive	93	14.9
Left-sided limb weakness	76	12.2
Aphasia/incoherent speech	64	10.3
Diabetes Mellites	30	4.8
Forgetfulness/Dementia	28	4.5
Loss/altered consciousness	23	3.7
Convulsion	15	2.4
Headache	13	2.1
Dizziness/gait disturbance	8	1.3
RVD/Breast neoplasm	6	0.9
Others	23	3.6
Total	**624**	**100**

Table 3: shows the CT findings in the patients.

CT findings	Frequency	Percentage
Lt-sided hemispheric infarcts	88	15.4
Rt-sided hemispheric infacts	81	14.2
Cerebral atrophy	71	12.4
Bihemispheric infarcts	48	8.4
Intraventricular haemorrhage	40	7.0
Subfalcine/tonsillar herniation	32	5.6
Cerebral oedema	30	5.3
Basal ganglial infarcts	30	5.3
Basal ganglial haemorrhage	25	4.4
Periventricular white matter disease	23	4.0
Thalamic infarcts	23	4.0
Subarachnoid/subdural/epidural haemorrhage	21	3.7
Intracerebral haemorrhage	13	2.3
Pontine infarcts	13	2.3
Thalamic haemorrhage	10	1.7
Bilateral cerebellar ischaemia	7	1.2
Bilateral cerebellar hemorrhage	7	1.2
Others	9	1.6
Total frequency	**571**	**100**

Three hundred and forty-two (342) scans were done for stroke patients, but only 318 satisfied the criteria, representing 15.4% of total scans within the period under review. These were made up of 199 males (62.6%) and 119 females (37.4%), with a male-to-female ratio of 9: 5.5. Their ages ranged between 25 and 89 years (table 1) with a mean of 61.7 years. The highest frequency of occurrence was among those

between the 70-74 age groups, while the least was among those within the 25 and 29 age groups (19.0% and 0.9% respectively).

The most frequent presenting complaint was the inability to move (21.5%), while the least was vomiting (0.5%). Right-sided limb weakness occurred more frequently than the left (17.8% and 12.2% respectively). Hypertension, diabetes mellitus and retroviral disease (RVD) were background diseases found in some of these patients at 14.9, 4.8 and 0.9 per cent respectively (table 2). Other presenting complaints such as visual impairment, vomiting, deranged electrolytes, and congestive cardiac failure, (CCF) constituted 3.6%.

Of the 318 patients, 7 had normal CT findings, constituting 2.2%. Our study showed that 74.4% of the lesions were ischaemic while 28.6% were haemorrhagic. The most frequent finding was left-sided hemispheric infarcts (15.4%), followed by right-sided infarcts (14.2%), while 8.4% had bi-hemispheric infarcts. Others, such as pineal gland mass, porencephalic cyst, hydrocephalus and vascular aneurysm constituted 1.6% of the findings.

Discussion

Cerebrovascular accident is a leading cause of disability and death in the third world, particularly, among the elderly, and CT plays an important role in its definitive diagnosis and accurate management.[2,11] It is a first-line imaging modality, and with its increasing availability locally, more CVA patients are benefiting from this service which is timely and accurate in their management.[10]

Our study had 199 males (62.6%) and 119 females (37.4%), with a male to female ratio of 9: 5.5. This male gender preponderance agrees with studies of Otubogun *et al* in Odeda, Ike in Enugu, Eze in Abakaliki, all from Nigeria, Adoukonou, *et al* in the Benin Republic and Siddiqi *et al* in Zambia, respectively.[12-16] But a study by Karpal *et al*[17] reported that there was no gender preference for male patients.[17] This male preponderance in CVA suggests that men have higher risk factors and habits for CVA than women. Examples of such factors are hypertension and diabetes mellitus, smoking and alcoholism. Gedafe *et al*[18] and Fekadu *et al*[19], all from Ethiopia, added the absence of vascular protection of endogenous oestrogens in males to be responsible for the high preponderance.

The patients' ages ranged from 25 to 89 years (table 1) with a mean of 61.7 years. This compares to the mean age of 67.3 years in a study in the southwest by Ibrahim *et al*[1] and 57.3 years by Ijeh-Tarila *et al*[20] in South-South region of Nigeria. The most frequently affected age group were those between 70-74 years, while the least was among those between 25 and 29 years (19.0% and 0.9% respectively). This defers from the finding of Eze *et al*[21] in south east Nigeria which was lower (within the 50-59 years age group). Conversely, studies by Greffie *et al*[22] found stroke to be more common in females than males. This female preponderance was attributed to the high use of contraceptive drugs and pregnancy-related disorders The most frequent presenting clinical complaints were inability to move the limbs (21.5%), while the least was vomiting (0.5%). Also, right-sided limb weakness occurred more frequently than the left (17.8% and 12.2% respectively). This agrees with the findings of Todo *et al*[23] and Benamar *et al*.[24] Hypertension, diabetes mellitus and RVD were background diseases found in some of these patients at 14.9, 4.8 and 0.9 percent respectively (table 2). In Africa, strokes occur alongside other co-morbid conditions such as sickle cell disease (SCD), human immunosuppressive disease (HIV), diabetes mellitus and end vessel disease. Human immunodeficiency virus (HIV) and SCD increases the risk of stroke, with the disease occurring at a younger onset of age among these categories of people.[25-28] Africa bears the greatest burden of SCD in the world, as 75% of individuals born with the disease globally every year are born in sub-Saharan Africa.[29] This has been reported to increase stroke risk among children and adults in Africa.[30] Also, Africa has a slightly greater preponderance of small vessel disease-related stroke and intracerebral haemorrhagic lesions than elsewhere in the world.[31]

Of the 318 patients, 7 had normal CT findings, constituting 2.2%. This percentage is lower than the reported 4.2% in the south-south and 5% in the south-east regions of Nigeria.[20,21] However, a study by Eze *et al*[32] in Abakaliki showed a higher percentage of 21.7% of patients with normal CT findings. Also, our study showed that 74.4% of the lesions were ischaemic while 28.6% were haemorrhagic. This is close to the finding of Ogbole *et al*[10] in Ibadan where 72.3% had ischaemic stroke while 27.7% had haemorrhagic episodes.

Globally, it is quoted that, at least, over 62% of all stroke incidents are ischaemic.[3,33] Our most frequent finding is left-sided hemispheric infarcts only (15.4%), followed by right-sided infarcts (14.2%), while 8.4% had bi-hemispheric infarcts. That means patients with right-sided strokes are slightly higher than those on the left-side. This tallies with the frequency of clinical presentations of our patients. Others, such as pineal gland mass, poroncephalic cyst, hydrocephalus and vascular aneurysm constituted 1.6% of the findings.

Less than a century ago, stroke was relatively uncommon in Africa,[34,35]but now, the continent has some high indices of stroke burden in the world.[36] Stroke is currently, the second most common non-communicable disease cause of death in Africa and Asia,[8,24] and should therefore be well investigated. The diagnosis and determination of stroke type require neuroimaging with CT for adequate management and good prognoses (CT).[11] Since CT is an established tool for the diagnosis of stroke types,[37] it should be more available in our secondary and tertiary health institutions. Challenges, such as poverty and bad road networks in rural areas, in developing countries like Nigeria often lead to delayed presentation of stroke patients in hospitals.[10] Patients in developing countries such as Nigeria normally have a time lag at hospital presentation, because of factors such as lack of knowledge on stroke recognition, poor socioeconomic status and limited infrastructures .[38-40]

Conclusion

Our study revealed a male preponderance in the incidence of haemorrahgic and ischaemic CVA, with ischaemic stroke occurring more than haemorrhagic in the general population. Also, left-sided intracranial hemispheric lesions were more than those on the right which explains why right-side strokes are commoner than on the contralateral side.

References

1. Ibrahim AO, Shabi OM, Agbesanwa TA, Olowoyo P. Five-year analysis of clinical presentations and predictors of stroke mortality in rural Southwestern Nigeria: A retrospective observational study. African Journal of Emergency Medicine 2022; 12: 12–18.
2. Mensah GA, B, Feigin VE. The global burden of stroke. Neuroepidemiology 2015; 45 (3): 143–5.
3. Owolabi MO, Akarolo- Anthony S, Akinyemi R, Arnett D, Gebreziabher M, Jenkins C. The burden of stroke in Africa: a glance at the present and a glimpse into the future. Cardiovasc J Afr 2015; 26 (2): S26–38.
4. Global Burden of Disease (GBD). Stroke Collaborators. Global, regional and national burden of stroke and its risk factors, 1990-2019: a systematic analysis for the global burden of disease study 2019. The Lancet Neurology, 2021; 20: 795-820.
5. Global Burden of Disease (GBD). 2021 heart dx and stroke statistical update fact sheet. American Heart Association. 2021; Pp.1-3.
6. Deresse B, Shaweno D. Epidemiology and in-hospital outcome of stroke in South Ethiopia. J Neurol Sci 2015; 355 (1): 138–42.
7. Baduku TS and Tabari AM. Adult brain CT pattern among seizure patients in Kaduna: a 24 months review of findings. J. Radiation Med. in the Tropics. 2020; 1 (2): 79-83
8. Desalu OO, Wahab KW, Fawale B, Olarenwaju TO, Busari OA, Adekoya AO, Afolayan JO. A review of stroke admissions at a tertiary hospital in rural Southwestern Nigeria. Ann Afr Med 2011; 10: 80–5.
9. Feigin VL, Krishnamurthi RV, Parmar P, *et al*. Update on the global burden of ischemic and hemorrhagic stroke in 1990–2013: the GBD 2013 study. Neuroepidemiology 2015; 45 (3): 161–76.
10. Ogbole GI, Owolabi MO, Ogun O, Ogunseyinde OA, Ogunniyi A (2015). Time of presentation of stroke patients for CT imaging in a Nigeria Tertiary Hospital. Ann IbdPg Med 2015; 13 (1): 23-28.
11. Sacco RL, Kasner SE, Broderick JP, *et al*.; American Heart Association Stroke Council, Council on Cardiovascular Surgery and Anesthesia; Council on Cardiovascular Radiology and Intervention; Council on Cardiovascular and Stroke Nursing; Council on Epidemiology and Prevention; Council on Peripheral Vascular Disease; Council on Nutrition, Physical Activity and Metabolism. An updated definition of stroke for the 21st century: a statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2013; 44: 2064-2089.
12. Otubogun, F. M., Akinyemi, R. & Ogunniyi, S. Burden of adult neurological diseases in Odeda Area, Southwest Nigeria. BMJ Neurol. Open 2020; 2: e000062.

13. Ike SO. The pattern of admissions into medical wards of the University of Nigeria Teaching Hospital, Enugu. Nigerian Journal of Clinical Practice 2008; 11 (3): 185 – 192.

14. Eze, C. O. & Kalu, U. A. Pattern of neurological admissions in the tropics: experience at Abakaliki south-eastern Nigeria. Niger. J. Med. 2014; 23, 302–305.

15. Adoukonou, T. *et al*. Prevalence of stroke survivors in Parakou in northern Benin: a door-to-door community survey. Rev. Neurol. 2020; 176: 839–845.

16. Siddiqi, O. K., Atadzhanov, M., Birbeck, G. L. & Koralnik, I. J. The spectrum of neurological disorders in a Zambian tertiary care hospital. J. Neurol. Sci. 2010; 290: 1–5.

17. Karpal MK, Fang J, Hill MD, Silver F, Richards J, Jaigobin C, Cheung AM. Sex differences in stroke care and outcome. Stroke 2005; 36 (4): 809–814.

18. Gedefa B, Menna T Berhe T, Abera H. Assessment of risk factors and treatment outcome of stroke admissions at St. Paul's Teaching Hospital, Addis Ababa, Ethiopia. J Neurol Neurophysiol 2017; 8: 3. DOI: 10.4172/2155-9562.1000431.

19. Fekadu G, Chelkeba L, Kebede A. Risk factors, clinical presentations and predictors of stroke among adult patients admitted to stroke unit of Jimma University medical center, south west Ethiopia: prospective observational study. BMC Neurol 2019; 19: 187. https://doi.org/10.1186/s12883-019-1409-0.

20. Ijeh-Tarila KI, Alaizgha N, Mbaba AN, Ogolodom MP, Orupabo-Oyan B, Nwazor E, Robinson ED, Abam R, Ijeruh OY and Nwodo VK. Brain Computed Tomography Findings in Stroke Patients in Port Harcourt: A Retrospective Hospital-Based Study. Am. J. Biomed. Sci. & Res. 2020; 8 (4). MS.ID.001286. DOI: 10.34297/AJBSR.2020.08.001286

21. Eze CU, Okaro AO, Ohagwu CC. Pattern of computed tomography findings in cerebrovascular accident patients in South-Eastern Nigeria – a retrospective study of 480 patients. European Journal of Scientific Research. 2009; 34 (1): 104-109.

22. Greffie ES, Mitiku T, Getahun S. Risk factors, clinical pattern and outcome of stroke in a referral hospital, Northwest Ethiopia 2015; 4 (6): 182–8.

23. Todo K, Moriwaki H, Saito K, Tanaka M, Oe H, Naritomi H. Early CT Findings in Unknown-Onset and Wake-Up Strokes. Cerebrovasc Dis 2006; 21: 367–371.

24. Benamer HT, Grosset D. Stroke in Arab countries: A systematic literature review. J Neurol Sci 2009; 284 (1-2): 18–23.

25. Benjamin LA, Corbett, EL, Connor MD, Mzinganjira H, Kampondeni S, Choko A, Hopkins M, Emsley HCA, Bryer A, Faragher B, Heyderman RS, Allain TJ, Solomon T. HIV infection and stroke: current perspectives and future directions. Lancet Neurol. 2012; 11: 878–890.

26. Abdallah A, Chang JL, O'Carroll CB, Musubire M, Chow FC, Wilson AL, Siedner MJ. Stroke in human immunodeficiency virus-infected individuals in sub-Saharan Africa (SSA): a systematic review. J. Stroke Cerebrovasc. Dis. 2018; 27: 1828–1836.

27. Global Burden of Disease (GBD) HIV Collaborators. Global, regional, and national incidence, prevalence, and mortality of HIV, 1980-2017, and forecasts to 2030, for 195 countries and territories: a systematic analysis for the Global Burden of Diseases, Injuries, and Risk Factors Study 2017. Lancet HIV. 2019; 6: e831–e859.

28. Ortiz G, Koch S, Romano J, Forteza A & Rabinstein A. Mechanisms of ischemic stroke in HIV-infected patients. Neurology 2007; 68: 1257–1261.

29. Wonkam, A. & Makani, J. Sickle cell disease in Africa: an urgent need for longitudinal cohort studies. Lancet Glob. Health 2019; 7: e1310–e1311.

30. Fatunde, O., Adamson, F., Ogunseyinde, O., Sodeinde, O. & Familusi, J. Stroke in Nigerian children with sickle cell disease. Afr. J. Med. Med. Sci. 2005; 34: 157–160.

31. Owolabi M, Olowoyo P, Popoola F, Lackland D, Jenkins C, Arulogun O, Akinyemi R, Akinyemi O, Akpa O, Olaniyan O, Uvere E, Kehinde I, Selassie A, Gebregziabher M, Tagge R, Ovbiagele B. The epidemiology of stroke in Africa: A systematic review of existing methods and new approaches. J Clin Hypertens. 2018; 20: 47–5.

32. Chukwuemeka O Eze, Christian E. Agu, Uma A Kalu, Chidiegwu A Maduanusi Sunday T Nwali, Chika, Igwenyi, The Pattern and Presentation of Stroke in Federal Teaching Hospital Abakaliki (FETHA) South-East Nigeria Journal of Biology, Agriculture and Healthcare. 2013; 3 (11): 2224-2320.

33. Global stroke fact sheet 2022. World stroke organization. Pp1-152.
34. Osuntokun, B. O., Odeku, E. L. & Adeloye, R. B. Cerebrovascular accidents in Nigerians: a study of 348 patients. West Afr. Med. J. Niger. Pract. 1969; 18: 160–173.
35. Osuntokun, B. O. Stroke in the Africans. Afr. J. Med. Med Sci. 1977; 6: 39–53.
36. Akinyemi RO, Owolabi MO, Ihara M, Damasceno A, Ogunniyi A, Dotchin C, Paddick S, Ogeng'o J, Walker R, and Kalaria RN. Stroke, cerebrovascular diseases and vascular cognitive impairment in Africa. Brain Res. Bull. 2019; 145: 97–108.
37. Tomandl BF, Klotz E, Handschu R, Stemper B, Reinhardt F, Huk WJ, Eberhardt KE, Fateh-Moghadam S. Comprehensive Imaging of Ischemic Stroke with Multisection CT. RadioGraphics 2003; 23: 565–592.
38. Wardlaw JM. Diagnosis of stroke on neuroimaging. BMJ 2004; 328 (7441): 655-656.
39. Ogbole GI, Ogunseyinde AO, Obajimi MO, Adeyinka OA. Experience with three-dimensional computed tomographic angiography in Ibadan, Nigeria. Niger J Clin Pract. 2010; 13: 187-194.
40. Kaukab S, Mazhar B. How Much Time Lapses Between Stroke onset and Acquisition of CT Scan Brain? Ann. Pak. Inst. Med. Sci. 2009; 5: 269-270.

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