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Research Article



# Brain Computed Tomography Findings in Stroke Patients in Port Harcourt: A Retrospective Hospital-Based Study

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## Abstract

**Objective:** The purpose of this study was to examine stroke cases in our population to properly characterize them, exclude stroke mimics and document the patterns in this environment using Computed Tomography (CT).

**Materials and Methods:** This is a retrospective cross-sectional study conducted in the Radiology Department of Braithwaite Memorial Specialist Hospital (now Rivers State University Teaching Hospital) Port Harcourt, Nigeria. Brain CT examinations were performed using standard departmental protocol using 64 Slices General Electric machine. CT images and reports of patients that underwent brain CT based on clinical diagnosis of stroke from January 2017 to March 2019 were reviewed and data such as age, gender and radiological imaging findings were retrieved using data capture sheet. Frequency, tables and charts were used for result presentations.

**Results:** Males were 64% with mean age of 52.19 ±15.28 years while females accounted for 36% with mean age of 62.39±15.82 years. Majority of the subjects were within the age group of 43-62 years 43% and the least were in the age group ≥ 83 years, which is 9%. Out of 100 cases studied, ischaemic infarct was highest 56% and the least were brain tumour and subdural hematoma, which is 1% each respectively. Greater proportion of the infarctions were located in the parietal region of the brain 31 (55.4%), and haemorrhagic cases were located in the basal gangalia 12 (41.4%).

**Conclusion:** Non-contrast Computed tomography is indispensable for confirmation and classification of stroke types. Our study showed a higher occurrence of stroke in men with ischaemic infarction being the most common type.

**Keywords:** Computed Tomography, Ischaemic, Haemorrhagic, Stroke

## Introduction

Stroke is a major cause of mortality and disability globally. Out of the 240 causes of death, stroke ranks second after ischaemic heart diseases [1]. Stroke accounts for 10.8% mortality and 3.1% of disease burden worldwide according to World Health Organization (WHO) [2]. The incidence and mortality of stroke differ between countries, geographical regions, and ethnic groups [3]. The burden of stroke in sub-Saharan Africa is about the highest worldwide with age-standardized incidence rate of up to 316 per 100 000, prevalence rates of up to 14 per 1000 population and 1-month fatality rates of up to 40% [4,5]. The current prevalence of stroke

in Nigeria is 1.14 per 1000 while the 30-day case fatality rate is as high as 40% [6]. It has been postulated that the incidence of stroke and modifiable risk factors in developing clime will continue to rise as they go through socioeconomic and epidemiological transition from communicable to non-communicable diseases as the major cause of morbidity [7].

Strokes can be classified into two major categories, namely, ischaemic stroke and haemorrhagic stroke. The first INTERSTROKE study that was carried out in 22 countries revealed that the proportions of ischaemic and haemorrhagic stroke in Africa were about 66% and 34%, respectively, when compared to data from high-income countries where ischaemic stroke constitute about 91% and haemorrhagic stroke 9% [8]. A changing pattern of stroke with an increasing frequency of hemorrhagic type has been reported in our environment in recent time [8], and hemorrhagic stroke is known to be responsible for more deaths and disability-adjusted life-years lost.

Neuro-imaging is indispensable for the diagnosis, characterization and patterns of stroke as well as exclusion of stroke mimics. Non-contrast CT is the imaging modality of choice for the evaluation of patient suspected of stroke for diagnosis and classification into the various stroke types [9] because it is widely available, short scan time which is favorable for unstable patient and less expensive. A lot of work has been done on stroke in our setting documenting its pattern, however some of these works are based on clinical diagnosis, WHO definition of stroke and Sirirag Stroke Score without confirmation with neuro-imaging and this may not accurately represent the true pattern of stroke in this environment. Only a few of such studies used neuro-imaging for confirmation of diagnosis, however none of them was conducted in the South-South of Nigeria. The outcome of stroke management vastly depends on early accurate diagnosis of the two main types because of the different treatment approaches. In this study we aimed to examine stroke cases in our population to accurately characterize them, exclude stroke mimics and document the patterns in this environment using CT. It is hoped that this will assist physicians in decision making, instituting quick definitive interventions and follow-up of these patients.

## Materials and Methods

This is a retrospective cross-sectional study conducted in the Radiology Department of Braithwaite Memorial Specialist Hospital (now Rivers State University Teaching Hospital) Port Harcourt, Nigeria. Ethical clearance for this study was obtained from the institutional Research Review Board. The brain CT examinations were performed by qualified CT Radiographers using standard departmental protocol for brain investigations on 64 Slices General Electric machine. CT images and reports of patients that underwent cranial CT based on clinical diagnosis of stroke from January 2017 to March 2019 were reviewed and data such as age, gender and radiological imaging findings were retrieved using data capture sheet. Data analysis was done using SPSS version 21. Frequency, tables and charts were used for result presentations.

## Results

In this present study, males were 64% with mean age of 52.19 ±15.28 years while females accounted for 36% with mean age of 62.39±15.82 years (Table 1). Majority of the subjects were within the age group of 43-62 years 43%, followed by age groups 23-42 years and 63-82 years 24% each respectively and the least were in the age group ≥ 83 years, which is 9% (Table 1).

**Table 1:** Age and sex frequency and percentage distribution of study population.

| Variable | Sex | | Total |
|---|---|---|---|
| | Male | Female | |
| | n (%) | n (%) | n (%) |
| 23 – 42 years | 21 (87.5) | 3 (12.5) | 24 (100.0) |
| 43 – 62 years | 27 (62.8) | 16 (37.2) | 43 (100.0) |
| 63 – 82 years | 14 (58.3) | 10 (41.7) | 24 (100.0) |
| ≥83 years | 2 (22.2) | 7 (77.8) | 9 (100.0) |
| | 52.19±15.28 | 62.39±15.82 | 57.29±32.18 |
| Total | 64 (64.0) | 36 (36.0) | 100 (100.0) |

Out of 100 cases studied, ischaemic infarct was highest 56%, followed by intracerebral haemorrhage 27% and the least were brain tumour and subdural hematoma, which is 1% each respectively. Normal CT finding accounted for only 5% of the total population (Table 2). Based on the clinical diagnosis by pattern of stroke on CT among our study population, out of 100 cases studied, 72%, 22% and 6% of the cases were non-specific, ischaemic and haemorrhagic cases respectively (Table 3). Out of 72% non-specific cases identified by clinical diagnosis, 41 (56.9%) were ischaemic on CT imaging as highest, followed by haemorrhagic 20 (27.8%) and the least was normal CT finding, which is 3 (4.2%) (Table 3).

**Table 2:** Frequency and percentage distribution of CT findings among study population.

| Variables | Frequency | Percentage |
|---|---|---|
| Normal | 5 | 5 |
| Infarct | 56 | 56 |
| Intra-parenchymal haemorrhage | 27 | 27 |
| Subarachnoid haemorrhage | 2 | 2 |
| Cerebral atrophy | 3 | 3 |
| Cerebral oedema | 3 | 3 |
| Cerebral abscess | 2 | 2 |
| Brain tumour | 1 | 1 |
| Subdural hematoma | 1 | 1 |
| Total | 100 | 100 |

**Table 3:** Distribution of clinical diagnosis by pattern of stroke on CT among study population.

| Clinical diagnosis | CT findings | | | Normal | Total |
|---|---|---|---|---|---|
| | Haemorrhagic | Ischaemic | Mimics | | |
| | n (%) | n (%) | n (%) | n (%) | n (%) |
| Haemorrhagic | 5 (83.3) | 0 (0.0) | 1 (16.7) | 0 (0.0) | 6 (100.0) |
| Ischemic | 4 (18..2) | 15 (68.2) | 1 (4.5) | 2 (9.1) | 22 (100.0) |
| Non-Specific | 20 (27.8) | 41 (56.9) | 8 (11.1) | 3 (4.2) | 72 (100.0) |
| Total | 29 (29.0) | 56 (56.0) | 10 (10.0) | 5 (5.0) | 100 (100.0) |

We found that the greater proportion of the infarction cases were located in the parietal region of the brain 31 (55.4%), followed by those located in the frontal lobe 11 (19.6%) and the least was located in the temporo-parietal lobe of the brain 1 (1.8%) (Figure 1). Majority of the haemorrhagic cases in our study were located in the basal gangalia 12 (41.4%), followed by those located in the frontal lobe and brain stem 4 (13.8%) each respectively and the least were located in the cerebellum, temporal and subarachnoid, which is 2 (6.9%) each respectively (Figure 2).

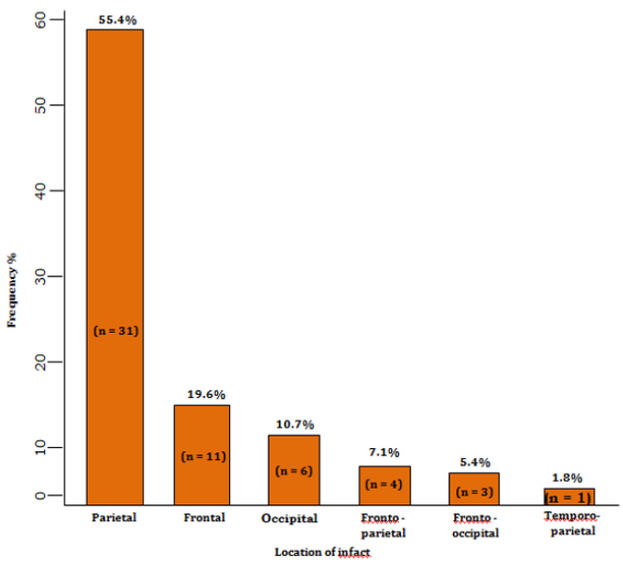


**Figure 1:** Location of ischaemic infarct among study population.

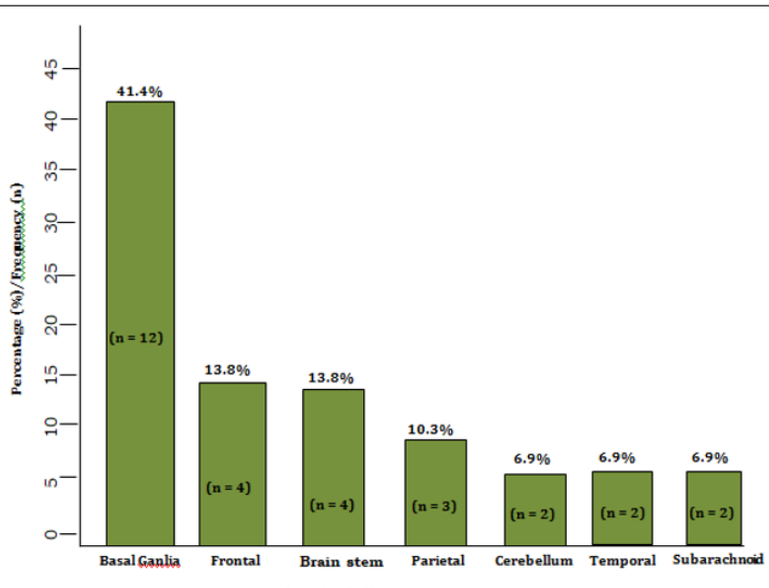


**Figure 2:** Location of haemorrhage among study population

## Discussion

In this present study, male population was highest when compared with their female counterparts. This finding is consistent with the findings of the studies conducted by Ogbole et a.l [9], Habibi-Koolaee et al. [10], Karaye et al. [11], Ukoha et al [12]. In a study by Habibi-Koolaee et al.(10), study, which was conducted to evaluate the stroke subtypes and risk factors in patients admitted to Sayad Shirazi Hospital, Gorgan, reported 218(58.19%) men against 157(41.90%) women out of their total study population. Ogbole et al [9] in their study aimed at determining the time lag between stroke onset and acquisition of brain CT in a tertiary hospital, reported high incidence among the male population with a ratio of 1.2:1. Karaye et al [11], in their findings, also reported high incidence of stroke in the male population, which is 51.90% against their female counterparts of 48.1%. Ukoha et al. [12] study, which was carried out to determine the burden and outcome of stroke in their setting, reported that out 37 patients, 19(51.3%) were males while 18(48.7%) were females. Our finding in this study with regards to gender is inconsistent with the findings of similar studies conducted by Taiwo et al. [13] and Ogun et al. [14]. In their studies, they reported high female prevalence. The male preponderance noted in our study, could be attributed to the fact that males were more frequently exposed to the predisposing factors of stroke. The difference observed between our findings and that of Taiwo et al. [13] and Ogun et al. [14], could be ascribed to the different sample size and the nature of various studies.

With regards to the subject age, the mean age of the subject was the 57.29 years and majority of the subjects were within the age group of 43-62years. Our finding is similar to the results documented in other related studies carried by Taiwo et al. [13], Ogbole et al. [9] and Karaye et al. [11]. Although, there were slight differences in the absolute values of our findings which could explained by the study population.

In the present study, cerebral ischaemic infarct accounted for 56% of the total cases, followed by intra-cerebral haemorrhage. Our finding corroborate with findings of Rasmussen et al. [15], Ogbole et al. [9] and Taiwo et al. [13]. Rasmussen et al. [15] study, reported 159(76%) infarct and 23(11%) haemorrhage. Ogbole et al. [9] study, reported 50.6% cerebral infarction while 27.7% had haemorrhagic stroke. Taiwo et al. [13] study, reported 69.3% (104) intracerebral ischaemia than haemorrhagic 30.7% (46). Our finding with regards to the high incidence of ischaemic infarct, is not in agreement with the finding of a study conducted by Sarfo et al. [16]. According to Sarfo et al. [16], haemorrhagic stroke accounted for 52. 5% (270) against 47.5% (245) among subjects less than 50years of age.

These discrepancies in our findings could be attributed to the sample size and the demographic variables. This study also showed that CT is more accurate in the diagnosis of stroke than clinical diagnosis. This is evidenced by the fact that out 72% cases identified as non-specific on clinical grounds, were diagnosed with 41 (56.9%) ischaemic, 20(27.8%) haemorrhagic, 8 (11.1%) mimics and 3 (4.2%) normal finding. This finding is in line with the conclusion drawn by Taiwo et al. [13]. According to them, evidence has shown that clinical diagnosis of stroke alone without comparism with CT diagnosis has low accuracy.

With regards to the locations of the ischaemic infarcts and haemorrhages, in this study, ischaemic infarcts were commonly found in the parietal lobe while the haemorrhagic cases were mostly found in the basal ganglia. Our finding is slightly similar to the finding of the study carried out by Taiwo et al. [13]. Taiwo et al. [13] study, reported 57 (22.7%) ischaemic stroke in the parietal lobe while haemorrhagic stroke in the parietal lobe of the brain accounted for 19 (18.5%). There are slight differences in our findings. We found haemorrhagic stroke to be common in the basal gangalia while Taiwo et al[13] reported more of the haemorrhagic stroke in the parietal lobe. The nature of the different studies could account for these discrepancies.

## Conclusion

Non-contrast Computed tomography is indispensable for confirmation and classification of stroke types. Our study showed a higher occurrence of stroke in men with ischaemic infarction being the most common type. Stroke occurring in the parietal lobe was more common. It is hoped that this study will assist immensely in effective targeted stroke management planning and follow-up of patients in our environment.

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