PATTERN OF COMPUTED TOMOGRAPHY FINDINGS IN ADULT PATIENTS PRESENTING WITH STROKE IN NNEWI, SOUTHEAST NIGERIA

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Abstract

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. This study sort to evaluate the pattern of computed tomography findings in adult patients presenting with stroke in Nnewi, Southeast Nigeria in order to provide the baseline data that will enable accurate diagnosis in patients affected by stroke. This was a retrospective cross-sectional review. A convenient sampling technique was used to recruit patients' data with clinical suspected CVA and retrieve records/cases of CT examination findings from this population at Waves diagnostics Nnewi, Anambra state. Statistical package for social science (SPSS) V.20.0 was used to analyse the data include descriptive statistics such as mean, frequency and percentage was used to summarize the data. Data was categorized according to age group and gender. Majority of the participant where in the age range of 51-60years (25%) followed closely by 61-70years (22%) and then 71-80years (19.0%) making age range 51-80years the most stroke affected population (66%). Majority of the participants where males (51%). Result also showed that majority of the participants were diagnosed with right ischaemic CVA (72%) whereas the least was bilateral haemorrhagic CVA (1.0%). In general, ischaemic CVA had the highest prevalence (74.7%). Ischaemic stroke was prevalent in this population, more men had stroke than women especial bilateral CVA (multiple affectation). CVA was more prevalent in the older age group than in the younger population. While basal ganglia lacunar was common feature in ischaemic CVA, intracerebral/subdural haemorrhage and subarachnoid haemorrhage were common features in haemorrhage CVA.

INTRODUCTION

The World Health Organization (WHO) defined stroke or CVA as a syndrome of rapidly developing clinical symptoms and signs of focal or global loss of cerebral functions lasting 24 hours or longer or resulting in the individual demise traceable only to vascular pathology (Chugh, 2019). This can be due to ischemia caused by thrombosis or embolism or due to a haemorrhage (Donnan *et al.,* 2008). Stroke is a medical emergency and can cause permanent neurological damage, complications, and death. It is the second leading cause of death worldwide, with over two-thirds of these deaths occurring in developing regions of the world, such as Sub-Saharan Africa (SSA) (Owolabi, 2013). In Southeast Asia and Africa, where peak age of the disease is 1 to 2 decades earlier than in industrialized countries and accounting for 0.9% - 4% of hospital admissions (Abiodun, 2018; Nwosu *et al.,* 2001).

In Nigeria and across many African countries, the increasing burden of stroke has been attributed to epidemiologic and demographic transitions driven in part by both rural-urban drift and rapid economic development (Adeloye, 2014). Nigeria is the most populous black nation in the world with a population of over 140 million people, and its stroke prevalence rate was reported as 1.14 per 1000 with a higher prevalence of 1.51 per 1000 in males compared to 0.69 per 1000 in females (Danesi *et al.,* 2007). The resulting population growth, ageing, physical inactivity, and consumption of processed foods high in cholesterol and salt have contributed to increasing number of stroke cases seen in the last two decades (Adeloye, 2014). The factors that determine outcome following stroke include the stroke subtype, patient bio-profile (age and gender), disease severity, physiological parameters (blood pressure on admission, blood glucose and level of consciousness), and presence of complication (Chen *et al.,* 2016; Gkantzios *et al.,* 2023; Kuriakose and Xiao, 2020).

The diagnosis and classification of stroke was based on clinical judgment, with the advent of radio-imaging techniques in stroke being visualized using either computed tomography (CT) or magnetic resonance imaging (MRI). Computed tomography has greatly influenced the diagnosis and management of stroke and added significantly to our understanding of pathophysiology of stroke. The main role of imaging in stroke is to differentiate an intracranial hemorrhage from an infarct, to define the ischemic region, to distinguish between infarct core and penumbra, to depict the vessel status, and to rule out other pathologic processes that can present with stroke-like symptoms. Computed tomography is the most common imaging modality used to assess patients with suspected stroke (Birenbaum *et al.,* 2011). The diagnosis and determination of stroke type requires neuroimaging with computed tomography (Sacco *et al.,* 2013). A detailed history and imaging will usually exclude stroke mimics. A brain CT is usually the first line imaging modality required to differentiate ischemic from haemorrhagic stroke (Nor *et al.,* 2005; Paul *et al.,* 2007; Sacco *et al.,* 2013).

Due to the substantial economic, social and medical problems stroke poses worldwide, there is a need to reduce its effects, by prompt institution of intensive management which has imaging diagnosis at its foundation and core. Compounding this is the lack of systematic audits of the quality of care offered to stroke patients, such as public stroke literacy levels and the rate of thrombolysis for ischemic stroke (Owolabi *et al.,* 2013). Therefore, acknowledging the existence of related studies, no study on computed tomography examination of stroke patients has been done in this present location according to the researcher's knowledge hence this study aims to evaluate the pattern of computed tomography findings in patients presenting with clinically suspected stroke in Nnewi, southeast Nigeria in order to provide the baseline data that will enable accurate diagnosis in patients affected by stroke.

MATERIALS AND METHODS

Research Design

The research design was a retrospective cross-sectional descriptive review.

Study Area

The study was specifically carried out at Waves diagnostics, Nnewi, Anambra state, Nigeria. This site was selected because Waves is a standard diagnostic center located in the center of the city very close to Nnamdi Azikiwe Teaching Hospital, it's one of the very few centers in Nnewi with a working CT machine and have patients from all over Nnewi metropolis including several stroke patients from the teaching hospital.

Study Populations

The research population for this research comprised of all CT result and case note of consenting consecutive patients with clinically suspected stroke with radiological requests for neuroimaging from January 2022 to June 2022 at Waves diagnostics, Nnewi, Anambra state. Using data on the average monthly investigations conducted in the radiology and imaging units, the population was estimated at 400 for the proposed data collection period.

Sample Size

The sample size was determined using Yaro Yamane's formula as adopted by Elugwu *et al.,* (2023) at 0.05% degree of precision:

$n = \frac{N}{1+N(e)^2}$ $n = \frac{400}{1+400(0.05)^2}$ = 200 CT result and case note of suspected stroke patients.

Sampling Technique

A convenient sampling technique was used to recruit patients data with clinical suspected CVA and retrieve records/cases

of CT examination findings from the population at Waves diagnostics Nnewi, Anambra state.

Ethical Considerations
Ethical clearance was obtained from Faculty of Health Science and Technology (FHST) ethical approval board, Nnamdi Azikiwe University, Nnewi Campus. Institutional permission was also secured from Waves diagnostics center.

Method of Data Collection
Patients' clinical notes was reviewed, and the following information extracted: Age, gender, medical history, presenting complaints, pre-diagnoses, CT features, diagnosis and stroke subtype. Data collection sheets was used to record the information retrieved for each participant. All data collection sheets were anonymized. Each study participant was allocated a unique numerical code that was used in data abstraction. Confidentiality of participants was maintained throughout the study.

Method of Data Analysis
Data was categorized according to age group and gender. Statistical package for social science (SPSS) V.25.0 was used to analyse the data includes descriptive statistics such as mean, frequency and percentage was used to summarize the data. Chi square was used to compare proportion of patients with various neuroimaging findings and clinical presentation. A p-value less than 0.05 was considered as statistical significance.

Results
Greater number of the participant where in the age range of 51-60years (25%) followed closely by 61-70years (22%) and then 71-80years (19.0%) making age range 51-80years the most stroke affected population (66%). More than half of the participants where males (51%).

Majority of the participants with available medical history had a history of CVA (45.5%), the second most come history was head injury/trauma (18.2%) as shown in Fig 1. The study further showed that majority of the participants complained of sudden collapse / loss of consciousness / fainting attack (20.2%) followed by limb weakness (15.2%) and then headache (10.1%) as seen in table 1. Furthermore subacute/chronic basal ganglia infarct and acute subarachnoid haemorrhage are the most common features common on the CT films (see fig 2)

Many were diagnosed with right ischaemic CVA (72%) whereas the least was bilateral haemorrhagic CVA (1.0%). In general, ischaemic CVA had the highest prevalence (74.7%) (see fig 3 & 4). There was no significant association between gender and stroke subtypes, $\chi 2$ (1) = 0.007; P = 0.933, gender and diagnoses, $\chi 2$ (5) = 9.186; P = 0.102 and between age and stroke subtypes, $\chi 2$ (7) = 13.265; P = 0.066 as seen in table 2 and 3.

There was positive significant correlation between age and presenting complaint (r=0.201; p=0.004), between gender and medical history (r=0.679; p=0.001) and between diagnoses and stroke subtype (r=0.571; p<0.001 whereas there was a negative significant correlation between gender and diagnoses (r=-0.136; p=0.001) as seen in table 4.

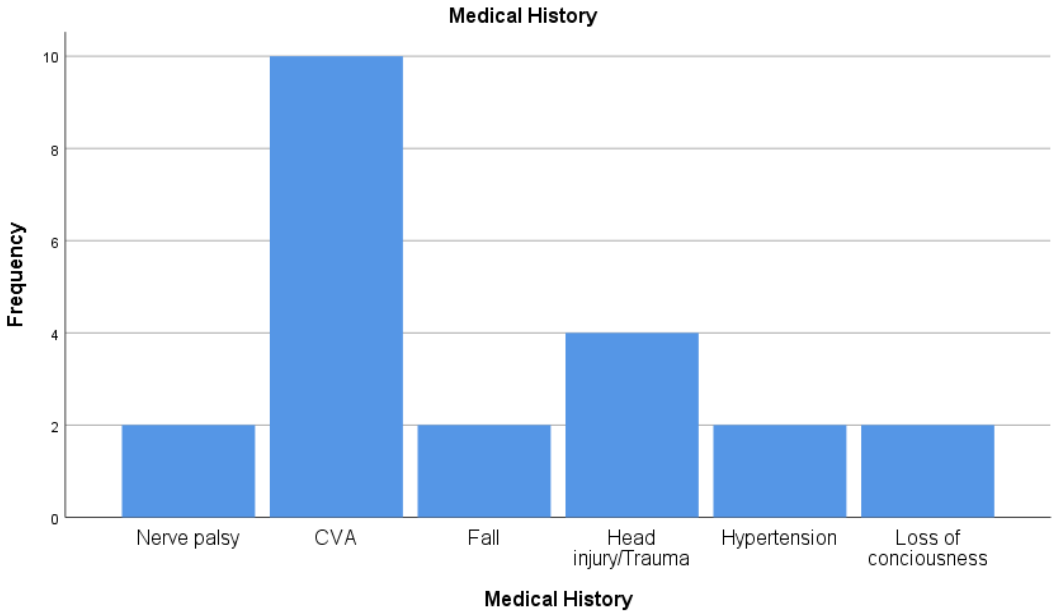

Fig 1 showing participant's medical history.

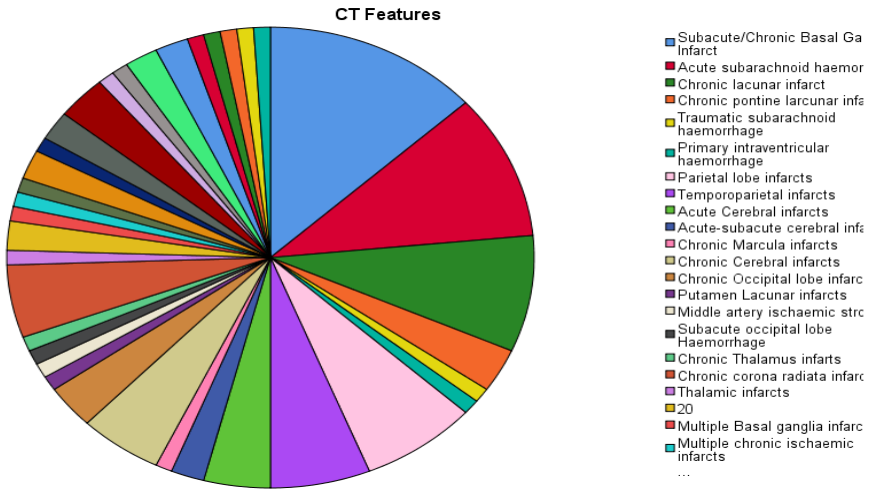

Fig 2 CT features in participants CT diagnostic results.

Table 1 showing participants complaints before the CT examination

Presenting Complaints	Frequency (F)	Percentage (%)
Headache	20	10.1
Vomiting	2	1.0
Seizure Disorders	10	5.1
Facial nerve palsy	4	2.0
Limb weakness	30	15.2
Dizziness	2	1.0
Confusion	10	5.1
Insomnia	4	2.0
Incoherent speech	8	4.0
Sudden collapse/Loss of consciousness/Fainting attack	40	20.2
Numbness	8	4.0
Aphasia	2	1.0
Drowsiness	2	1.0
Inability to walk	18	9.1
Sluggish movement	4	2.0
Slurred speech	8	4.0
Difficulty in swallowing	2	1.0
Abnormal gait	2	1.0
Visual Disturbance	2	1.0
Fall	4	2.0
Sudden memory loss	6	3.0
Headache and vomiting	4	2.0
Fall and loss of consciousness	2	1.0
Feeling of fullness in the headache	4	2.0

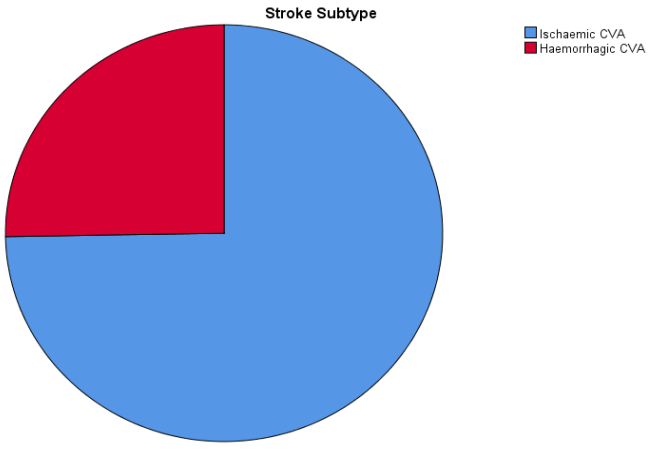

Fig 3 showing the distribution of participants CT Stroke diagnoses and the subtypes

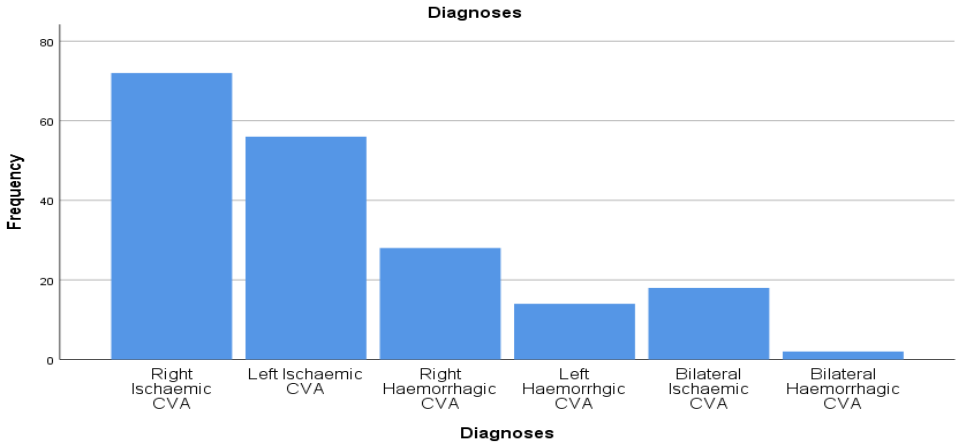

Fig 4 showing the distribution of participants CT Stroke diagnoses by subtypes.

Table 2 chi-square test of association between diagnosed stroke subtype and gender

Chi-square		Gender			
		Male N (%)	Female N (%)	χ^2-Value	P-Value
Stroke Subtype	Ischaemic CVA	72 (50.7)	70 (49.3)	0.007	0.933
	Haemorrhagic CVA	24 (50.0)	24 (50.0)		
Diagnoses	Right Ischaemic CVA	34 (47.2)	38 (52.8)	9.186	0.102
	Left Ischaemic CVA	24 (42.9)	32 (57.1)		
	Right Haemorrhagic CVA	14 (50.0)	14 (50.0)		
	Left Haemorrhagic CVA	8 (57.1)	6 (42.9)		
	Bilateral Ischaemic CVA	14 (77.8)	4 (22.2)		
	Bilateral Haemorrhagic CVA	2 (100.0)	0 (0.0)		

Table 3 chi-square test of association between age and stroke subtype

Chi-square		Gender			
		Ischaemic CVA N (%)	Haemorrhagic CVA N (%)	χ^2-Value	P-Value
Age	Less than 18years	2 (1.4)	0 (0.0)	13.265	0.066
	18-30years	4 (2.8)	0 (0.0)		
	31-40years	16 (11.3)	0 (0.0)		
	41-50years	18 (12.7)	12 (25.0)		
	51-60years	32 (22.5)	14 (29.2)		
	61-70years	28 (19.7)	12 (25.0)		
	71-80years	30 (21.1)	8 (16.7)		
	81-90years	12 (8.5)	2 (4.2)		
	Above 90years	0 (0.0)	0 (0.0)		

Table 4 showing the correlations between certain variables of the participants

Spearman's Rank Correlation	r-value	p-value
Age * Presenting complaint	0.201	0.004*
Age * Diagnoses	0.057	0.435
Age * Stroke subtype	-0.007	0.928
Gender * Medical history	0.679	0.001*
Gender * presenting complaint	-0.014	0.846
Gender * Diagnoses	-0.136	0.001*
Gender * Stroke subtype	0.006	0.933
CT feature * Diagnoses	0.115	0.119
CT feature * Stroke subtype	0.141	0.054
Diagnoses * Stroke subtype	0.571	<0.001*

Discussion

The mean age for this population was 59.42 ± 15.07 and majority of the screened cases were within the age range of 51-80years old. This is consistent with a study where the risk increases with age, the incidence doubling with each decade after the age of 45 years and over 70% of all strokes occur above the age of 65 (Kelly-Hayes, 2010). Though increasing and worrying numbers are seen in those age 41-50years and 31-40years (15% and 8%) respectively. This is consistent

with a previous study where they found trends toward increasing stroke incidence at younger ages, significant increases were seen in the proportion of strokes among those aged 20 – 44 years and those 20 – 54 years (Kissela *et al*., 2012). This is of great public health significance because strokes in younger patients carry the potential for greater lifetime burden of disability and because some potential contributors identified for this trend are modifiable. National data show that stroke risk factors (especially diabetes and obesity) are increasing at younger ages (Kissela *et al.,* 2012), and thus likely increasing stroke risk in the young.

There is slightly higher number of men than women in this study with stroke (51%). This is consistent with a previous study where males were also higher (Ugwuanyi *et al.,* 2020), but in contrast with a study where women tend to be more prevalence of strokes (Yu *et al.,* 2015). They observed that women have a higher lifetime risk of stroke than men, and the stroke mortality was higher among women than men in high-income countries. These facts are often attributed to the longer life expectancy of women. The increased male prevalence in this study could be due to the difference in sample size and potential location of the study. Women being less likely to present to a hospital within 3 hours as compared to men could play a significant role in this finding (Mehndiratta *et al.,* 2015). Research has shown that the occurrence of stroke in men and women also depends on age. It is higher at younger ages in women, whereas incidence increases slightly with older age in men (Kuriakose and Xiao, 2020). Looking at the age of this study subjects, they are older which may better explain why there are slightly more men than women.

This study also showed that majority of the retrieved case notes/hospital record had a previous history of CVA making it a relapsing CVA and majority are characterized by sudden collapse or loss of consciousness which tends to happen often in developing nations because people fail to see the earlier signs or take note of the risk factors until it severe stage that leads to a sudden collapse or loss of consciousness. This was seen in a study by Hsai *et al.* (2011) where almost half of the participants said the reason for delay was thinking the symptoms were not serious and/or they would self-resolve. The loss of consciousness, limb weakness and headache were the most common primary complaints given by the participants in this study. This is supported by a previous study where one of the predictors of mortality in stroke was loss of consciousness implying that it's a critical complication of stroke (Ekeh *et al.,* 2015). Limb weakness and headache were also reported as common symptoms of stroke (ASA, 2023). The prevailing headache was also consistent with the findings of a previous study where headache was the most indication for brain CT (Ugwuanyi *et al.,* 2020).

This research findings also showed that subacute/chronic basal ganglia infarct and subarachnoid haemorrhage were the majority features on the CT scan that caused the strokes among the retrieved case notes. Others like infarcts at the lacunar and parietal lobe were also common. This finding is consistent with the study by Danziger (2018), who stated that the etiologies of stroke are varied but can broadly be categorized into ischemic or hemorrhagic infarctions. Approximately 80-87% of strokes are from ischemic infarction due to thrombotic or embolic cerebrovascular occlusion. Hemorrhagic infarctions constitute most of the remainder of strokes, with a smaller number due to aneurysmal subarachnoid hemorrhage (Danziger, 2018). The most common locations for lacunar infarctions include the basal ganglia, internal capsule, thalamus, and the corona radiata. (Danziger, 2018). This seem to be the case in this study as basal ganglia, corona radiata were common site for infarcts in this study.

This study also showed that Ischaemic CVA (74.7%) was more prevalent than the haemorrhage subtype (25.3%). This is consistent with a previous study where 65% patients had an ischemic stroke while 35% had a hemorrhagic stroke (Salvadori *et al.,* 2020). Danziger, (2018) study reported approximately 80-87% of strokes were from ischemic infarction due to thrombotic or embolic cerebrovascular occlusion while haemorrhagic infarctions constitute most of the remainder of strokes subtype. From this study, one could say, the two main cause of the haemorrhage CVA (25.3%) was subarachnoid haemorrhage and intracranial/subdural haemorrhage, which is somewhat consistent with a previous study where among the 81 patients with hemorrhagic stroke, 64 (79%) had an intracerebral hemorrhage, and 17 (21%) subarachnoid hemorrhage (Salvadori *et al.,* 2020). Most of the basal ganglia haemorrhage could be due to transformation as described by Danziger that 20-40% of patients with ischemic infarction may develop hemorrhagic transformation within one week after ictus (Danziger, 2018). Furthermore, this study showed that right ischaemic CVA was of high in diagnosis, proving that ischaemic CVA was most prevalent.

The male (50.7%) gender had slightly more of the ischaemic stroke as compared to the female (49.3%) whereas they both had equal number of haemorrhagic CVA distribution (50.0%). Although there was no statistical significance ($p>0.05$) hence no association between the male and female in respect to the stroke subtype. The female gender had more right sided ischaemia (52.8%) than the male (47.2%) and left sided CVA (57.1%) than the male (42.9%). The male (100%) had ischaemic CVA bilaterally against the female (0%). These differences were not statistically significant ($p> 0.05$). This further supports the statement that except for subarachnoid haemorrhage, there was little evidence of sex differences in stroke subtype or severity (Reeves *et al.,* 2008).

Summary of findings

Majority of the participants were diagnosed with right ischaemic CVA (72%) whereas the least was bilateral haemorrhagic CVA (1.0%). In general, ischaemic CVA had the highest prevalence (74.7%). There was a positive significant correlation between Age and presenting complaint ($r=0.201$; $p=0.004$) which implies that the higher the age the more serious the presenting complaint or rather the more the presenting complaint and vice versa. There was also a positive significant

correlation between gender and medical history (r=0.679; p=0.001) implying that as we move from male to female, the medical history differs. Finally, there was also a positive significant correlation between diagnoses and stroke subtype (r=0.571; p<0.001), implying a direct linear relationship whereas there was a negative significant correlation between gender and diagnoses (r=-0.136; p=0.001).

Conclusion

Ischaemic stroke was prevalent in this population, more men had stroke than women especial bilateral CVA (multiple affectation). The CVA was prevalent in the older age group but also substantial in the younger age group. While basal ganglia lacunar was common feature in ischaemic CVA, intracerebral/subdural haemorrhage and subarachnoid haemorrhage were common features in haemorrhage CVA.

Recommendations

1. Patients stroke history, duration of stroke and treatment should be incorporated in future research to ascertain if they would have effect on the CT results.
2. More work should be done to ascertain why younger adults are now having increased prevalence of stroke and as well assess the risk factors.

References

[1]. Abiodun, A. (2018). Stroke (Cerebrovascular Accident (CVA) or Brain Attack) and Its Management-Literature Review. *International Journal of Innovative Healthcare*; 6(4):1-9.
[2]. Adeloye D. (2014) An Estimate of the Incidence and Prevalence of Stroke in Africa: A Systematic Review and Meta-Analysis. *PLoS ONE;* 9(6): 1007-24.
[3]. American Stroke Association (ASA) (2023). Stroke symptoms.https://www.stroke.org/en/about-stroke/stroke-symptoms Accessed 18/052023
[4]. Birenbaum D., Bancroft L. W., Felsberg G. J. (2011). Imaging in acute stroke. *The Western Journal of Emergency Medicine*; 12(1):67-76.
[5]. Chen, R., Ovbiagele, B. and Feng, W. (2016). Diabetes and Stroke: Epidemiology, Pathophysiology, Pharmaceuticals and Outcomes. *American Journal Medical Sciences;*351(4): 380–386.
[6]. Chugh, C. (2019). Acute Ischemic Stroke: Management Approach. *Indian Journal Critical Care Medicine*; 23(2): 140–146.
[7]. Danesi M., Okubadejo N., Ojini F. (2007). Prevalence of stroke in an urban, mixed-income community in Lagos, Nigeria. *Neuroepidemiology*; 28(4):216-23. Danziger A. (2018). https://emedicine.medscape.com/article/338385-overview?reg=1&icd=login_success_email_match_norm#a1 Accessed on 18/05/2023
[8]. Donnan, G. A., Fisher, M.,Macleod,M. and Davis,S. M.(2008). Stroke. *Lancet*;371:1612–23.
[9]. Ekeh, B., Ogunniyi, A., Isamade, E. and Ekrikpo, U. (2015). Stroke mortality and its predictors in a Nigerian teaching hospital. *African Health Science;* 15(1): 74–81.
[10]. Elugwu, C. H., Idigo, F. U., Makata, N. E., Ugwu, A. C., Ohagwu, C. C., Eze, J. C., and Ikegwuonu, N. (2023). Interprofessional learning impacts on professional dynamics among health professionals in Southeastern Nigeria. *IJRDO -Journal of Health Sciences and Nursing*; 9(1), 1-8. https://doi.org/10.53555/hsn.v9i1.5564.
[11]. Gkantzios, A., Kokkotis, C., Tsiptsios, D., Moustakidis, S., Gkartzonika, E., Avramidis, T., Aggelousis, N. and Vadikolias, K. (2023). Evaluation of Blood Biomarkers and Parameters for the Prediction of Stroke Survivors' Functional Outcome upon Discharge Utilizing Explainable Machine Learning. *Diagnostics*; 13, 532- 50.
[12]. Hsia A. W, Castle A., Wing J. J, Edwards D. F, Brown N. C, Higgins T. M, Wallace J. L, Koslosky S. S, Gibbons M. C, Sánchez B. N, Fokar A., Shara N., Morgenstern L. B., Kidwell C. S. (2011). Understanding reasons for delay in seeking acute stroke care in an underserved urban population. *Stroke;* 42(6):1697-701.
[13]. Kelly-Hayes M. (2010). Influence of age and health behaviors on stroke risk: lessons from longitudinal studies. *Journal of American Geriatrics Society*. 2(2): S325.
[14]. Kissela B. M., Khoury J. C., Alwell K., Moomaw C. J., Woo D., Adeoye O., Flaherty M. L., Khatri P., Ferioli S., De Los Rios La Rosa F., Broderick J. P., Kleindorfer D. O. (2012). Age at stroke: temporal trends in stroke incidence in a large, biracial population. *Neurology*. 23;79(17):1781-7
[15]. Kuriakose, D. and Xiao, Z. (2020). Pathophysiology and Treatment of Stroke: Present Status and Future Perspectives. *International Journal Molecular Science*; 21(20): 7609.
[16]. Mehndiratta P., Wasay M., Mehndiratta M. M. (2015). Implications of female sex on stroke risk factors, care, outcome and rehabilitation: an Asian perspective. *Cerebrovascular Disease*. 39, 302–308.
[17]. Nor A. M, Davis J., Sen B. (2005). The Recognition of Stroke in the Emergency Room (ROSIER) scale: development and validation of a stroke recognition instrument. *Lancet Neurology*; 4:727-734.
[18]. Nwosu M. C. (2001). Epidemiology of stroke an overview. *Journal of Medical Investigation and Practice;* 3:14-22.
[19]. Owolabi M. O. (2013). Consistent determinants of poststroke health-related quality of life across diverse cultures: Berlin-Ibadan study. *Acta Neurologica Scandinavica*; 128(5):311- 320.
[20]. Paul S. L, Srikanth V. K., and Thrift A. G. (2007). The large and growing burden of stroke. *Current Drug Targets*; 8:786-93.
[21]. Reeves M. J., Bushnell C. D., Howard G., Gargano J. W., Duncan P. W., Lynch G., Khatiwoda A., Lisabeth L. (2008) Sex differences in stroke: epidemiology, clinical presentation, medical care, and outcomes. *Lancet Neurology*; 7(10):915-26.

[22]. Sacco R. L., Kasner S. E., Broderick J. P. (2013). An updated definition of stroke for the 21st century: a statement for healthcare professionals from the American Heart Association /American Stroke Association. *Stroke*; 44:2064-2089.

[23]. Salvadori E., Papi G., Insalata G., Rinnoci V.., Donnini I., Martini M., Falsini C., Hakiki B., Romoli A., Barbato C., Polcaro P., Casamorata F., Macchi C., Cecchi F., Poggesi A. (2020). Comparison between Ischemic and Hemorrhagic Strokes in Functional Outcome at Discharge from an Intensive Rehabilitation Hospital. *Diagnostics (Basel);*11(1):38.

[24]. Ugwuanyi, D. C., Sibeudu, T. F., Irole, C. P., Ogolodom, M. P., Nwagbara, C. T., Ibekwe, A. M. and Mbaba, A. N. (2020). Evaluation of common findings in brain computerized tomography (CT) scan: A single center study. *AIMS Neuroscience*; 7(3): 311–318.

[25]. Yu C., An Z., Zhao W., Wang W., Gao C., Liu S., Wang J., Wu J. (2015). Sex Differences in Stroke Subtypes, Severity, Risk Factors, and Outcomes among Elderly Patients with Acute Ischemic Stroke. *Front Aging Neuroscience*; 7:174.