



Neuro-epidemiology of Acute Stroke Syndrome in the Adult Emergency Department of a Tertiary Hospital in a Resource-limited Environment of South-eastern Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author GUPI designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors PUN, COAA and ANA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Globally, acute stroke is one of the leading causes of preventable emergency hospital admissions. It is emerging as an important cause of disability and mortality among adult Nigerian Africans in the emergency department(ED) of Nigerian hospitals.

Aim: The study was designed at reviewing epidemiology of acute stroke syndrome in the adult ED of a tertiary hospital in South-east Nigeria.

Study Design: This was a retrospective descriptive study.

Place and Duration of Study: The study was carried out on patients with acute stroke syndrome at the ED of Federal Medical Centre, Umuahia, Nigeria over a five year period from January 2008 to December 2012.

Methods: The sources of data were from medical records, patients' case notes; ED admission

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registers and nurses report books. Information collected were age, sex, place of the incidence, time of presentation to the ED, duration of symptoms at presentation, month (season) of occurrence, type of stroke, number of episodes and associated clinical conditions. Operationally, time of presentation to the ED was categorized into two: day time was defined inclusively as time period from 6.00 am to 6.00 pm while night time referred exclusively to the time period from 6.00 pm to 6.00 am Nigerian time. Early presentation to the ED meant that the victim arrived the ED of the hospital inclusively within 1 hour of the occurrence of the acute stroke while those that arrived after 1 hour were defined as late presentation to the hospital.

Results: The age ranged from 36 years to 95 years with mean age of 68.2±7.4 years. There were 155 (58.3%) males and 111 (41.7%) females with male to female ratio of 1.4: 1. The incident predominantly occurred at home (77.8%), 239 (89.8%) had duration of symptoms more than 1 hour at presentation, 162 (60.9%) presented during the night time, 158 (59.4%) occurred during dry season, 157 (59.1%) had repeat episode, 199 (74.8%) were ischemic stroke and the most commonly associated clinic-medical condition was hypertension (80.1%).

Conclusion: There was variability in the epidemiology of stroke with ischemic stroke being the pre-eminent type and hypertension the most associated clinical condition. The incident occurred predominantly among male gender, elderly patients, at home, during dry season and most of the patients presented late to the ED and at night time. Interventional strategies aimed at risk reduction, early presentation to dedicated and responsible stroke units and centres are advocated.

Keywords: Acute stroke; adult Nigerians; emergency department; epidemiology.

1. INTRODUCTION

Globally stroke is a rapidly growing public health problem that poses a serious threat to clinical practice in both developed and developing countries of the world [1,2]. However, in resource-constrained environment already struggling to manage infectious diseases the burden of stroke is on the rise and stroke-related disability and death exert an increasingly severe effect on healthcare systems [3,4]. Although the burden of stroke is declining in high-income countries(HICs), they are increasing in virtually every other region of the low and middle-income countries(LMICs) and mortality from stroke in developing nations disproportionately exceeds those from developed countries [2,5,6]. The dynamics of these disparities between developed and developing countries have been linked to demographic and lifestyle transitions in addition to poor standard of health care amongst others [7-9].

Cerebrovascular disease is an umbrella term that embraces cerebrovascular accident or stroke. The term stroke is not consistently defined in clinical and public health practice research. However, an updated definition that incorporates clinical and tissue criteria aimed at harmonized definition has been adduced [10]. Generally, stroke is characterized as either ischemic or haemorrhagic with majority of stroke events being ischemic [7,10,11]. Patho-

biophysiologicaly, human brain receives about 20% of the cardiac output and control every action of the body such as walking, talking, breathing, among others, thus the global and focal clinical manifestations of stroke depends largely on the area of the brain involved and the extent of neuronal cell death.

Worldwide, about 15 million cases of stroke occur each year with two thirds occurring in developing nations and greater than one third of the stroke events are fatal [6]. The burden of stroke has been described in various age groups [12-14], sex [15-18] and global populations such as United States of America [19], China [20], Singapore [21], South Africa [22] and Ghana [23]. In United States of America, each year about 800,000 new or recurrent stroke events occur and this accounted for 1 out of every 18 deaths [19].

In Nigerian Africa, there has been increasing concern about the burden of stroke and stroke-related adverse events in different parts of the country among hospital patients and various community population groups [24-32]. In Lagos, South-west Nigeria, stroke was reported to occur at 1.14 per 1000 in general population and 24.1 per 1000 in those older than 65 years [25]; while in South-east Nigeria stroke occurred in 1.63 per 1000 population [26]. Among hospitalized patients in Lagos, South-west Nigeria stroke constituted the most common cause of neurological admissions [25] while in Sagamu,

South-west Nigeria, stroke accounted for 2.4% of all emergency admissions and 1.8% of emergency department death with case fatality at 24 hours, 7 days, 30 days and 6 months of 9%, 28%, 40% and 46% respectively [27]. Stroke was responsible for 17% death of medical ward admission in a teaching hospital in Sagamu, South-west Nigeria [28]; accounted for 4.5% of medical admission, 1.3% of total hospital admission and 26.7% mortality with case fatality of 3.0%, 10.9% and 23.8% at 24 hours, 7 days and 30 days in Ido-Ekiti, South-west Nigeria; 17.4% of ED death in a rural hospital in South-west Nigeria [30]; 15.6% of medical ward admission in Umuahia, South-east Nigeria [31]; 15.7% of geriatric emergencies in South-east Nigeria [32] and 3.8% of geriatric morbidity from non-communicable diseases in South-east, Nigeria [33].

Patients who have stroke syndromes often present as emergency cases to the ED of Nigerian hospitals [30,34,35] and sometimes are dramatic in their clinical presentations [27,36]. Of great concern is that some of these patients with new or repeat stroke succumbed to the attack before presenting to the ED of the hospital [32]. More worrisome in the study area is that stroke and stroke-related complications constitute cardinal indications for healer-shopping and patronage of traditional medical practitioners [32,33]. The envisaged outcome of such delay in seeking early and appropriate treatment and unorthodox consultation can better be imagined than seen in the study area. Research studies on the management of stroke in Nigerian hospital settings have reported variable outcomes of stroke care suggesting the involvement of factors other than medical interventions in the prognosis [26,28,30] and epidemiological characteristics of their presentations at the first port of call and contact with ED of the hospital is one of such factors [24,36,37]. The early recognition of the epidemiological profile of the stroke patients that predispose, promote, perpetuate or enable the occurrence of cerebrovascular accident therefore avails great opportunity for proactive interventions [38-40]. It is based on this premise that the authors reviewed retrospectively the epidemiology of stroke syndromes in the adult emergency department of a tertiary hospital in a resource-limited environment of South-eastern Nigeria over a five year period from January 2008 to December 2012.

2. MATERIALS AND METHODS

2.1 Study Design

This was a retrospective descriptive study. It involved the review of two hundred and sixty-six cases of patients who had acute stroke syndrome that were managed at the Emergency Department of Federal Medical Centre, Umuahia, Nigeria between January 2008 and December 2012.

2.2 Study Setting

The study was conducted at the Emergency Department of Federal Medical Centre, Umuahia, Abia state, South-East Nigeria. Until recently, Umuahia capital city and its environs have witnessed an upsurge in the number of banks, hotels, schools, markets, industries, junk food restaurants in addition to the changing dietary, behavioural and social lifestyles. Federal Medical Centre, Umuahia is located in the metropolitan city of Umuahia. It is one of the tertiary referral hospitals in South-east Nigeria and has facilities for primary, secondary and tertiary health care.

The emergency department of the hospital serves as a medical unit within the tertiary hospital setting of the Federal Medical Centre. All cases of acute stroke are first seen at the emergency department of the hospital before they are admitted into the hospital wards for further management, discharged home, leave against medical advice, signed against medical advice or referred to other health facilities.

2.3 Selection Criteria

The inclusion criteria were the availability of case notes of patients who had acute stroke syndrome and required data while patients who were brought in dead with history suggestive of stroke to the hospital were excluded from the study.

2.4 Methods

Collection of data was done using data collection form which was developed for the study by the authors through robust review of literature on epidemiology of stroke [3,14,15,18,23-31,36-40]. The secondary sources of data were emergency department admission registers. Case folders of patients who had acute stroke syndrome were retrieved from the department of medical records of the hospital. These were supplemented with

data from nurses report books. The epidemiological characteristics of the acute stroke patients focused on patient age, sex, where the incidence occurred (place), time of presentation to the ED of the hospital, duration of symptoms at time of presentation to the ED, season(month) of occurrence, number of stroke episodes, type of stroke, and associated clinical conditions.

2.5 Operational Definition of Research Variables

Operationally, acute stroke syndrome is characterized by global symptoms and focal neurological signs which are specific to either ischemic or hemorrhagic stroke [41]. Age of the adult patients was categorized into younger adults aged 18-59 years and elderly patients who were aged 60 years and more. The time of presentation to the ED was classified into two: day time was defined inclusively as time period from 6.00am to 6.00pm Nigerian time while night time refers exclusively to the time period from 6.00pm to 6.00am Nigerian time. Early presentation to the ED meant that the stroke victim arrived the emergency department of the hospital inclusively within 1 hour of the occurrence of the acute stroke while those who arrived after 1 hour were defined as late presentation to the hospital. The 1 hour arrival bracket in ED is imperative in the study area considering the care pathway navigated by the acute stroke patients in accessing ED care such as time for general and neurological evaluation, performing and reading the neuroimage, access to stroke team among other bureaucratic bottlenecks which are likely to sum up to 3 hours conservative estimate before definitive care is rendered to stroke patients. Early presentation to the ED within 1 hour of onset of symptoms provides best opportunity for successful management. The season of occurrence was divided into two: dry or harmattan and rainy seasons based on the Nigerian meteorological setting. Dry or harmattan season referred to the time period from November to March while rainy season is defined as the time period from April to October.

2.6 Statistical Analysis

The results generated were analyzed using software Statistical Package for Social Sciences (SPSS) version 13.0, Microsoft Cooperation, Inc. Chicago, IL, USA for the calculation of mean, frequencies and percentages.

3. RESULTS

The age of the patients with acute stroke syndrome ranged from 36 years to 95 years with mean age of 68.2±7.4 years. There were 155 (58.3%) males and 111 (41.7%) females with male to female ratio of 1.4: 1 [Table 1].

Table 1. Age and sex distribution of patients with acute stroke syndrome

Age group (years)	Sex	
	Male number (%)	Female number (%)
18 – 59	12(7.8)	7(6.3)
≥ 60	143(92.2)	104(93.7)

Two hundred and seven (77.8%) of the cases of acute stroke syndrome occurred at home while fifty-nine occurred outside the home (22.2%) [Table 2].

Table 2. Distribution of the stroke patients by place of occurrence of stroke

Place of occurrence	Number (%)
Home environment	207(77.8)
Outside home environment	59(22.2)

Two hundred and thirty-nine (89.8%) of the patients who had acute stroke syndrome had duration of symptoms of more than 1 hour at presentation while twenty seven (10.2%) presented early within 1 hour to the ED of the hospital [Table 3].

Table 3. Distribution of the patients by duration of symptoms at presentation to the emergency department

Duration of symptoms (hour)	Number (%)
≤ 1 hour	27(10.2)
> 1 hour	239(89.8)

One hundred and sixty- two (60.9%) of the patients presented during the night time (6pm-6am exclusive, Nigeria time) while one hundred and four (39.1%) presented during the day time [Table 4].

Table 4. Distribution of the stroke patients based on the time of presentation to the emergency department

Time of presentation to ED	Number (%)
Day time (6am – 6pm inclusive)	104(39.1)
Night time (6pm – 6am exclusive)	162(60.9)

One hundred and fifty-eight (59.4%) of the cases of acute stroke occurred during dry (harmattan) Nigeria season while one hundred and eight (40.6%) happened during rainy season [Table 5].

Table 5. Distribution of the patients by season of occurrence

Season of occurrence of stroke	Number (%)
Dry (Harmattan)	158(59.4)
Rainy	108(40.6)

One hundred and fifty-seven (59.1%) of the patients had repeated stroke while one hundred and nine (40.9%) had first episode of acute stroke [Table 6].

Table 6. Number of stroke episodes among the patients with acute stroke syndrome

Number of episodes	Number (%)
First episode	109(40.9)
Repeated episode	67(25.2)

One hundred and ninety-nine (74.8%) of cases of acute stroke syndrome were ischemic stroke while sixty-seven (25.2%) were haemorrhagic stroke [Table 7].

Table 7. Type of stroke among the patients

Type of stroke	Number (%)
Ischemic	199(74.8)
Hemorrhagic	67(25.2)

Two hundred and thirty (80.1%) cases of acute stroke patients had hypertension, eighty four (31.6%) had diabetes mellitus and sixty-seven (25.2%) had co-occurrence of diabetes mellitus and hypertension [Table 8].

Table 8. Associated clinico-medical conditions of the stroke patients

Type of clinical condition	Number (%)
Hypertension	213(80.1)
Diabetes mellitus	84(31.6)
Co-occurrence of diabetes and hypertension	67(25.2)

4. DISCUSSION

This study has demonstrated the variations of acute stroke syndrome among young adults and the elderly patients in the ED of the hospital. The most affected age group was the elderly patients

aged 60 years and above with a mean age of 68.2±7.4. The mean age of occurrence of stroke in this study is within the 6th and 7th decade of life adduced for sub-Saharan Africa and in contrast to the peak age of occurrence of 7th and 8th decade of life described for developed countries [11,42]. The mean age of occurrence of stroke has been reported in various parts of Nigeria [25,27,29,31,39] and other parts of the Africa like Ghana [23]: In Ido-Ekiti, South-west Nigeria mean age of occurrence of stroke of 68.0 years was reported [29], 66.5 years was reported in Umuahia, South-east Nigeria [31], 63.4 years was reported in Surulere, Lagos, South-west Nigeria [25]; 61.5 years was reported in Sagamu, South-west Nigeria [27], 60.7 years was reported in Ukpo, South-east Nigeria [26], 59.4 years was reported in Ibadan Southwest Nigeria [39] and 65.6 years was reported in Ghanaian Africans [23]. The lower mean age of occurrence of stroke in this study compared to developed nations is attributed to various reasons such as lower life expectancy in Nigeria, poor standard of care for cerebrovascular disease among other factors which affect cardiovascular health of the Nigerian population [1,11,32,33,43]. Although age standardized rates of mortality from stroke have decreased globally in the past 2 decades but the absolute number of persons who have stroke events every year are increasing particularly in developing countries like Nigeria [11]. The higher burden of stroke among the elderly patients could be a reflection of the fact that the elderly population are likely to have more clusters and aggregates of risk factors of stroke when compared to the younger adults [14,33,44,45]. Since the preponderance of global burden of stroke resides in developing countries [1] like Nigeria, occurring largely among geriatric population, there is need for geriatric cerebrovascular health specifically and cardiovascular health generally in addition to universal access to organized stroke services in the sub-region. This appears to be one of the ways geriatric Nigerians will benefit from good health-related quality of life and longevity as obtained in advanced nations of the world.

This study has shown that males had higher prevalence of acute stroke syndrome compared to their female counterparts. This finding is in agreement with global gender epidemiological pattern for stroke [15-18,46]. In Catalonia Spain which has one of the lowest incidence of stroke in the world, the reported cumulative incidence per 100,000 populations was 218 in men and 127 in women [47]. Although the Global Burden

of Stroke Study reported higher prevalence of ischemic stroke in males compared to female and lack of sex difference in hemorrhagic stroke but reports from different parts of Nigeria such as Lagos, South-west Nigeria [25]; Ukpo, South-east Nigeria [26]; Umuahia, South-east Nigeria [31] and other parts of Africa like Ghana [23] and South Africa [22] have documented higher prevalence of stroke in males compared to their female counterparts. The higher prevalence of acute stroke syndrome among male gender in the study area could be attributed to the reports that men who had pre-existing medical conditions that predispose and promote the occurrence of stroke such as hypertension, dyslipidaemia, obesity, diabetes mellitus and other atheroma markers of cerebrovascular disease such as history of transient ischemic attack are generally more reluctant to seek treatment, non-adherent with prescribed medications and are more likely to engage in behavioural and lifestyle activities that could precipitate and provoke occurrence of acute stroke [32,33]. Furthermore, researchers in Nigeria have adduced that the lower prevalence of acute stroke syndrome among female Nigerians could be attributed to the finding that females who had acute stroke are likely to patronize religious houses and spiritual homes for spiritual intervention and divine healing and are less likely to present to the orthodox health facilities for treatment [25,26]. There is therefore an urgent need for hospital and community-oriented research studies that are adequately powered for men and women respectively in order to derive scientifically robust and credible data on the sex difference in the burden of acute stroke syndrome in the study area.

This study found that 77.8% of acute stroke syndrome occurred at home. The higher occurrence of acute stroke at home in the study area could be a reflection of the predominant type of stroke and the biosocial characteristics of the victims [25,26,48,49]. Neuro-pathophysiologically ischemic stroke has been documented in biomedical literature to occur predominantly at rest or after waking up from sleep. More so, the gradual and progressive onset of ischemic stroke should have allowed the victim the window period of time to get to their homes and rest or sleep believing that the symptoms of stroke would disappear by the time they wake up from sleep not knowing that they may not wake up in good health. Furthermore, the higher frequency of occurrence of acute stroke at home could also be a proxy indicator of

the demographic characteristics of the elderly Nigerians who are likely to have retired from active primary occupation and are unlikely to be engaged in secondary occupation and are more likely to be at home at the time of the cerebrovascular accident [48].

One hundred and sixty-two (60.9%) of the cases of acute stroke patients presented to the ED at night time (6 pm-6 am exclusive). This could be attributed to the delay in decision to go to hospital or early health-seeking behaviour among the Nigerian society or delay in pre-hospital transfer of acute stroke victims [32]. More so, it could be ascribed to delay at the first port of call that are closest to the patient and within the vicinity of the place of occurrence of acute stroke such as private hospitals, primary health centres or traditional and spiritual healing homes where these patients must have visited before coming to the ED of the hospital. In addition, this could be a mirror of the societal disposition to clinical manifestation of acute stroke syndrome as being a spiritual attack, an evil spells and strike from evil persons and demons.

Although the time interval between acute stroke and arrival to the ED of the hospital is variable but only twenty seven (10.2%) of the stroke victims presented to the ED of the hospital within one hour of stroke episodic occurrence. The current concept in the clinical evaluation of acute stroke patients has connoted stroke as 'a brain attack' or 'accident' (cerebrovascular accident) which emphasized the need for rapid and focused intervention with focus on 'watch and intervene' rather than the old concept of 'wait and see'. This is in tandem with neurologist mantra 'time is neurone; and 'time is brain' which is similar to the cardiologist mantra for myocardial infarction 'time is muscle' The longer the delay before effective action, the more brain tissues are lost because time lost is equivalent to brain tissue lost. Interventions to restore cerebral circulation should take place within the critical hours of need in order to safeguard normal brain tissues, and surrounding at risk brain tissues (penumbra) as soon as possible. However, study has demonstrated that early recurrent embolization particularly in cardioembolic stroke is an important predictor of in-hospital mortality [50]. The finding of this study therefore is a wake up calls for patient, person and population health information and education on acting fast if the person thinks that he/she or someone has warning FAST signs of acute stroke (Facial weakness; Arm/limb weakness; Speech

difficulties; Time is brain). With these envisaged and other constraints that militate against prompt presentation to the ED of hospital it appears that late presentation to the hospital could have been prevented proactively. In this regard, multi-sectoral and multi-disciplinary interventions targeted at ensuring that acute stroke victims receive early emergency medical services during the crucial window of need are advocated in the study area.

This study has shown that one hundred and fifty-seven (59.1%) of the study subjects had repeated stroke. Although the rate of recurrence of stroke is influenced by various independent or clusters of risk factors of stroke such as hypertension, dyslipidaemia, diabetes mellitus, obesity amongst others [44,49,51-54]. However, the atherosclerosis of the internal carotid artery and vertebrobasilar artery arcade remains relevant for anterior circulation and posterior circulation recurrent ischemic stroke. Since the causal factors that are associated with recurrence of stroke are largely known in most patients, it is pertinent to identify patients at different risk of recurrence and stratify these patients according to their risk of recurrent stroke for targeted secondary prevention and other diverse care. This is essential for preventing future stroke events since repeat stroke is often more serious than index or previous stroke events.

The study found that one hundred and fifty-eight (59.4%) of the acute stroke syndrome occurred during dry or harmattan season in Nigeria. Epidemiologically, the incidence of acute stroke syndrome varies from globally [1] from one geographical region to another and from time to time but nothing is known about the seasonality or secularity of the occurrence of stroke in the Nigeria. Although acute stroke syndrome occurred predominantly during the dry season in this study but the evidence for a link between stroke events and season of the year in Nigeria remained largely unreported in biomedical literature. Further research studies are therefore needed in making definitive association between meteorological season and risk of acute stroke syndrome in Nigeria.

This study has demonstrated that one hundred and ninety-nine (74.8%) of acute stroke syndrome was ischemic stroke. This finding is in consonance with the global epidemiological pattern of stroke with majority of stroke being ischemic [1,3,7,11,19]. In Nigerian Africans,

variable prevalence of ischemic stroke have been reported in different parts of the country: 64.0% was reported in Sagamu, South-west Nigeria [27]; 64.4% was reported in Ido-Ekiti, South-west Nigeria [29] and 65.5% in Umuahia, South-east Nigeria [31]. The preponderance of ischemic stroke could be attributed to the atherosclerotic load [55]. Aetio-pathogenetically, atherosclerosis is generally associated with various adverse cardiovascular events and specifically with cerebrovascular event like ischemic stroke [52,55-57]. More so, recurrence of ischemic stroke is related to the advanced stage of atherosclerotic plaque and its characteristic risk burden [53,54]. Since atherosclerotic cerebrovascular events have been associated with incident or recurrent stroke, it is relevant to look out for the surrogate markers of atherosclerosis or markers of atheromatosis during clinical encounter with stroke patients [53,54,56,58]. There is therefore need to control the overt and covert risk factors of stroke particularly those with metabolic signature of atherothrombosis such as hypertension and diabetes mellitus through integrated primary and secondary prevention strategies.

Hypertension is the most common medical condition associated with acute stroke syndrome in this study. Globally, hypertension is the commonest risk factor of stroke accounting for greater percentage of incident and recurrent stroke events [23,29,59]. In Nigeria, hypertension-related stroke events have been reported in different parts of the country: 89.0% was reported among stroke patients in Bayelsa, South-south, Nigeria [59], 85.2% was reported in Ido-Ekiti, South-west Nigeria [29], 80.0% was reported in Southwest Nigeria [42], 74.3% was reported in Umuahia, South-east Nigeria [31] while in other parts of sub-Saharan Africa such as Ghana, 63.0% of stroke patients had hypertension [23]. The predispositional predilection for stroke in hypertensive patients could be attributed to the fact that hypertension and stroke are component defining criteria under the umbrella of cardiovascular disease [41,44,60,61]. Hypertension is the principal risk factor for cardiovascular disease [62] and its co-occurrence in stroke patients possibly points to a common precipitating and promotional genetic and environmental factors [61-63]. Furthermore, hypertension is known to predispose to stroke by its contribution to the process of atherogenesis particularly in the cerebral anatomical vascular arcade resulting in insufficiency in cerebral perfusion pressure among other disturbances of

the cerebral hemodynamic and homeostatic physiology [5,60]. With increasing prevalence of hypertension in Nigeria and poor awareness of the risk factors of stroke [36,64] and its warning signs among the Nigerian populace, the trend in the hypertension-related stroke may continue unabated. The finding of this study therefore brings to the front burner the issues of Nigerian population cardiovascular health education, promotion and maintenance.

5. IMPLICATIONS OF THE STUDY

Acute stroke is a neurological emergency and constitutes an important aspect of clinical and public health emergencies and is assuming increasing relevance among adult Nigerians as the most common cause of emergency department hospitalizations and deaths. The increase in the occurrence of acute stroke is probably due to changing modifiable and non-modifiable risk factors of stroke that are favourable to the onset of cerebro-vascular accident particularly undiagnosed and uncontrolled hypertension. The changing socio-economic and demographic characteristics of the study area could have contributed to the variability of its epidemiology. However, emergency department physicians, neurologists, neurosurgeons and other health professionals attending to stroke victims in the study area should be aware of these epidemiological characteristics as this may affect the quality of care rendered to them.

6. LIMITATIONS OF THE STUDY

The limitations arising from the retrospective nature of the study using secondary data sources are recognized by the authors. More so, the sample size was relatively small; although this was the number of patients with acute stroke syndrome whose case notes met the inclusion criteria during the period under review. Furthermore, stroke victims who were brought in dead were excluded from the study. If these dead patients were inclusively considered, this could have added to the sample size. In addition, this study didn't assess for pre-hospital care received by the stroke victims and other diverse epidemiological information. This was due to poor state of documentation of what happened during health professional-patient-patient relatives interface particularly at the time of arrival, the time of discharge or referral. Moreover, the case definition of acute stroke syndrome in the data extraction proforma from

the retrospective record review was based on predefined WHO MONICA clinical diagnostic criteria and Siriraj stroke score used at the ED which have been validated in Nigeria for use in management of stroke where CT scan is not available [31,65]. The clinical diagnostic criteria are simple tools that differentiate cerebral infarct from cerebral hemorrhage but diagnosing stroke subtypes required neuroimaging which is unavailable at the hospital during the period under review and access is limited by time, distance and cost.

7. CONCLUSION

There was variability in the epidemiology of stroke with ischemic stroke being the pre-eminent type and hypertension the most associated clinical condition. The incident occurred predominantly among male gender, elderly patients, at home, during dry season and most of the patients presented late to the ED and at night time. Interventional strategies aimed at risk reduction, early presentation to dedicated and responsible stroke units and centres are advocated. In addition, integrated clinical and public health cardiovascular actions aimed at decreasing morbidity and preserving life is needed.

CONSENT

All authors declare that 'written informed consent was also obtained from respondents included in the study.

ETHICAL APPROVAL

Ethical certificate was obtained from the Health Research and Ethics Committee of the hospital.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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