

Original Research Article

Neuro-epidemiology of acute stroke syndrome in the adult emergency department of a tertiary hospital in a resource-limited environment of South-eastern Nigeria

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 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 6.00am to 6.00pm while night time referred exclusively to the time period from 6.00pm to 6.00am 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,

38 during dry season and most of the patients presented late to the ED and at night
39 time. Interventional strategies aimed at risk reduction, early presentation to
40 dedicated and responsible stroke units and centres are advocated.

41 Key words: Acute stroke, adult Nigerians, emergency department, epidemiology,

42 **INTRODUCTION**

43 Globally stroke is a rapidly growing public health problem that poses a serious
44 threat to clinical practice in both developed and developing countries of the world
45 [1,2]. However, in resource-constrained environment already struggling to manage
46 infectious diseases the burden of stroke is on the rise and stroke-related disability
47 and death exert an increasingly severe effect on healthcare systems [3,4]. Although
48 the burden of stroke is declining in high-income countries(HICs), they are increasing
49 in virtually every other region of the low and middle-income countries(LMICs) and
50 mortality from stroke in developing nations disproportionately exceeds those from
51 developed countries[2,5,6]. The dynamics of these disparities between developed
52 and developing countries have been linked to demographic and lifestyle transitions in
53 addition to poor standard of health care amongst others [7-9].

54 Cerebrovascular disease is an umbrella term that embraces cerebrovascular
55 accident or stroke. The term stroke is not consistently defined in clinical and public
56 health practice research. However, an updated definition that incorporates clinical
57 and tissue criteria aimed at harmonized definition has been adduced[10]. Generally,
58 stroke is characterized as either ischemic or haemorrhagic with majority of stroke
59 events being ischemic[7,10,11]. Patho-biophysiologicaly, human brain receives
60 about 20% of the cardiac output and control every action of the body such as
61 walking, talking, breathing, among others, thus the global and focal clinical
62 manifestations of stroke depends largely on the area of the brain involved and the
63 extent of neuronal cell death.

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

71 In Nigerian Africa, there has been increasing concern about the burden of
72 stroke and stroke-related adverse events in different parts of the country among
73 hospital patients and various community population groups [24-32]. In Lagos, South-
74 west Nigeria, stroke was reported to occur at 1.14 per 1000 in general population
75 and 24.1 per 1000 in those older than 65 years [25]; while in South-east Nigeria
76 stroke occurred in 1.63 per 1000 population[26]. Among hospitalized patients in
77 Lagos, South-west Nigeria stroke constituted the most common cause of
78 neurological admissions[25] while in Sagamu, South-west Nigeria, stroke accounted
79 for 2.4% of all emergency admissions and 1.8% of emergency department death
80 with case fatality at 24 hours, 7 days, 30 days and 6 months of 9%, 28%, 40% and
81 46% respectively[27]. Stroke was responsible for 17% death of medical ward
82 admission in a teaching hospital in Sagamu, South-west Nigeria [28]; accounted for
83 4.5% of medical admission, 1.3% of total hospital admission and 26.7% mortality
84 with case fatality of 3.0%, 10.9% and 23.8% at 24 hours, 7 days and 30 days in Ido-
85 Ekiti, South-west Nigeria; 17.4% of ED death in a rural hospital in South-west Nigeria
86 [30]; 15.6% of medical ward admission in Umuahia, South-east Nigeria[31]; 15.7% of
87 geriatric emergencies in South-east Nigeria [32] and 3.8% of geriatric morbidity from
88 non-communicable diseases in South-east, Nigeria [33].

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

109 **MATERIALS AND METHODS**

110 **Study design**

111 This was a retrospective descriptive study. It involved the review of two
112 hundred and sixty-six cases of patients who had acute stroke syndrome that were

113 managed at the Emergency Department of Federal Medical Centre, Umuahia,
114 Nigeria between January 2008 and December 2012.

115 **Study setting**

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

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

128 **Selection criteria**

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

132 **Methods**

133 Collection of data was done using data collection form which was developed
134 for the study by the authors through robust review of literature on epidemiology of
135 stroke[3,14,15,18,23-31,36-40]. The secondary sources of data were emergency

136 department admission registers. Case folders of patients who had acute stroke
137 syndrome were retrieved from the department of medical records of the hospital.
138 These were supplemented with data from nurses report books. The epidemiological
139 characteristics of the acute stroke patients focused on patient age, sex, where the
140 incidence occurred (place), time of presentation to the ED of the hospital, duration of
141 symptoms at time of presentation to the ED, season(month) of occurrence, number
142 of stroke episodes, type of stroke, and associated clinical conditions.

143 **Operational definition of research variables**

144 Operationally, acute stroke syndrome is characterized by global symptoms
145 and focal neurological signs which are specific to either ischemic or hemorrhagic
146 stroke [41]. Age of the adult patients was categorized into younger adults aged 18-
147 59 years and elderly patients who were aged 60 years and more. The time of
148 presentation to the ED was classified into two: day time was defined inclusively as
149 time period from 6.00am to 6.00pm Nigerian time while night time refers exclusively
150 to the time period from 6.00pm to 6.00am Nigerian time. Early presentation to the
151 ED meant that the stroke victim arrived the emergency department of the hospital
152 inclusively within 1 hour of the occurrence of the acute stroke while those who
153 arrived after 1 hour were defined as late presentation to the hospital. The 1 hour
154 arrival bracket in ED is imperative in the study area considering the care pathway
155 navigated by the acute stroke patients in accessing ED care such as time for general
156 and neurological evaluation, performing and reading the neuroimage, access to
157 stroke team among other bureaucratic bottlenecks which are likely to sum up to 3
158 hours conservative estimate before definitive care is rendered to stroke patients.
159 Early presentation to the ED within 1 hour of onset of symptoms provides best
160 opportunity for successful management. The season of occurrence was divided into

161 two: dry or harmattan and rainy seasons based on the Nigerian meteorological
162 setting. Dry or harmattan season referred to the time period from November to
163 March while rainy season is defined as the time period from April to October.

164 **Statistical analysis**

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

168

169

170 **RESULTS**

171 The age of the patients with acute stroke syndrome ranged from 36 years to 95
172 years with mean age of 68.2 ± 7.4 years. There were 155 (58.3%) males and 111
173 (41.7%) females with male to female ratio of 1.4: 1 [Table 1].

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

176 Two hundred and thirty-nine (89.8%) of the patients who had acute stroke
177 syndrome had duration of symptoms of more than 1 hour at presentation while
178 twenty seven (10.2%) presented early within 1 hour to the ED of the hospital [Table
179 3].

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

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

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

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

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

193 **DISCUSSION**

194 This study has demonstrated the variations of acute stroke syndrome
195 among young adults and the elderly patients in the ED of the hospital. The most
196 affected age group was the elderly patients aged 60 years and above with a mean
197 age of 68.2 ± 7.4 . The mean age of occurrence of stroke in this study is within the 6th
198 and 7th decade of life adduced for sub-Saharan Africa and in contrast to the peak
199 age of occurrence of 7th and 8th decade of life described for developed
200 countries[11,42]. The mean age of occurrence of stroke has been reported in
201 various parts of Nigeria [25,27,29,31,39] and other parts of the Africa like Ghana[23]:
202 In Ido-Ekiti, South-west Nigeria mean age of occurrence of stroke of 68.0 years was
203 reported[29], 66.5 years was reported in Umuahia, South-east Nigeria[31], 63.4
204 years was reported in Surulere, Lagos, South-west Nigeria[25]; 61.5 years was
205 reported in Sagamu, South-west Nigeria[27], 60.7 years was reported in Ukpo,

206 South-east Nigeria[26], 59.4 years was reported in Ibadan Southwest Nigeria[39]
207 and 65.6 years was reported in Ghanaian Africans[23]. The lower mean age of
208 occurrence of stroke in this study compared to developed nations is attributed to
209 various reasons such as lower life expectancy in Nigeria, poor standard of care for
210 cerebrovascular disease among other factors which affect cardiovascular health of
211 the Nigerian population[1,11,32,33,43]. Although age standardized rates of mortality
212 from stroke have decreased globally in the past 2 decades but the absolute number
213 of persons who have stroke events every year are increasing particularly in
214 developing countries like Nigeria [11]. The higher burden of stroke among the elderly
215 patients could be a reflection of the fact that the elderly population are likely to have
216 more clusters and aggregates of risk factors of stroke when compared to the
217 younger adults[14,33,44]. Since the preponderance of global burden of stroke
218 resides in developing countries[1] like Nigeria, occurring largely among geriatric
219 population, there is need for geriatric cerebrovascular health specifically and
220 cardiovascular health generally in addition to universal access to organized stroke
221 services in the sub-region. This appears to be one of the ways geriatric Nigerians will
222 benefit from good health-related quality of life and longevity as obtained in advanced
223 nations of the world.

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

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

251 This study found that 77.8% of acute stroke syndrome occurred at home.
252 The higher occurrence of acute stroke at home in the study area could be a
253 reflection of the predominant type of stroke and the biosocial characteristics of the
254 victims[25,26,48]. Neuro-pathophysiologically ischemic stroke has been documented
255 in biomedical literature to occur predominantly at rest or after waking up from sleep.

256 More so, the gradual and progressive onset of ischemic stroke should have allowed
257 the victim the window period of time to get to their homes and rest or sleep believing
258 that the symptoms of stroke would disappear by the time they wake up from sleep
259 not knowing that they may not wake up in good health. Furthermore, the higher
260 frequency of occurrence of acute stroke at home could also be a proxy indicator of
261 the demographic characteristics of the elderly Nigerians who are likely to have
262 retired from active primary occupation and are unlikely to be engaged in secondary
263 occupation and are more likely to be at home at the time of the cerebrovascular
264 accident[48].

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

276 Although the time interval between acute stroke and arrival to the ED of the
277 hospital is variable but only twenty seven (10.2%) of the stroke victims presented to
278 the ED of the hospital within one hour of stroke episodic occurrence. The current
279 concept in the clinical evaluation of acute stroke patients has connoted stroke as 'a
280 brain attack' or 'accident' (cerebrovascular accident) which emphasized the need for

281 rapid and focused intervention with focus on 'watch and intervene' rather than the old
282 concept of 'wait and see'. This is in tandem with neurologist mantra 'time is neurone;
283 and 'time is brain' which is similar to the cardiologist mantra for myocardial
284 infarction 'time is muscle' The longer the delay before effective action, the more
285 brain tissues are lost because time lost is equivalent to brain tissue lost.
286 Interventions to restore cerebral circulation should take place within the critical hours
287 of need in order to safeguard normal brain tissues, and surrounding at risk brain
288 tissues (penumbra) as soon as possible. However, study has demonstrated that
289 early recurrent embolization particularly in cardioembolic stroke is an important
290 predictor of in-hospital mortality [50]. The finding of this study therefore is a wake up
291 calls for patient, person and population health information and education on acting
292 fast if the person thinks that he/she or someone has warning FAST signs of acute
293 stroke (Facial weakness; Arm/limb weakness; Speech difficulties; Time is brain).
294 With these envisaged and other constraints that militate against prompt presentation
295 to the ED of hospital it appears that late presentation to the hospital could have been
296 prevented proactively. In this regard, multi-sectoral and multi-disciplinary
297 interventions targeted at ensuring that acute stroke victims receive early emergency
298 medical services during the crucial window of need are advocated in the study area.

299 This study has shown that one hundred and fifty-seven (59.1%) of the study
300 subjects had repeated stroke. Although the rate of recurrence of stroke is influenced
301 by various independent or clusters of risk factors of stroke such as hypertension,
302 dyslipidaemia, diabetes mellitus, obesity amongst others[44,49,51]. However, the
303 atherosclerosis of the internal carotid artery and vertebrobasilar artery arcade
304 remains relevant for anterior circulation and posterior circulation recurrent ischemic
305 stroke. Since the causal factors that are associated with recurrence of stroke are

306 largely known in most patients, it is pertinent to identify patients at different risk of
307 recurrence and stratify these patients according to their risk of recurrent stroke for
308 targeted secondary prevention and other diverse care. This is essential for
309 preventing future stroke events since repeat stroke is often more serious than index
310 or previous stroke events.

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

321 This study has demonstrated that one hundred and ninety-nine (74.8%) of
322 acute stroke syndrome was ischemic stroke. This finding is in consonance with the
323 global epidemiological pattern of stroke with majority of stroke being
324 ischemic[1,3,7,11,19]. In Nigerian Africans, variable prevalence of ischemic stroke
325 have been reported in different parts of the country: 64.0% was reported in Sagamu,
326 South-west Nigeria[27]; 64.4% was reported in Ido-Ekiti, South-west Nigeria[29] and
327 65.5% in Umuahia, South-east Nigeria. [31] The preponderance of ischemic stroke
328 could be attributed to the atherosclerotic load[55]. Aetio-pathogenetically,
329 atherosclerosis is generally associated with various adverse cardiovascular events
330 and specifically with cerebrovascular event like ischemic stroke[52,55-57]. More so,

331 recurrence of ischemic stroke is related to the advanced stage of atherosclerotic
332 plaque and its characteristic risk burden[53,54]. Since atherosclerotic
333 cerebrovascular events have be associated with incident or recurrent stroke, it is
334 relevant to look out for the surrogate markers of atherosclerosis or markers of
335 atheromatosis during clinical encounter with stroke patients [53,54,56,58]. There is
336 therefore need to control the overt and covert risk factors of stroke particularly those
337 with metabolic signature of atherothrombosis such as hypertension and diabetes
338 mellitus through integrated primary and secondary prevention strategies.

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

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

362 **Implications of the study**

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

375 **Limitations of the study**

376 The limitations arising from the retrospective nature of the study using
377 secondary data sources are recognized by the authors. More so, the sample size
378 was relatively small; although this was the number of patients with acute stroke
379 syndrome whose case notes met the inclusion criteria during the period under

380 review. Furthermore, stroke victims who were brought in dead were excluded from
381 the study. If these dead patients were inclusively considered, this could have added
382 to the sample size. In addition, this study didn't assess for pre-hospital care received
383 by the stroke victims and other diverse epidemiological information. This was due to
384 poor state of documentation of what happened during health professional-patient-
385 patient relatives interface particularly at the time of arrival, the time of discharge or
386 referral. Moreover, the case definition of acute stroke syndrome in the data
387 extraction proforma from the retrospective record review was based on predefined
388 WHO MONICA clinical diagnostic criteria and Siriraj stroke score used at the ED
389 which have been validated in Nigeria for use in management of stroke where CT
390 scan is not available [31,65]. The clinical diagnostic criteria are simple tools that
391 differentiate cerebral infarct from cerebral hemorrhage but diagnosing stroke
392 subtypes required neuroimaging which is unavailable at the hospital during the
393 period under review and access is limited by time, distance and cost.

394 **CONCLUSION**

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

403 **CONSENT**

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

406 **ETHICAL APPROVAL**

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

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

615

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

616

617 Table 2: Distribution of the stroke patients by place of occurrence of stroke

618

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

619

620 Table 3: Distribution of the patients by duration of symptoms at presentation to the
621 Emergency Department

622

623

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

624

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628

629 Table 4: Distribution of the stroke patients based on the time of presentation to the
630 Emergency Department

631

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

632

633 Table 5: Distribution of the patients by season of occurrence

634

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

635

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

637

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

638

639 Table 7: Type of stroke among the patients

640

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

641

642 Table 8: Associated clinico-medical conditions of the stroke patients

643

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

644