

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, during dry season and most of the patients presented late to the ED and at night time. Interventional strategies aimed

37 at risk reduction, early presentation to dedicated and responsible stroke units and centres are
38 advocated.

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

40 **INTRODUCTION**

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

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

60 Worldwide, about 15 million cases of stroke occur each year with two thirds
61 occurring in developing nations and greater than one third of the stroke events are fatal[6].

62 The burden of stroke has been described in various age groups [12-14], sex[15-18] and
63 global populations such as United States of America [19], China[20], Singapore[21], South
64 Africa[22] and Ghana [23]. In United States of America, each year about 800,000 new or
65 recurrent stroke events occur and this accounted for 1 out of every 18 deaths [19].

66 In Nigerian Africa, there has been increasing concern about the burden of stroke and
67 stroke-related adverse events in different parts of the country among hospital patients and
68 various community population groups [24-32]. In Lagos, South-west Nigeria, stroke was
69 reported to occur at 1.14 per 1000 in general population and 24.1 per 1000 in those older than
70 65 years [25]; while in South-east Nigeria stroke occurred in 1.63 per 1000 population[26].
71 Among hospitalized patients in Lagos, South-west Nigeria stroke constituted the most
72 common cause of neurological admissions[25] while in Sagamu, South-west Nigeria, stroke
73 accounted for 2.4% of all emergency admissions and 1.8% of emergency department death
74 with case fatality at 24 hours, 7 days, 30 days and 6 months of 9%, 28%, 40% and 46%
75 respectively[27]. Stroke was responsible for 17% death of medical ward admission in a
76 teaching hospital in Sagamu, South-west Nigeria [28]; accounted for 4.5% of medical
77 admission, 1.3% of total hospital admission and 26.7% mortality with case fatality of 3.0%,
78 10.9% and 23.8% at 24 hours, 7 days and 30 days in Ido-Ekiti, South-west Nigeria; 17.4% of
79 ED death in a rural hospital in South-west Nigeria [30]; 15.6% of medical ward admission in
80 Umuahia, South-east Nigeria[31]; 15.7% of geriatric emergencies in South-east Nigeria [32]
81 and 3.8% of geriatric morbidity from non-communicable diseases in South-east, Nigeria [33].

82 Patients who have stroke syndromes often present as emergency cases to the ED of
83 Nigerian hospitals [30,34,35] and sometimes are dramatic in their clinical
84 presentations[27,36]. Of great concern is that some of these patients with new or repeat
85 stroke succumbed to the attack before presenting to the ED of the hospital[32]. More
86 worrisome in the study area is that stroke and stroke-related complications constitute cardinal

87 indications for healer-shopping and patronage of traditional medical practitioners[32,33]. The
88 envisaged outcome of such delay in seeking early and appropriate treatment and unorthodox
89 consultation can better be imagined than seen in the study area. Research studies on the
90 management of stroke in Nigerian hospital settings have reported variable outcomes of stroke
91 care suggesting the involvement of factors other than medical interventions in the prognosis
92 [26,28,30] and epidemiological characteristics of their presentations at the first port of call
93 and contact with ED of the hospital is one of such factors [24,36,37]. The early recognition
94 of the epidemiological profile of the stroke patients that predispose, promote, perpetuate or
95 enable the occurrence of cerebrovascular accident therefore avails great opportunity for
96 proactive interventions [38-40]. It is based on this premise that the authors reviewed
97 retrospectively the epidemiology of stroke syndromes in the adult emergency department of a
98 tertiary hospital in a resource-limited environment of South-eastern Nigeria over a five year
99 period from January 2008 to December 2012.

100 **MATERIALS AND METHODS**

101 **Study design**

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

106 **Study setting**

107 The study was conducted at the Emergency Department of Federal Medical Centre,
108 Umuahia, Abia state, South-East Nigeria. Until recently, Umuahia capital city and its
109 environs have witnessed an upsurge in the number of banks, hotels, schools, markets,
110 industries, junk food restaurants in addition to the changing dietary, behavioural and social

111 lifestyles. Federal Medical Centre, Umuahia is located in the metropolitan city of Umuahia.
112 It is one of the tertiary referral hospitals in South-east Nigeria and has facilities for primary,
113 secondary and tertiary health care.

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

119 **Selection criteria**

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

123 **Methods**

124 Collection of data was done using data collection form which was developed for the
125 study by the authors through robust review of literature on epidemiology of
126 stroke[3,14,15,18,23-31,36-40]. The secondary sources of data were emergency department
127 admission registers. Case folders of patients who had acute stroke syndrome were retrieved
128 from the department of medical records of the hospital. These were supplemented with data
129 from nurses report books. The epidemiological characteristics of the acute stroke patients
130 focused on patient age, sex, where the incidence occurred (place), time of presentation to the
131 ED of the hospital, duration of symptoms at time of presentation to the ED, season(month) of
132 occurrence, number of stroke episodes, type of stroke, and associated clinical conditions.

133 **Operational definition of research variables**

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

152 **Statistical analysis**

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

156

157

158 **RESULTS**

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

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

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

167 One hundred and sixty- two (60.9%) of the patients presented during the night time
168 (6pm-6am exclusive, Nigeria time) while one hundred and four (39.1%) presented during the
169 day time [Table 4].

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

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

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

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

180 **DISCUSSION**

181 This study has demonstrated the variations of acute stroke syndrome among young
182 adults and the elderly patients in the ED of the hospital. The most affected age group was the
183 elderly patients aged 60 years and above with a mean age of 68.2 ± 7.4 . The mean age of
184 occurrence of stroke in this study is within the 6th and 7th decade of life adduced for sub-
185 Saharan Africa and in contrast to the peak age of occurrence of 7th and 8th decade of life
186 described for developed countries[11,42]. The mean age of occurrence of stroke has been
187 reported in various parts of Nigeria [25,27,29,31,39] and other parts of the Africa like
188 Ghana[23]: In Ido-Ekiti, South-west Nigeria mean age of occurrence of stroke of 68.0 years
189 was reported[29], 66.5 years was reported in Umuahia, South-east Nigeria[31], 63.4 years
190 was reported in Surulere, Lagos, South-west Nigeria[25]; 61.5 years was reported in Sagamu,
191 South-west Nigeria[27], 60.7 years was reported in Ukpo, South-east Nigeria[26], 59.4 years
192 was reported in Ibadan Southwest Nigeria[39] and 65.6 years was reported in Ghanaian
193 Africans[23]. The lower mean age of occurrence of stroke in this study compared to
194 developed nations is attributed to various reasons such as lower life expectancy in Nigeria,
195 poor standard of care for cerebrovascular disease among other factors which affect
196 cardiovascular health of the Nigerian population[1,11,32,33,43]. Although age standardized
197 rates of mortality from stroke have decreased globally in the past 2 decades but the absolute
198 number of persons who have stroke events every year are increasing particularly in
199 developing countries like Nigeria [11]. The higher burden of stroke among the elderly
200 patients could be a reflection of the fact that the elderly population are likely to have more
201 clusters and aggregates of risk factors of stroke when compared to the younger
202 adults[14,33,44]. Since the preponderance of global burden of stroke resides in developing
203 countries[1] like Nigeria, occurring largely among geriatric population, there is need for
204 geriatric cerebrovascular health specifically and cardiovascular health generally in addition to

205 universal access to organized stroke services in the sub-region. This appears to be one of the
206 ways geriatric Nigerians will benefit from good health-related quality of life and longevity as
207 obtained in advanced nations of the world.

208 This study has shown that males had higher prevalence of acute stroke syndrome
209 compared to their female counterparts. This finding is in agreement with global gender
210 epidemiological pattern for stroke [15-18,46]. Although the Global Burden of Stroke Study
211 reported higher prevalence of ischemic stroke in males compared to female and lack of sex
212 difference in hemorrhagic stroke but reports from different parts of Nigeria such as Lagos,
213 South-west Nigeria [25]; Ukpou, South-east Nigeria[26]; Umuahia, South-east Nigeria[31] and
214 other parts of Africa like Ghana [23] and South Africa[22] have documented higher
215 prevalence of stroke in males compared to their female counterparts. The higher prevalence
216 of acute stroke syndrome among male gender in the study area could be attributed to the
217 reports that men who had pre-existing medical conditions that predispose and promote the
218 occurrence of stroke such as hypertension, dyslipidaemia, obesity, diabetes mellitus and other
219 atheroma markers of cerebrovascular disease such as history of transient ischemic attack are
220 generally more reluctant to seek treatment, non-adherent with prescribed medications and are
221 more likely to engage in behavioural and lifestyle activities that could precipitate and
222 provoke occurrence of acute stroke[32,33]. Furthermore, researchers in Nigeria have adduced
223 that the lower prevalence of acute stroke syndrome among female Nigerians could be
224 attributed to the finding that females who had acute stroke are likely to patronize religious
225 houses and spiritual homes for spiritual intervention and divine healing and are less likely to
226 present to the orthodox health facilities for treatment[25,26]. There is therefore an urgent
227 need for hospital and community-oriented research studies that are adequately powered for
228 men and women respectively in order to derive scientifically robust and credible data on the
229 sex difference in the burden of acute stroke syndrome in the study area.

230 This study found that 77.8% of acute stroke syndrome occurred at home. The higher
231 occurrence of acute stroke at home in the study area could be a reflection of the predominant
232 type of stroke and the biosocial characteristics of the victims[25,26,47]. Neuro-
233 pathophysiologically ischemic stroke has been documented in biomedical literature to occur
234 predominantly at rest or after waking up from sleep. More so, the gradual and progressive
235 onset of ischemic stroke should have allowed the victim the window period of time to get to
236 their homes and rest or sleep believing that the symptoms of stroke would disappear by the
237 time they wake up from sleep not knowing that they may not wake up in good health.
238 Furthermore, the higher frequency of occurrence of acute stroke at home could also be a
239 proxy indicator of the demographic characteristics of the elderly Nigerians who are likely to
240 have retired from active primary occupation and are unlikely to be engaged in secondary
241 occupation and are more likely to be at home at the time of the cerebrovascular accident[47].

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

252 Although the time interval between acute stroke and arrival to the ED of the hospital
253 is variable but only twenty seven (10.2%) of the stroke victims presented to the ED of the
254 hospital within one hour of stroke episodic occurrence. The current concept in the clinical

255 evaluation of acute stroke patients has connoted stroke as ‘a brain attack’ or ‘accident’
256 (cerebrovascular accident) which emphasized the need for rapid and focused intervention
257 with focus on ‘watch and intervene’ rather than the old concept of ‘wait and see’. This is in
258 tandem with neurologist mantra ‘time is neurone; and ‘time is brain’ which is similar to the
259 cardiologist mantra for myocardial infarction ‘time is muscle’ The longer the delay before
260 effective action, the more brain tissues are lost because time lost is equivalent to brain tissue
261 lost. Interventions to restore cerebral circulation should take place within the critical hours of
262 need in order to safeguard normal brain tissues, and surrounding at risk brain tissues
263 (penumbra) as soon as possible. The finding of this study therefore is a wake up calls for
264 patient, person and population health information and education on acting fast if the person
265 thinks that he/she or someone has warning FAST signs of acute stroke (Facial weakness;
266 Arm/limb weakness; Speech difficulties; Time is brain). With these envisaged and other
267 constraints that militate against prompt presentation to the ED of hospital it appears that late
268 presentation to the hospital could have been prevented proactively. In this regard, multi-
269 sectoral and multi-disciplinary interventions targeted at ensuring that acute stroke victims
270 receive early emergency medical services during the crucial window of need are advocated in
271 the study area.

272 This study has shown that one hundred and fifty-seven (59.1%) of the study subjects
273 had repeated stroke. Although the rate of recurrence of stroke is influenced by various
274 independent or clusters of risk factors of stroke such as hypertension, dyslipidaemia, diabetes
275 mellitus, obesity amongst others[44,49,50]. However, the atherosclerosis of the internal
276 carotid artery and vertebrobasilar artery arcade remains relevant for anterior circulation and
277 posterior circulation recurrent ischemic stroke. Since the causal factors that are associated
278 with recurrence of stroke are largely known in most patients, it is pertinent to identify patients
279 at different risk of recurrence and stratify these patients according to their risk of recurrent

280 stroke for targeted secondary prevention and other diverse care. This is essential for
281 preventing future stroke events since repeat stroke is often more serious than index or
282 previous stroke events.

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

292 This study has demonstrated that one hundred and ninety-nine (74.8%) of acute stroke
293 syndrome was ischemic stroke. This finding is in consonance with the global epidemiological
294 pattern of stroke with majority of stroke being ischemic[1,3,7,11,19]. In Nigerian Africans,
295 variable prevalence of ischemic stroke have been reported in different parts of the country:
296 64.0% was reported in Sagamu, South-west Nigeria[27]; 64.4% was reported in Ido-Ekiti,
297 South-west Nigeria[29] and 65.5% in Umuahia, South-east Nigeria. [31] The preponderance
298 of ischemic stroke could be attributed to the atherosclerotic load[53]. Aetio-pathogenetically,
299 atherosclerosis is generally associated with various adverse cardiovascular events and
300 specifically with cerebrovascular event like ischemic stroke[50,53-55]. More so, recurrence
301 of ischemic stroke is related to the advanced stage of atherosclerotic plaque and its
302 characteristic risk burden[51,52]. Since atherosclerotic cerebrovascular events have be
303 associated with incident or recurrent stroke, it is relevant to look out for the surrogate markers
304 of atherosclerosis or markers of atheromatosis during clinical encounter with stroke patients

305 [51,52,54,56]. There is therefore need to control the overt and covert risk factors of stroke
306 particularly those with metabolic signature of atherothrombosis such as hypertension and
307 diabetes mellitus through integrated primary and secondary prevention strategies.

308 Hypertension is the most common medical condition associated with acute stroke
309 syndrome in this study. Globally, hypertension is the commonest risk factor of stroke
310 accounting for greater percentage of incident and recurrent stroke events[23,29,57]. In
311 Nigeria, hypertension-related stroke events have been reported in different parts of the
312 country: 89.0% was reported among stroke patients in Bayelsa, South-south, Nigeria[57],
313 85.2% was reported in Ido-Ekiti, South-west Nigeria [29], 80.0% was reported in Southwest
314 Nigeria[42], 74.3% was reported in Umuahia, South-east Nigeria [31] while in other parts of
315 sub-Saharan Africa such as Ghana, 63.0% of stroke patients had hypertension[23]. The
316 predispositional predilection for stroke in hypertensive patients could be attributed to the fact
317 that hypertension and stroke are component defining criteria under the umbrella of
318 cardiovascular disease[41,44,58,59]. Hypertension is the principal risk factor for
319 cardiovascular disease [60] and its co-occurrence in stroke patients possibly points to a
320 common precipitating and promotional genetic and environmental factors[59-61].
321 Furthermore, hypertension is known to predispose to stroke by its contribution to the process
322 of atherogenesis particularly in the cerebral anatomical vascular arcade resulting in
323 insufficiency in cerebral perfusion pressure among other disturbances of the cerebral
324 hemodynamic and homeostatic physiology[5,58]. With increasing prevalence of
325 hypertension in Nigeria and poor awareness of the risk factors of stroke [36,62] and its
326 warning signs among the Nigerian populace, the trend in the hypertension-related stroke may
327 continue unabated. The finding of this study therefore brings to the front burner the issues of
328 Nigerian population cardiovascular health education, promotion and maintenance.

329 **Implications of the study**

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

341 **Limitations of the study**

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

352 **CONCLUSION**

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

360 **CONSENT**

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

363 **ETHICAL APPROVAL**

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

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

546

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

547

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

549

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

550

551 Table 3: Distribution of the patients by duration of symptoms at presentation to the Emergency
552 Department

553

554

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

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560 Table 4: Distribution of the stroke patients based on the time of presentation to the Emergency
 561 Department

562

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

563

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

565

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

566

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

568

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

569

570 Table 7: Type of stroke among the patients

571

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

572

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

574

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

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