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Spontaneous Intracerebral Hemorrhage: Epidemiology, Clinical Profile and Short-Term Outcome in a Tertiary Hospital in Sub-Saharan Africa

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Abstract

Background: Data on spontaneous intracerebral haemorrhagic (SICH) are scarce in Africa. Our objectives were to determine the prevalence of SICH, describe the clinical profile, aetiology and evaluate the prognosis (fatality case, functional outcome) of patients in a tertiary health care hospital in Cameroon. **Methods:** This was a hospital-based retrospective cohort which included patients with SICH and followed up for 6 months after stroke. Subarachnoid haemorrhage, cerebral venous thrombosis with bleeding or bleeding related with ischemic or brain tumour were excluded. Predictive factors were obtained using multiple logistic regression and survival by Kaplan Meier method. **Results:** The prevalence of SICH was 37% with male predominance (64.0%), a mean age of 55.6 ± 11.8 years. Deep coma was found in 30.3% on admission. The basal ganglion was the most frequent location of haemorrhage (85.1%) while intraventricular blood effusion, mass effect, cerebral oedema and herniation occurred in 31.4%, 25.7%, 8.8% and 5.0% respectively. Hypertension (57.5%) was the most common aetiology. The mean length of hospitalization was 9.0 ± 7.7 days and chest infection (30.7%) was the most frequent complication. The cumulative case fatality rate after 24 hours (day 1), during admission, month 1 and month 3 was 9.6%, 39.9%, 46.0%, 59.8% respectively. On multivariate analysis, GCS < 9 [OR (95% CI) = 3.538 (1.086 - 11.526), p = 0.036] and NIHSS 15 - 24 [OR (95% CI) = 7.498 (1.306 - 43.029), p = 0.024] were independent predictors of in-hospital mor-

tality while mass effect [OR (95% CI) = 3.563 (1.217 - 10.432), p = 0.020] and hyperthermia [OR (95% CI) = 4.645 (1.341 - 16.085), p = 0.015] predict poor functional outcome. Six-month survival was 37.8%. **Conclusion:** About one-third of stroke patient were haemorrhagic. Hypertension is the leading CVRF and aetiology of spontaneous ICH. About 1 over 2 patients with SICH would die within 3 months while 50% of survivors would have a poor functional outcome at 6th month.

Keywords

Spontaneous Intracerebral Haemorrhage, Epidemiology, Prognosis, Africa

1. Introduction

Stroke is a leading cause of mortality and long term disability worldwide [1] [2]. Globally, stroke comprises approximately 10 percent of all deaths and causes 5.5 million deaths each year, with 44 million disability-adjusted life-years (DALYs) lost [3] [4]. In 2010, there were 16.9 million strokes worldwide, of which 70 percent occurred in low and middle-income countries; this trend is expected to increase over the next 20 years [3] [5]. SICH is twice as frequent in low-to-middle income countries (LMICs) compared to high-income countries [6]. Presently, LMICs account for more than 85 percent of the global stroke mortality [7]. The rate of mortality and poor functional recovery amongst patients with SICH is higher compared to those with ischemic stroke [8]. Over the last decade, there has been an increase in stroke admission and case-fatality in Cameroon [9]. In Cameroon, SICH accounts for 48% of stroke cases and hypertension (HTN) is the predominant cerebrovascular risk factor [10]. Over the last 3 decades, the overall incidence of SICH has remained unchanged, but its regional incidence varies by race, sex, season and geographical location [11]. Understanding the epidemiology of SICH will help influence treatment decisions towards optimal management of SICH and contribute to the limited available data on ICH in sub-Saharan Africa. The aim of this study was to determine the epidemiology, describe the clinical profile, aetiology, and evaluate the prognosis (fatality case, functional outcome) of patients in a tertiary health care hospital in Cameroon.

2. Methods

Patients and study design

We carried out a hospital-based retrospective cohort study in a tertiary care hospital which included consenting patients admitted for SICH in the Neurology Unit and the Intensive Care Unit (ICU) of the Douala General Hospital (DGH) from January 2010 to December 2015. Patients aged 15 years and above who were admitted for confirmed SICH within 7 days of onset of symptoms were included in our study. Patients with incomplete files (unconfirmed stroke), subarachnoid haemorrhage, traumatic ICH, haemorrhagic cerebral tumours, acute

ischemic stroke, acute ischemic stroke with haemorrhagic transformation and cerebral venous thrombosis were excluded.

Data collection and patient management

For every patient with SICH, sociodemographic data, cerebrovascular risk factors (CVRFs), clinical and paraclinical profile were collected. The following definitions and standard operating techniques were used to identify risk factors for stroke in each subject: Hypertension was defined as patient with medical history of hypertension, treated or not and patient with persistent high blood pressure > 140/90 mmHg after stroke. Diabetes Mellitus was defined as patient with medical history of diabetes, treated or not, random serum glucose ≥ 2 g/L or venous fasting glucose test ≥ 1.26 g/L. Dyslipidemia was defined as patient with medical history of dyslipidemia or Total cholesterol > 2 g/L or Low-density lipoprotein > 1 g/L or High-density lipoprotein < 0.40 g/L in males or <0.50 g/L in females, triglycerides > 1.50 g/L. On admission, blood samples were collected from all patients during the first 24 hours of admission to do complete metabolic panels (glycaemia, urea, creatinine, uric acid, serum electrolytes) and lipid profile using the Cobas 311 autoanalyzers. A full blood count with platelet counts, prothrombin time, cephaline-kaolin time, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and HIV serology were done. Other tests were prescribed if required by the patient's conditions: chest X-ray, urine culture, hemoculture, and thick blood film to check for plasmodium falciparum. Neurological assessment was done by a neurologist or intensive care specialist while the interpretation of CT scan films was done by both radiologist and neurologist. On admission, stroke severity was assessed using the National Institute of Health Stroke Scale (NIHSS) and the Glasgow coma scale for patients admitted in the ICU while the functional outcome was assessed using the modified Rankin score (mRS). Follow up was done daily for clinical evaluation and complications were noted. Oxygen was administrated if ambient oxygen saturation was less than 94%. Paracetamol was used 1g every six hours if temperatures superior to 37.5˚C were noted. Prevention of deep venous thrombosis and stress ulcers was done using prophylactic dose of enoxaparin (40 mg) and omeprazole (20 mg), respectively. An insulin protocol was set up when capillary glycaemia was above 1.4 g/L. Concerning the blood pressure, nicardipine was given intravenously with electric syringe in case of high blood pressure with a target of 140 to 160 mmHg for systolic blood pressure in haemorrhagic stroke. In the absence of 20% mannitol, furosemide was administered to patients with evidence of cerebral oedema. Nasogastric tubes were inserted for feeding of patients with deglutition problems. Antibiotics and artemether were used for bacterial infection and malaria, respectively. Stroke death and cause of death during admission and within 6 months post stroke was also recorded. After the initial stroke discharge, patients were booked for follow up visits at 1, 3 and 6 months post SICH. For every follow visit, the stroke severity and functional outcome of stroke survivors was reassessed using the NIHSS and mRS. Poor functional outcome was considered in

patients with mRS > 2 within the first 6 months post stoke discharge while good functional outcome was considered in patients who are alive within the first 6 months post stroke and with mRS ≤ 2. The carers of patients who did not come for routine follow up visits were contacted using cells phone for vitality status of the stroke patients.

Statistical analysis

Statistical analysis was done using the Statistical Package for Social Sciences (SPSS) Standard version, Release 20.0 (IBM Inc. 2012). Mean and standard deviation (SD) of all continuous data are reported. Chi Square test and Independent Samples t-test were used to test for the factors associated with stroke mortality and functional recovery. Independent predictors for mortality and functional recovery were determined using the cox regression model analysis. Survival analysis was performed using Kaplan Meier analysis. Level of significance was considered 0.05 (two-sided).

Ethical consideration

This study was approved by the Institutional Ethics Committee of Research on Human Health of the University of Douala and the authorities of the DGH. Confidentiality, anonymity and privacy of all patients' medical records were guaranteed at all levels of this study.

3. Results

Prevalence of ICH

In this study, we registered a total of 704 confirmed cases of acute stroke, with ICH representing 37.1% (261/704), as seen in Figure 1.

Sociodemographic characteristics

Of the 261 patients with SICH, 167 (64%) were males with a sex ratio of 1.77. The age ranged from 23 to 95 years with a mean age of 55.6 ± 11.8 years and patients with ICH aged > 55 years were the most frequent group (50.6%). The

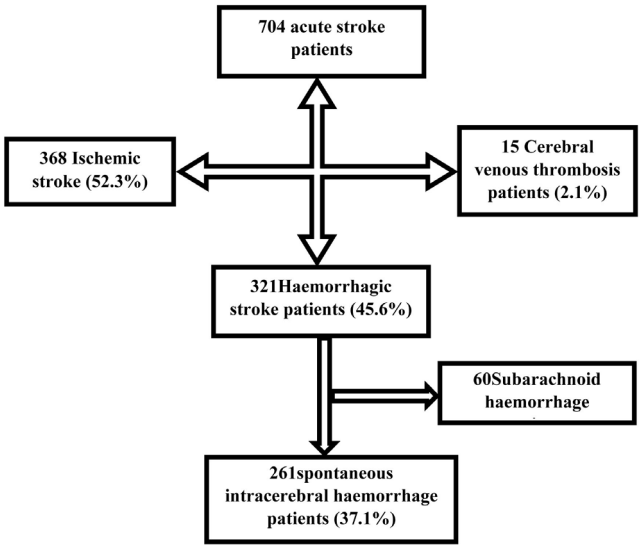

Figure 1. Flow chart for patients inclusion.

mean age of female patients with SICH was 57.3 ± 12.3 years compared to 54.6 ± 11.4 years amongst the male patients and there was no significant difference (Table 1).

Cerebrovascular risk factors (CVRF)

At the time of SICH, the most frequent CVRF was hypertension representing 73.2% (191/261) of the patients with ICH. Obesity, diabetes mellitus, alcohol abuse, smoking and a history of previous stroke were amongst the five most frequent CVRF after hypertension (Table 1).

Time delay from onset of symptoms to stroke diagnosis

The mean time delay in initial consultation at any health facility from onset of stroke symptoms was 16.70 ± 41.88 hours while the mean time delay in consultation at the stroke unit of the DGH from onset of stroke symptoms was 52.72 ± 84.09 hours. Upon arrival at the stroke unit of the DGH, the mean time delay in obtaining CT scan results from time of stroke symptoms onset was 47.20 ± 64.82 hours. Only 64 (24.5%) patients with SICH consulted at the stroke unit within 6 hours of onset of symptoms (Table 2).

Clinical presentation, site of haemorrhage and associated lesions on imagery

Table 1. Sociodemographic characteristics and cerebrovascular risk factors amongst ICH patients.

Variables	Values
Sociodemographic characteristics	
Age > 55 years, n (%)	132 (50.6)
Age, years (Mean ± SD)	55.6 ± 11.8
Male, n (%)	167 (64.0)
Employed, n (%)	96 (36.8)
Medical insurance, n (%)	43 (16.5)
Cerebrovascular risk factors	
HTA, n (%)	191 (73.2)
Obesity, n (%)	112 (42.9)
Diabetes mellitus, n (%)	102 (39.1)
Alcohol consumption, n (%)	83 (31.8)
Smoking, n (%)	38 (14.6)
Previous stroke, n (%)	24 (9.2)
Sleep apnoea syndrome, n (%)	12 (4.6)
Dyslipidemia, n (%)	12 (4.6)
Cardiopathy, n (%)	9 (3.5)
HIV seropositive, n (%)	9 (3.5)
Migraine, n (%)	7 (2.7)

Table 2. Clinical profile of spontaneous intracerebral haemorrhage patients.

Delay in seeking medical care and CT scan confirmation	
Delay in initial consultation at any health facility from onset of stroke symptoms (in hours)	16.70 ± 41.88
Delay in consultation at the DGH from onset of stroke symptoms (in hours)	52.72 ± 84.09
Delay in obtaining CT scan results from time of stroke symptoms (in hours)	47.20 ± 64.82
Clinical parameters	
SBP, mmHg (mean ± SD)	179.3 ± 36.5
SBP > 140 mmHg, n (%)	222 (85.1)
DBP, mmHg (mean ± SD)	108.1 ± 23.6
DBP > 90 mmHg, n (%)	205 (78.5)
CFG, g/L (mean ± SD)	1.46 ± 0.72
CFG > 1.4 g/L, n (%)	96 (36.8)
Glasgow coma score (mean ± SD)	10.9 ± 3.7
Site of haemorrhage on imagery	
Basal ganglia hematoma, n (%)	222 (85.1)
Lobar hematoma, n (%)	28 (10.7)
Brainstem hematoma, n (%)	7 (2.7)
Cerebellar hematoma, n (%)	4 (1.5)
Associated anomalies on imagery	
Intraventricular haemorrhage	82 (31.4)
Mass effect, n (%)	67 (25.7)
Cerebral oedema, n (%)	23 (8.8)
Brain coning, n (%)	13 (5.0)
Etiological mechanism of ICH	
Hypertension	150 (57.5)
Confirmed arterio-venous malformation	11 (4.2)
Amyloid angiopathy	2 (0.8)
Undetermined	98 (37.6)

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, CFG: Capillary fasting glucose.

Of the 261 patients admitted with SICH, 222 (85.1%) and 205 (78.5%) had systolic blood pressure (SBP) > 140 mmHg and diastolic blood pressure (DBP) > 90 mmHg respectively upon admission while capillary glucose > 1.4 g/L was seen in 96 patients (36.8%). On arrival in the Neurological Unit, 79 patients (30.3%) with SICH had a Glasgow coma score (GCS) ≤ 8 and were admitted at the ICU (Table 2).

With the use of CT scan, the site of haemorrhage was localised as shown in Table 1. The most frequent site of haemorrhage amongst patients with SICH

was basal ganglia hematoma (85.1%) while cerebellar hematoma was the least site of haemorrhage involved (1.5%). Intraventricular blood effusion was seen in 82 patients (31.4%) with SICH, mass effect in 67 patients (25.7%), cerebral oedema in 23 patients (8.8%) and brain coning occurred in 13 patients (5.0%). This is shown in Table 2.

Aetiology of ICH and in-hospital complication

The most frequent aetiology of SICH in this study was hypertension (57.5%). Chest infections (30.7%) was the most frequent in-hospital complication seen in patients with ICH while pressure ulcers were the least predominant complication as seen in 6 patients (2.3%).

Length of hospitalisation (LOH), functional recovery, stroke severity and mortality on admission

The mean LOH was 9.0 ± 7.7 days with range of 1 to 51 days. On arrival 81 (31.0%) and 92 (35.3%) patients with SICH had severe and very severe strokes using the NIHSS. The 24-hour post-stroke mortality rate was 9.6% (25/261) while intra-hospital mortality rate was 39.9% (104/261). This is shown in Table 3. The most predominant cause of death amongst patients with SICH was severe sepsis (32.7%) (Table 3).

Functional recovery and case fatality after stroke admission

Using the mRS, 67 SICH survivors (61.5%) had a poor functional outcome at month 1 while 47 ICH survivors had a poor functional outcome at month 3 after stroke onset. During 6 months of regular follow up after stroke onset, the case fatality at month 1 was 46% (120/261) and 59.8% (156/261) at month 3 (Table 3) while the overall 6 months post case fatality was 63.2% (165/261). Figure 2 shows the survival analysis amongst patients with SICH.

Factors associated with in-hospital mortality amongst patients with SICH

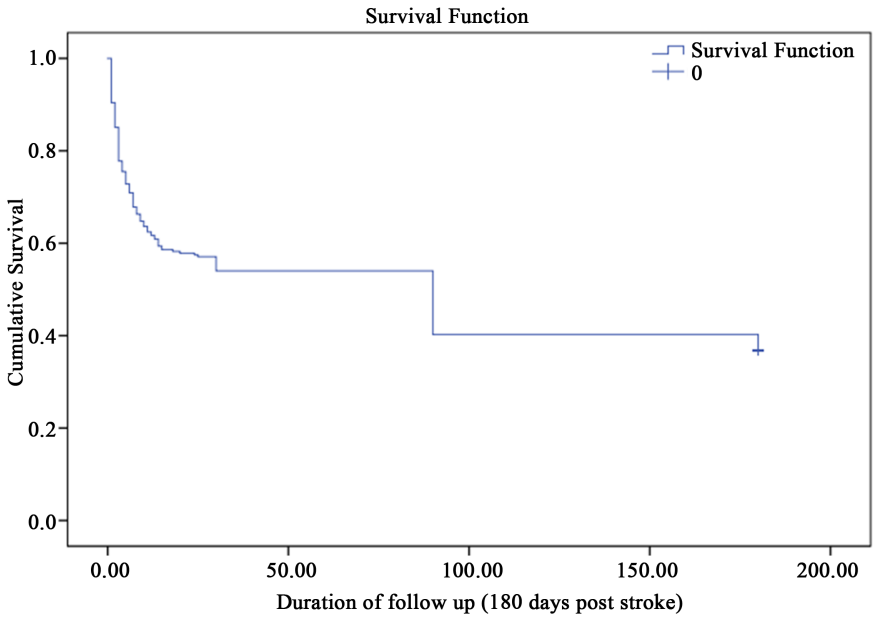

Figure 2. Survival curve of patients with SICH with a median survival period of 90 days.

Table 3. In-hospital and 6 months outcome amongst SICH.

In-hospital complications	
Chest infection	80 (30.7)
Urinary tract infection	63 (24.1)
Deglutition problems	57 (21.8)
Epilepsy/seizures	29 (11.1)
Malaria	23 (8.8)
Desaturation	23 (8.8)
Chest and urinary tract co-infection	12 (4.6)
Pressure ulcers	6 (2.3)
Outcome on admission	
Duration of hospital stay (days)	9.0 ± 7.7
Rankin score ≤ 2	24 (9.2)
Rankin score > 2	237 (90.8)
NIHSS < 5	28 (10.7)
NIHSS 5 - 14	60 (23.0)
NIHSS 15 - 24	81 (31.0)
NIHSS > 24	92 (35.3)
24-hour post-stroke mortality	25 (9.6)
In hospital mortality	104 (39.9)
Cause of death	
Sepsis	34 (32.7)
Multiple organ failure	24 (23.1)
Coning/cerebral herniation	17 (16.3)
Renal failure	2 (1.9)
Undetermined	27 (26.0)
Outcome within 6 months post stroke	
Rankin score > 2 at M1	67 (61.5)
Rankin score > 2 at M3	47 (50.0)
Case fatality at M1	120 (46.0)
Case fatality at M3	156 (59.8)
Case fatality at M6	165 (63.2)

On univariate analysis, the following factors were associated with in-hospital mortality after stroke onset, as seen in Table 4; alcohol abuse, GCS < 9, NIHSS 15 - 24, NIHSS > 24, hyperglycemia, hyperthermia, haemoglobin levels < 10 g/dl, leucopenia, leucocytosis, hypernatremia, hypokalemia, hyperkalemia, elevated CRP and elevated urea levels. On multivariate analysis, GCS < 9 [OR (95% CI) = 3.538 (1.086 - 11.526), p = 0.036] and NIHSS 15 - 24 [OR (95% CI) = 7.498

Table 4. Factors associated with in hospital mortality amongst patients with SICH.

Variables	Alive	Dead	Unadjusted OR (95% CI)	p-value
Alcohol abuse	60 (74.1%)	21 (25.9%)	0.477 (0.295 - 0.771)	0.003
GCS < 9	15 (19%)	64 (81%)	0.065 (0.033 - 0.126)	<0.001
NIHSS score 15 - 24	40 (60.6%)	26 (39.4%)	4.680 (1.110 - 19.737)	0.036
NIHSS score ≥ 25	25 (33.3%)	50 (66.7%)	12.441 (3.019 - 51.262)	<0.001
Glycemia > 1.4 g/dl	59 (51.3%)	56 (48.7%)	1.813 (1.220 - 2.694)	0.003
Temperature > 37.5˚C	47 (47.5%)	52 (52.5%)	2.017 (1.372 - 2.966)	<0.001
Hemoglobin ≤ 10 g/dl	5 (35.7%)	9 (64.3%)	0.457 (0.229 - 0.912)	0.026
WBC < 4000/mm^3	74 (77.9%)	21 (22.1%)	0.548 (0.319 - 0.939)	0.029
WBC > 10,000/mm^3	19 (38%)	31 (62%)	1.973 (1.216 - 3.202)	0.006
Sodium > 145 mEq/L	16 (34%)	31 (66%)	2.863 (1.833 - 4.471)	<0.001
Potassium < 3.5 mEq/L	58 (55.2%)	47 (44.8%)	1.779 (1.130 - 2.802)	0.013
Potassium > 5.5 mEq/L	9 (34.6%)	17 (65.4%)	5.395 (2.944 - 9.884)	<0.001
CRP > 6 mg/L	52 (61.9%)	32 (38.1%)	1.999 (1.005 - 3.975)	0.048
Urea > 0.45 g/L	40 (48.2%)	43 (51.8%)	1.800 (1.199 - 2.702)	0.005

(1.306 - 43.029), p = 0.024] were seen to independent predictors of in-hospital mortality after stroke.

Predictors of poor functional outcome amongst patients with ICH

On multivariate analysis, mass effect [OR (95% CI) = 3.563 (1.217 - 10.432), p = 0.020] and hyperthermia [OR (95% CI) = 4.645 (1.341 - 16.085), p = 0.015] were seen to independent predictors of poor functional recovery after stroke (Table 5).

4. Discussion

In this study, the prevalence of SICH was 37% with male predominance (64.0%) and mean age of 55.6 ± 11.8 years and there was no significant gender difference in age. The prevalence of haemorrhagic stroke in a three years prospective study in Cameroon was 48% with a mean age (SD) of 58.66 (13.6) years and male predominance of 68.1% [10]. This is slightly higher because of haemorrhagic stroke included ICH, subarachnoid haemorrhage and cerebral micro-bleeds only visualized on magnetic resonance imaging (MRI). This is slightly similar to the prevalence of 34.0% amongst with ICH patients aged 61 - 70 years with male predominance of 54.0% as reported by Agarwal *et al.* in India [12] while Desalu *et al.*, reported a prevalence of haemorrhagic stroke of 34.7% in Nigeria [13]. The prevalence of ICH remains unchanged and usually occurs most predominantly amongst patients aged 51 - 60 and 61 - 70 years. The male predominance seen in this study is comparable to that reported most epidemiological studies [14] [15]. Stroke is more prevalent amongst the males than females because other CVRFs such as smoking and alcohol abuse are more frequent amongst the

Table 5. Independent predictors of in hospital mortality amongst patients with SICH.

Predictors	Adjusted OR (95% CI)	p-value
GCS < 9	3.538 (1.086 - 11.526)	**0.036**
NIHSS [15 - 24]	7.498 (1.306 - 43.029)	**0.024**

men. Furthermore, the protective effect of oestrogen on the cerebral circulation reduces the risk of stroke amongst females [16].

Hypertension (HTN) was the most frequent CVRFs (73.2%) amongst patients with SICH. According to O'Donnell *et al*., in 2010, 73.6% of patients had self-reported history of HTN or BP > 160/90 mmHg [7]. Globally, several epidemiological studies have reported that HTN is the most predominant CVRFs [12] [13] [17] [18]. Hypertension is the most important risk factor for spontaneous ICH, and the contribution of hypertension is greater for deep SICH than for lobar SICH [19] [20].

On admission, deep coma occurred in 30.3%, poor functional outcome using mRS occurred in 90.8% and severe to very severe stroke occurred in 66.3% of SICH patients. Conversely, Agarwal *et al*., reported that the most common presenting symptom was altered sensorium present in 58% of SICH patients while Adeleye showed that 70% of SICH patients were in a severe clinical state, 57.2% comatose; and with hemiparesis, headache, vomiting, and aphasia being the main clinical symptoms [12] [17].

The basal ganglia was the most frequent site of haemorrhage seen on imaging (85.1%) while intraventricular blood effusion, mass effect, cerebral oedema and coning (herniation) occurred in 31.4%, 25.7%, 8.8% and 5.0% respectively. Similarly, Safatli *et al*., in 2016 reported that the most common hematoma location was the basal ganglia (43.9%) [21]. According to Adeleye *et al*., spontaneous SICH was supratentorial on brain CT in 90.5%, ganglionic in 50.8%, and thalamic in 58.3% of the latter [17]. And the bleed had CT evidence of mass effect and intraventricular extension (IVH) in more than half [17]. In a population-based, prospective inception cohort study of ICH, 60 (47%) adults had non lobar spontaneous primary first ever ICH (59 single non lobar and 1 multiple non lobar) and 68 (53%) had lobar ICH (61 singlelobar, 4 single lobar extending to non lobar regions, 2 multiple lobar and non lobar, and 1 multiple lobar) [22]. Ezeala Adikaibe *et al*., in Enugu, Nigeria showed that the frequency of lobar, deep cerebral, brain stem and cerebellar hemorrhages was 46.8%, 44.6%, 3.6% and 2.2%, respectively [23]. Smajlović *et al*., in 2008 showed that the most frequent localization of ICH was multilobar (38%), internal capsule/basal ganglia region (36%) and lobar (17%) [24].

Hypertension (57.5%) was the most predominant aetiology of ICH. ICH is usually caused by ruptured vessels that are degenerated due to long-standing hypertension which provokes lipohyalinosis of small deep artery of the brain [25].

The mean LOH was 9.0 ± 7.7 days and chest infections (30.7%) were the most

frequent complication that occurred during admission. The average hospital stay does not depend on the type of ictus, in the sense of whether it is ischaemic or haemorrhagic, but on its severity which mainly depends on the size of the lesion [26]. The longer duration of hospital admission was due to the occurrence of multiple complications as shown in **Table 4**.

The case fatality rate after 24 hours (day 1), during admission, at month 1, month 3 and month 6 was 9.6%, 39.9%, 46.0%, 59.8% and 63.2% respectively. In Norway, the proportion of fatal outcome in retrospective analysis of data at 1 week was 22.1%, at 3 months 39.2%, and at 12 months 44.9% [27]. Safatli *et al*., in 2016 reports a 30-day mortality in patients with SICH of 25.15% [21]. The case fatality rates reported in most studies are lower than what is seen in our context due to the time delay from onset of stroke symptoms and arrival at the stroke unit. The mean time delay in consultation at the stroke unit of 52.72 ± 84.09 hours in this study, without proper antihypertensive control allows time for the hematoma volume to increase and extend to the ventricles.

On multivariate analysis, GCS < 9 and NIHSS between 15 - 24 were independent predictors of mortality while mass effect and temperature > 37˚C were independent predictors of poor functional recovery after stroke. According to Rathor *et al*., the mean GCS score was significantly higher among survivors [14]. The prognostic value of low GCS and high NIHSS scores amongst SICH patients in others study probably reflects the mass effects of hematoma collection, intraventricular hemorrhage and intraventricular hematoma extension. In this study, 81% of ICH patients with GCS < 9 died in the acute phase of stroke (**Table 4**). Sepsis was the most common complications on admission and the most predominant cause of death (32.7%). This explains why the SICH patients with fever had poor functional outcome during admission as most septic patients present with fever. Fever increases mortality, worsens stroke severity and increases the intensive care length of stay and hospital length of stay [28]. A recent retrospective population-based study in Norway showed that predictors of severe disability or death were use of oral antithrombotic drugs, functional disability prior to SICH, low GCS on admission, larger hematoma volume, and intraventricular hematoma extension [27]. Smajlović *et al*., showed that mortality and good outcome at 1 month, is related to the localization of bleeding and that age, stroke severity, multilobar haemorrhage and intraventricular haemorrhage were factors independently associated with mortality [24]. Newly diagnosed diabetes mellitus was independently associated with 1-year poor functional outcome but showed no significant association with 1-year death and stroke recurrence [29]. Koivunen *et al*., in a follow up study of SICH patients aged 16 - 49 years showed that unfavorable functional outcome emerged in 49% and age, initial stroke severity and intraventricular blood effusion were associated with unfavourable functional outcome while male sex and diabetes were associated with increased mortality after adjusting for age and intraventricular hematoma extension [30] (**Table 6**).

Table 6. Independent predictors of poor functional outcome amongst patients with ICH.

Variables	Adjusted OR (95% CI)	p value
Age ≥ 65 years	3.980 (0.601 - 26.349)	0.152
Profession	0.659 (0.132 - 3.286)	0.611
Alcohol abuse	0.317 (0.100 - 1.010)	0.052
Mass effect	**3.563 (1.217 - 10.432)**	**0.020**
Duration of hospitalisation > 7 days	3.011 (0.905 - 10.018)	0.072
Female	0.510 (0.133 - 1.958)	0.327
Temperature > 37.5˚C	**4.645 (1.341 - 16.088)**	**0.015**
Urea > 0.45 g/L	1.720 (0.503 - 5.886)	0.387
NIHSS > 14	1.509 (0.495 - 4.597)	0.469

The major limitation of this study is the absence of information on the volume of the hematoma which is a probable predictor of poor stroke outcomes.

5. Conclusion

About one third of stroke patients were haemorrhagic. Hypertension is the leading CVRF and aetiology of SICH. About 1 over 2 patients with SICH would die within 6 months. Therefore, primary prevention and optimal management of SICH victims are crucial in the reduction of SICH related mortality and morbidity.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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