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Original Research Article

Haemorrhagic Stroke in Young People in Intensive Care: Prognostic Factors in Cote d'Ivoire

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Abstract: ***Introduction:*** Hemorrhagic cerebrovascular accident (HCVA) is a medical or medico- surgical emergency requiring treatment in neurovascular or intensive care units. The aim of this work was to determine the prognostic factors of hemorrhagic stroke in young subjects in intensive care in the 3 university hospitals of Abidjan. ***Method:*** This is a descriptive and analytical retrospective study covering, which extends from January 2018 to December 2022, taking into account All patients aged 18 to 50 admitted to intensive care for a hemorrhagic stroke during the study period. ***Results:*** 146 patients including 100 men were included. The average age was 43 years old. High blood pressure was the main modifiable risk factor. The average Glasgow score was 8.2 and 98% of cases presented with impaired consciousness. Grade 3 hypertension was found in 73 patients on admission. The main location of the hemorrhage on imaging was parenchymal and 45% of subjects had an ICH score greater than or equal to 3 in almost 50% of cases. Nicardipine was the antihypertensive of choice. 103 patients were intubated and ventilated. 52% underwent neurosedation 13% underwent neurosurgery. The average length of hospitalization was 8.3 days during which 72.6% of patients presented complications, mostly infectious. Mortality remains high at 66.44% of cases. We listed as prognostic factors, inaugural deep coma, inaugural grade 3 arterial hypertension, ICH severity score greater than or equal to 3, renal failure and length of stay less than 7 days. ***Conclusion:*** Hemorrhagic strokes in young subjects remain a common condition in our country. Mortality in intensive care is high and is linked to clinical and neurological severity, biological disorders, the occurrence of complications and the length of stay in intensive care.

Keywords: Stroke – hemorrhage – young – prognostic – intensive care.

INTRODUCTION

Stroke is a major public health issue because of its ever-increasing incidence and severity. Stroke is one of the most costly diseases, both in human and economic terms [1]. Age is considered a risk factor, and several studies have predicted an increase in its incidence as the population ages. Haemorrhagic stroke is mainly seen in people over the age of 55, but there has been a resurgence in young people [2, 3]. A patient suffering a stroke is considered to be 'young' if his or her age is less than 45-55 years. According to the Cincinnati Stroke Registry in the United States and the Dijon Stroke Registry, the prevalence of stroke in young people is increasing [4]. 8 to 15% of stroke victims are aged under 55. [5] In France, the prevalence of haemorrhagic stroke in young people is 17.5% [7]. In North Africa, the prevalence of haemorrhagic stroke is estimated at 50% in people under 60 [8]. The prognosis of stroke depends mainly on the initial neurological severity, age and volume of the brain lesion [6]. And although this pathology bears the same name in the young and elderly populations, we can see that stroke in the young subject is very different from that in the elderly subject in terms of aetiology, epidemiology, risk factors and repercussions. For young people, the consequences of stroke (paralysis, depression, fatigue, motor difficulties, speech, sensitivity and sleep problems) will follow them for the rest of their active lives. Studies on stroke in young people are rare in sub-Saharan Africa, particularly in Côte d'Ivoire. In a study conducted in Mali, the prevalence of stroke in people under 60 was estimated at 29.85% [9]. In Togo, Agnon Ayelola Koffi Balogou found that between 10% and 15% of strokes occurred in patients aged between 15 and 45 years [2]. In Côte d'Ivoire, in 2015, N'GORAN *et al.*, found a prevalence of 54% at the Abidjan Heart Institute [10]. As can be seen, we have little data on the epidemiology and prognosis of stroke. This observation

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motivated this study, the aim of which was to investigate the prognostic factors for haemorrhagic stroke in young people in public intensive care units in Abidjan.

METHODOLOGY

Our study took place in three (3) University Hospital Centres (CHU) in the city of Abidjan that had already registered haemorrhagic stroke patients, namely the intensive care unit of the CHU of ANGRE; the intensive care unit of the CHU of COCODY and the intensive care unit of the CHU of TREICHVILLE. The study period for the CHU of COCODY and TREICHVILLE was from January 2018 to December 2022 and that of the CHU of ANGRE was from January 2020 to December 2022.This was a retrospective descriptive and analytical multicentre study involving analysis of the medical records of patients admitted to our study setting with haemorrhagic stroke during our study period. H-stroke in young subjects was defined as : All patients aged 18 to 50 years admitted for haemorrhagic stroke. Patients whose medical records were incomplete, could not be used, were poorly completed or contained less than 85% of the items on the survey form were excluded. The variables studied were: stroke in young subjects defined according to WHO criteria and depending on: sociodemographic (age, sex, profession, country of origin, place of residence, laterality), risk, clinical, paraclinical, therapeutic and evolutionary factors. The data were analysed using Epi-info 3.5.4 software, French version, and were descriptive. It consisted of calculating the number of patients and determining the means and proportions. Quantitative variables were analysed as means with standard deviation. Qualitative variables were expressed as proportions. Quantitative variables were compared using the Chi-2 test in univariate analysis. Differences were considered significant at the 95% confidence level (95% CI).

RESULTS

In our study of a population of 2368 cases, 176 patients were admitted for haemorrhagic stroke in young subjects, representing a prevalence of 7.43%, and 146 cases were selected. The mean age of our patients was 43 ± 4.1 years, with extremes of 18 and 50 years. The most common age group was between 40 and 50 (68.49%). The patients were predominantly male, with a sex ratio of 2.17. The vast majority of our patients were engaged in informal activities (47.26%), followed by those with no source of income (23.97%). Patients were admitted mainly from public facilities (84.93%). The main risk factor for cardiovascular disease in our study population was hypertension (65.75%), followed by diabetes (6.85%). Patients with no risk factors for cardiovascular disease accounted for 12.33%. The average admission time for our patients was 73.94 ± 6.1 hours, with 49.32% of patients admitted within the first 24 hours. The main reasons for consultation were disturbed consciousness (74.66%), followed by headaches (13.70%) and convulsive seizures (6.85%). The vast majority of our patients (49.31%) had severe hypertension (GRADE III) on admission. Only 16.44% were admitted with normal blood pressure. The mean temperature of our patients was 37 ± 0.4 degrees Celsius, with 25.34% of cases having a temperature above 37.5 degrees Celsius. More than half of our patients (55.48%) had a Glasgow score of less than or equal to 8 on admission. On clinical examination, pyramidal syndrome was found in 89.73% of patients. Dyspnoea was present in 45.89% of patients. In our study, the body mass index was above normal in 80.82% of cases. The mean time taken for imaging was 71.94 ± 4.1 hours, with imaging performed within the first 24 hours in 49.32% of cases. Cranioencephalic computed tomography was by far the first-line diagnostic imaging examination (97.26%). All the lesions observed were haemorrhagic, with a predominance of intra-parenchymal haemorrhage (45.89%) associated with ventricular flooding in 55.22% of cases, followed by cerebro-meningeal haemorrhage in 38.36% of cases. The diencephalon was the brain territory most affected. The mean ICH score in our study was 2.46 ± 0.4, with an ICH score ≥ 3 in 45.2% of cases. Only 5.48% of our patients had a low prothrombin level (TP <70%). The mean haemoglobin level was 13.01 ± 1.9 g/dl with anaemia found in 28.08% of cases. The mean platelet count in our study was 203 ± 3,103, with thrombocytopenia found in 21.92% of cases. Mean blood glucose was 1.31 ± 0.2 g/L. The mean natraemia in our study was 140.2 ± 2 mEq/L, with dysnatremia in 30.13% of our patients. Mean kalaemia was 4.29 ± 0.6 mEq/L, with dyskalaemia found in 41.1% of our patients. The mean uraemia in our study was 0.50 ± 0.74 g/L, with hyperuraemia in 28.77% of our patients. Mean creatinine was 28.59 ± 6.3 mg/L, with hypercreatinine in 54.11% of our patients. In this study, hypertension (48.63%) was the main cause of haemorrhagic stroke. The remaining aetiologies were dominated by arterial aneurysms. In terms of management, 103 patients had received orotracheal intubation and mechanical ventilation (IOT+VM), 77 of whom had undergone neurosedation. Comfort sedation was used by 30.82% of our patients. Analgesics and anti-hypertensives were the most frequently administered symptomatic treatments. Only 13.01% of our patients had undergone surgery. This mainly involved decompressive craniotomy and/or external ventricular bypass. The average length of stay was 8.3 ± 2.1 days, with extremes of 1 and 70 days. The vast majority, i.e. 70% of our patients, had an LOS of less than or equal to 07 days. The most common complications were infectious (46.58%) and neurological (18.49%). The death rate was 66.44%, and mortality was statistically associated with grade 3 hypertension on admission, a Glasgow score of less than or equal to 8, an ICH score of greater than or equal to 3, renal failure and a length of stay of less than 7 days **(Table 1).**

Table I: Parameters associated with death in stroke in young people

Parameter	Living	Deceased	Chi-square 2	P
duration of hospitalisation ≤ 7 J	28 (28%)	73(72%)	5,11	**0,03**
> 7 J	21(47%)	24(53%)		
Glasgow score ≤ 8	6(7%)	73(93%)	55.81	**0,000**
> 8	43(66%)	22(34%)		
TA à l'admission normale	7(30%)	16(70%)	14.37	**0,0024**
Grade I	10(42%)	14(58%)		
Grade II	16(62%)	10(38%)		
Grade III	16(22%)	57(78%)		
ICH Score ≤ 3	33(42%)	46(58%)	5,22	**0.022**
> 3	16(24%)	51(76%)		
Uremia Normale	07(19%)	28(81%)	4,27	**0,038**
Elevée	42(38%)	68(62%)		

DISCUSSION

The limitations of our study were related to our case selection criteria and the retrospective nature of our work. Incomplete records, absence of cranioencephalic scans despite strong clinical suspicion of haemorrhagic stroke, for financial reasons. These factors explain the variability of our numbers when analysing the different results and the size of our study population. The prevalence of haemorrhagic stroke in young people in intensive care was 7.43%. In Libreville, Bitegue *et al.,* in a study conducted in 2022 on haemorrhagic stroke in intensive care, obtained a prevalence of 8.93%. Although their study was based on a much larger population than ours, their results were more or less the same as ours. This may reflect the prevalence of haemorrhagic stroke in the 18-50 age group [12]. In our study, the average age of the patients was 43 years, with extremes of 18 and 50 years. The majority of patients were aged between 40 and 50, accounting for 68% of our study sample. Our results are similar to those of Feldman *et al.,* who, in a study similar to ours carried out in the United States, found that the vast majority (66%) were between 40 and 49 years of age [13]. As for the mean age, Onwuchekwa *et al.,* obtained a mean age of 37.5 ± 6.1 years. This difference between their study and ours could be explained by sampling. Although Onwuchekwa's study focused on haemorrhagic stroke in young subjects, it only included those aged between 18 and 45 [14]. In this study, the sex ratio was 2.17. Several African series confirm the male predominance: Mohoungou-Guimbi *et al.,* [15]. 1.6 in 2012 in Congo Brazzaville, Jemea B *et al.,* [16] 1.53 in 2023 in Cameroon and Benois A *et al.,* [11] 8 in 2009 in Djibouti. This male predominance could be explained by the high frequency of risk factors for cardiovascular disease in males. Indeed, the worldwide prevalence of smoking was higher in men than in women [17]. High blood pressure is less common in women than in men before the age of 50. Women of childbearing age benefit from the protective effect of female sex hormones [18]. The largest occupational category in our study was the informal sector (47.26%). Those with no source of income came second, at 23.97%. This prevalence of haemorrhagic stroke among people of average or low socio-economic status could be explained by the absence of universal health coverage, which does not allow optimal management of hypertension and other vascular risk factors in our context over a long period [19]. With regard to risk factors, we found certain modifiable vascular factors: hypertension, diabetes, heart disease, dyslipidemia, oral contraceptives, obesity, sedentary lifestyle, and others that could not be modified, in particular age, sex and heredity. High blood pressure was the main risk factor for cardiovascular disease in our study, accounting for 65.75% of our sample. This predominance of hypertension in young subjects with haemorrhagic stroke has been found by other authors in higher proportions: Eze [20], Bernardo [21] and Miyares [22] noted 81.3%, 75% and 78% respectively in their series. A study conducted in Senegal by Ndiaye [23] showed that arterial hypertension was a major risk factor for haemorrhagic stroke in young subjects. This study also highlighted the importance of managing hypertension to prevent haemorrhagic stroke. A history of diabetes was found in 8.54% of our study population. This rate is close to those of Sarfo [24] 5.04%; onwuchekwa [14] 11.1% and Bernado [21] 13.9%. Eze [20] and Cisse [25] observed a much higher rate than ours, 45.3% and 41.7% respectively. A study by Ogunlade [26] identified the presence of comorbidities such as diabetes and obesity as unfavourable prognostic factors for haemorrhagic stroke in young subjects. This study highlighted the importance of prevention and management of co-morbidities to improve the prognosis of patients. 20.69% of the subjects in our study were obese. This result is similar to that of Eze [20], where 23.4% of young subjects with H stroke were obese. Another study conducted in Côte d'Ivoire by Adoubi *et al.,* highlighted the impact of excessive alcohol consumption on haemorrhagic stroke in young subjects. This study highlighted the importance of preventing alcoholism in young subjects in order to reduce the risk of haemorrhagic stroke [27]. In our study, alcohol consumption was found in 10.95% of cases, with a predominance of men. Our results are similar to those of Martinez-Menendez 10% [28]. In our study, only 7 patients (4.79%) were smokers. Another study, such as Eze [20], also noted a low rate of 1.6% of smokers, in contrast to certain studies which showed higher rates than ours, such as those by Miyares [22], Ngoran Y. [10],

and D. Leys [29] Qureshi [30] reported 13%, 18.8%, 29.03% and 30% cases respectively. Our work does not allow us to make a precise assessment of the role of smoking, as we were unable to distinguish between former smokers and recent smokers, or the number of pack years. According to Kurth [31], the risk of bleeding increases with the number of cigarettes smoked. At the clinical level, the admission time (corresponding to the date and time of onset of the first symptoms minus the date and time of admission to the emergency department, was calculated for each patient). The average admission time for our patients was 73.94 hours, with extremes ranging from 2 hours to 720 hours. Bengono [32] found an average delay of 17.7 with extremes ranging from 01 hour to 72 hours. The lack of education of the population concerning the warning signs and the difficulties of evacuation may explain our long delays in care. In addition, the impoverishment of our populations combined with the absence of universal health insurance means that they turn first to traditional medicine. Disturbed consciousness was the most frequent reason for consultation in our study, accounting for 74.66% of cases, as in most studies carried out in an intensive care unit, Bitegue [33] and Bengono [32]. In contrast to these intensive care unit studies, the main reason for hospitalisation was motor deficit [29, 34]. Arterial hypertension (AH) is usually present in the acute phase of a haemorrhagic stroke. Our study showed that 83.56% of our patients had hypertension on admission. Our rate is similar to that of Bernado [21], in whom 87.8% of their population had hypertension on admission. Sarfo [24] in Nigeria found a higher rate of 91.7%. Grade 3 hypertension was statically associated with mortality with p = 0.0024. Diallo *et al.*, at Treichville University Hospital, in a study of mortality and lethality factors in hypertension in black African adults, found a correlation between mortality and increased blood pressure [35]. The neurological examination of patients on admission revealed a disturbance of consciousness in 98% of cases. In more than half of these, i.e. 55.48% of patients, a deep coma (GLASGOW score less than or equal to 8) was noted. Bitegue [33] in Gabon and Bengono [32] in Cameroon found lower rates than in our study. In their studies, 70% and 73.5% of the population, respectively, presented with a disorder of consciousness. Deep coma was found in 21.7% and 35.3% of their cases respectively. The severity of the clinical picture in our different African series could be explained by the delay in consultations, but also by the unavailability of space in our intensive care units. Deep coma was statistically associated with mortality with a p= 0.0079, as confirmed by several studies including those by Bitegue [33] and Bengono [32]. Our patients had undergone one or more cranioencephalic imaging scans during their stay in intensive care. Our discussion will focus on the type of imaging performed, the lesions found (time taken to perform, type and subtype of haemorrhagic stroke) and the topography of the lesions (site of haemorrhage in the case of haemorrhagic stroke). All patients in our study were admitted to intensive care with their brain imaging. In 97.26% of cases, this was a cranioencephalic scanner (CT), and in less than 3% of cases, magnetic resonance imaging (MRI). Harewood-Marshall [36] found results similar to ours, with 94.9% of his patients undergoing CT and 1% undergoing MRI. Morphologically, on cerebral computed tomography (CT), the majority of haemorrhages were parenchymal, with or without ventricular or meningeal involvement in 123 patients (84.24%). Bitegue [33], in his series, found a higher rate than ours of 91.7%. The basal ganglia were most affected in our study with a rate of 41.78% cases, followed by lobar involvement (22.60%) and brain stem involvement (14.39%). Bernado [21], Kalita [37] and Rajaonarison [38] respectively found in their series a majority involvement of the basal ganglia at 75%, 71.3% and 65.62%. This predominance of the basal ganglia can be explained by the fact that hypertension is the main cause of haemorrhagic stroke. The most typical location of intracerebral bleeding related to hypertension is the basal ganglia [39]. The ICH score is a prognostic score used to assess the severity of haemorrhagic stroke. In our study, the ICH score was greater than or equal to 3 in 45.2% of cases. Bitegue [33] in his series found a score of 3 in 40% of his cases. There was a correlation between mortality and an ICH score greater than or equal to 3. Akani *et al.*, in a study of haemorrhagic stroke at Bouaké University Hospital, demonstrated the proportionality between an increase in the ICH score and mortality [40]. In terms of aetiology, hypertension (83.56%) is the main cause of haemorrhagic stroke. The same is true for Sarfo [24] and Gaye [41] with rates close to ours, respectively 88.7% and 80.4%. According to Aka Anghui [42], the lesions involved are diseases of the small arteries, in particular Charcot and Bouchard micro-aneurysms. The remaining aetiologies were dominated by arterial aneurysms. The presence of undetermined aetiology in our series can be explained by the fact that many patients were unable to undergo the various aetiological investigations requested, due to insufficient financial resources. Management in the acute phase of a stroke is crucial to prognosis [25]. Severe strokes lead to disruption of vital functions, including respiratory, haemodynamic and metabolic disorders [10]. Optimal and effective management therefore requires good patient conditioning. In our study, standard oxygen therapy was used in 19.86% of cases, orotracheal intubation plus mechanical ventilation in 70.55%, neuro-sedation in 52.74%, and comfort sedation in 30.82%. Several studies conducted on stroke discuss resuscitation measures in stroke patients and agree that resuscitation measures help to avoid rapid death in the initial phase of stroke and to prevent serious complications [29 ;31]. A hypertensive crisis is very common in the acute phase of a stroke, especially in haemorrhagic stroke [25]. Antihypertensive treatment was initiated in 67.12% of our patients. Nicardipine was used intravenously in all of these patients and was gradually replaced by oral medication. Pain sedation is very important in the acute phase of stroke, as it can cause discomfort, depression and hypertension. There are many causes of pain after a

stroke: dysaesthesia, central neurological pain, bedsores, shoulder-hand syndrome, spasticity. Pain must be relieved. Analgesics were required in 66.44% of our patients. The average length of stay was 8.3 days, with extremes of 1 and 70 days. Hospital stay was less than 14 days in 87.67% of patients. In Côte d'Ivoire, our results are similar to those of Ngoran [10] at the CHU de Cocody. He observed an average hospital stay of 10.43 days. Ngoran [10] at Treichville University Hospital and Diallo [35] in Senegal reported a longer average length of hospitalisation of 17.4 days for the former and 16.4 days for the latter. In our study, mortality decreased with increasing length of stay. The p-value was 5.11. In the study by Martinez-Menendez *et al.*, in a medical-surgical intensive care unit, the prognosis was better when the length of stay was short. This difference could be explained by the reasons why patients were admitted. In Martinez-Menendez's study, the diagnosis of patients was dominated by toxic comas, the management of which is generally favourable after antagonistic symptomatic treatment or after extra renal purification [28]. In our study, 106 patients presented at least one complication during hospitalisation. This represents 71.23% of our patients. The most frequent complication was infectious, essentially pneumopathy. Our results are similar to those of Bengono [32] who recorded 73.5% in his series with pneumopathies acquired during mechanical ventilation as the main complication. We recorded 97 deaths out of a study population of 146 patients. This represents a mortality rate of 66.44%. The same is true of Bitegue [33] who found a similar rate of 66.7% in his study of prognostic factors for haemorrhagic stroke in intensive care. The predictors of mortality observed were: inaugural deep coma, inaugural grade 3 arterial hypertension, ICH severity score greater than or equal to 3, renal failure and length of stay of less than 7 days.

CONCLUSION

At the end of our study carried out in the intensive care units of the CHU of Cocody, Angré and Treichville, which focused on the prognostic factors of haemorrhagic stroke in young subjects from 2018 to 2022, it is important to emphasise that the prevalence of haemorrhagic stroke in young subjects in intensive care was 7.43%, with an average age in our study of 43 years. The sex ratio (M/F) was 2.1. The average admission time was 71.94 hours. High blood pressure was the main cardiovascular risk factor, followed by obesity. Clinically, consciousness was impaired on admission in 98% of patients, more than half of whom were in a deep coma. High blood pressure (hypertension) was present in 83.56% of patients, and grade 3 hypertension accounted for almost half of all patients and was predictive of mortality. Fever, meningeal and pyramidal syndromes affected 25.34%, 10.27% and 81.51% of cases respectively. Cranioencephalic imaging showed that the majority of cases were intra-parenchymal (45.89%), more specifically in the basal ganglia. An ICH severity score ≥3 was statistically associated with mortality. High blood pressure was the main cause of haemorrhagic stroke in young people. As regards the treatment of our patients in the intensive care unit, the emphasis was placed on conditioning, management of hypertension, complications and, in some cases, neurosurgical intervention for aneurysms and arteriovenous malformations. The main complications were infectious (46.58%) and dominated by pneumopathies acquired during mechanical ventilation. The average length of stay was 8.3 days, and despite all our management measures resulted in death in 66.44% of cases. The prognostic factors we identified were inaugural deep coma, inaugural grade 3 arterial hypertension, ICH severity score greater than or equal to 3, renal failure and length of stay of less than 7 days. It is also important to note the difficulties we encountered, namely the lack or incompleteness of certain medical records and registers.

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