ISSN: 2690- 909X

Research Article

Advances in Neurology and Neuroscience

Predictive Factors of Mortality from Hemorrhagic Strokes in The University Hospitals of Togo

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Submitted: 23 Nov 2022; **Accepted**: 02 Dec 2022; **Published**: 06 Dec 2022

Citation: Vinyo Kodzo Kumako, Léhleng Agba, Koffi Bada, Damelan Kombate, Bidamin Ntimon, et al. (2022). Predictive Factors of Mortality from Hemorrhagic Strokes in The University Hospitals of Togo. *Adv Neur Neur Sci*. 5(4), 182-187.

Abstract

Introduction: *Hemorrhagic stroke (AVCs) is fraught with high mortality. As mortality related to AVCs is higher, prognostic scores have been developed and validated in several studies, the most common of which is the ICH score.*

Objective: *To determine the predictors of mortality related to AVCH in Togo.*

Methods: *This was a 12-month descriptive and analytical multicenter cross-sectional study conducted in the three university hospitals of Togo. It considered patients who were hospitalized during the study period for spontaneous hemorrhagic stroke proven by brain scan.*

Results: *The mean age of patients in this study was 53.7 ± 12 years with a sex ratio of M/F = 1.27. The mortality rate was higher among women (34.67%) than among men (31.41%). Cardiovascular risk factors that were significantly related to VHVAC were hypertension and chronic alcoholism. The elements of the clinical examination and paraclinical examinations that were statistically linked to death were a Glasgow score < 8, ventricular flooding, and a hematoma volume greater than 30 ml. Applying the ICH score in our study when this score was greater than or equal to 3 there was a mortality of 76.47%.*

Conclusion: *our study confirmed that AVCH is a pathology with high mortality and the best management remains preventive.*

Keywords: Hemorrhagic Strokes, Predictive Factors, Mortality, Togo, Sub-Saharan Africa.

Introduction

Stroke (CVAs) is a real public health problem in the world, representing, in industrialized countries, the leading cause of acquired disability in adults, the second cause of dementia (after Alzheimer's disease), and the third leading cause of death [1]. In sub-Saharan Africa, stroke is the leading cause of morbidity, mortality, and disability in major neurology departments [2,3]. According to a report by the World Health Organization (WHO), AVCs will be the leading cause of death and morbidity due to HIV/AIDS infection [4,5]. Hemorrhagic AVCs (AVCH), represent the type of stroke whose mortality is heavy, around 40%, with only 25% of survivors without sequelae at six months [6,7]. Half of all deaths occur within the first 48 hours after stroke. Survival at one and five years is 42% and 27%, respectively [8]. In Africa, the frequency of AVCH is high with rates ranging from 28 to 60% and they are often of reserved prognosis with mortality between 35-52% in the first 30 days after their installation [7]. This mortality remains high in Sub-Saharan Africa due to the inadequacy of technical platforms

[9]. Similarly, in Togo, in 2013, a frequency of 30.40% of AVCH was reported compared to 69.60% of ischemic stroke (AVCI) and cerebral hemorrhage was 37% more lethal than cerebral ischemia whose mortality rate was 17.5% [10]. In 2017, Anayo et al. reported a frequency of 23.56% of AVCH with lethality of 19.85% during hospitalization [11]. Many studies have tried to predict the prognosis of patients with cerebral hematoma, resulting in the establishment of several scores. Among these, the most commonly used score is the ICH ("Intra Cerebral Hemorrhage") score developed in 2001 in the USA by Hemphill et al. This score has been validated in several studies, on different populations, especially in Latin America and Asia [2,4]. In Africa, and specifically in Togo, few studies have reported on predictors of AVCH mortality and the assessment of the ICH score within populations. The present study was conducted to obtain more recent generalizable data compared to that conducted by ANAYO on all predictors of mortality of spontaneous intracerebral hematomas during hospitalization.

Methods

Study Framework

Our study was conducted in the neurology departments of the three university hospitals in Togo, namely the Sylvanus Olympio (SO) University Hospital (CHU), the CHU-Campus, and the CHU-Kara. The first two centers are located in Lomé, the capital, and the last one is located in Kara, the second largest city in the country, in the northern part of the country. These three centers are the country's reference centers.

Department of Neurology at the CHU-Campus

It is the one that has a greater capacity for reception. It has 38 beds in five common rooms, two cerebrovascular emergency rooms, and four individual cabins. On average 1150 patients are hospitalized there per year [11].

Department of Neurology of the CHU SO

It is the second major neurology department after that of the CHU-Campus. It has 22 beds in twelve rooms and cabins: a 4-bed room, four 2-bed rooms, and six one-bed cabins. On average, 200 patients are hospitalized in this department each year.

The Neurology Department of the CHU-Kara

At CHU-Kara, the neurology department is not individualized. It is an integral part of the Department of Medicine and Medical Specialties and thus shares the same hospital beds with the other departments of this department. Each year, the number of patients hospitalized on behalf of neurology averages 343.

Study Method

Type and Period of Study

This was a multicenter, analytical study with prospective data collection of patient records admitted to study centers for an AVCH for a period of 12 months (January 1 to December 31, 2020).

Study Population

We included in this study, patients in whom evidence of AVCH was made by brain imaging. The brain scan was the main diagnostic confirmation tool. Cases of subarachnoid hemorrhage were not included. The information collected on the questionnaire included the following elements: sociodemographic data, history of the disease, personal and family history of the patient, data from the clinical examination, results of additional examinations, complications, length of hospitalization, and duration of evolution. The data were collected as and when the diagnosis of AVCH was confirmed by the realization of the brain scan.

Definition of Concepts

• High Blood Pressure (Hypertension): The blood pressure used was that taken at the patient's admission. Hypertension was defined as systolic blood pressure greater than or equal to 140 mm Hg and/or diastolic blood pressure greater than or equal to 90 mm Hg.

• Diabetes: was defined as fasting venous blood glucose of 1.26g/l or higher. For known non-diabetic patients, the blood glucose considered was that of the first blood test performed on an empty stomach.

• Smoking: The patient was considered a smoker if he or she regularly or occasionally consumed tobacco or tobacco products.

• Chronic Ethylism: When the interrogation established that in three months, the patient consumed more than 5 standard drinks of alcohol, on a single occasion and this at least three times monthly in men, they were considered chronic ethyl. For female patients, the amount should be at least 4 standard glasses for the definition of chronic alcoholism.

• Diagnosis of Stroke: It was first evoked at the clinic in front of focal neurological disorders or disorders of sudden onset vigilance then the hemorrhagic nature of the stroke was confirmed by the presence on the brain scan without injection of a spontaneously hyperdense area.

• Volume of Intracerebral Hematoma: It was calculated using the ABC/2 formula, itself based on the ellipse volume formula and which is most widely used in studies [12].

• The ICH Score: This score was calculated as described by Hemphill et al [13]. One (01) point is awarded each time one has one of these conditions: age >80 years, subtentorial location of the hematoma, the volume of the hematoma > 30ml, an extension of bleeding in the ventricles, and the Glasgow score between 5 and 12. However, for a Glasgow score of 3 or 4, we were awarded 2 points. Based on these criteria, the ICH score was therefore between 0 and 6.

• Type of Trader: The small trader is defined as a seller of retail goods and dependent on wholesalers.

Method of Statistical Analysis

The R studio software (version 1.4.1106) and Excel 2013 were used to analyze the data collected. The Chi-2 test was used for the comparison of categorical variables with a 95% confidence interval. The result of a statistical test was considered significant when the p-value was less than 0.05. The mean values are presented with the standard deviation as a dispersion indicator. Next, a univariate and multivariate logistic regression was performed to look for factors associated with AVCH. A top-down step-by-step procedure was used to select the final model. It consisted of including all the

variables chosen in the initial model and then gradually removing the least significant variables. At each step, it was verified that there was no major confusion between the removed variable and those remaining in the model by checking the changes in their relative risks (tolerated variation: 20%).

Results

Socio-Demographic Data

We collected and studied 341 cases of AVCH in the neurology departments of the Chu du Togo, distributed as follows: 284 cases (83.28%) at the CHU campus, 46 cases (13.49%) at the CHU SO, and 11 cases (3.23%) at the CHU Kara. The mean age of patients was 53.7 ± 12 years with a male predominance of 56% (n=191). Neither age (p=0.71) nor sex (p=0.14) was correlated with death. The main socio-demographic data are summarized in [Tables I and II].

Table I: Sociodemographic characteristics of the study population

		Workforce (n)	Percentage (%)
Age groups (years)	26 – 35	11	3,23
	36 – 45	92	26,98
	46 – 55	99	29,03
	56 – 65	89	26,10
	66 – 75	32	9,38
	76 – 85	15	4,40
	86 – 95	3	0,88
Sex	Masculine	191	56,01%
	Feminine	150	43,99%
Profession	Small traders	122	35,78%
	Retirees	63	18,48%
	Officials	61	17,89%
	Craftsmen	57	16,72%
	Farmers	14	4,11%
	Drivers	12	3,52%
	Unemployed	12	3,52%

Table II: Key Clinical and Paraclinical Characteristics of Patients

		Survivors	Deceased	p-value
Socio-demographic characteristics				
Age, average ± SD (years)		52.43 ± 11.53	56.29 ± 12.59	0,71
Sex	Female (n=150)	98 (65.33%))	52 (34.67%))	0,14
	Male (n=191)	131 (68.59%))	60 (31.41%))	
Cardiovascular risk factors				
	HYPERTENSION (n=203)	141 (61.57%)	62 (55.36%)	2.94.10-8
	Type 2 Diabetes (n=8)	3 (37.50%)	5 (62.50%)	0.47
	Alcohol (n=106)	73 (68.87%)	33 (31.13%)	1,02.10-4
	Smoking (n=12)	8 (66.67%)	4 33.33%)	0,47
Score de Glasgow				
Average ± AND		12.88 ± 6.52	8 ±11.39	0,001
Score de Glasgow	Less than 8 (n=60)	13 (21.67%)	47 (78.33%)	
Localization of the hematoma on brain scan				

Supra-tentorial floor	Deep hematoma (n=286)	92 (32.17%)	194 (67.83%)	0,77
	Lobar hematoma (n=36)	13 (36.11%))	23 (63.89%)	
Subtentorial floor (n=19)		7 (36.84%)	12 (63.16%)	0,11
Ventricular flooding				
	Yes (n=160)	79 (49.38%))	81 (50.63%))	1.06.10-6
	No (n=181)	150 (82.87%))	31 (17.13%))	
Volume of hematoma				
Volume greater than 30 ml		71 (47.33%)	79 (52.67%)	1,11.10-11
Volume less than 30 ml		158 (82.72%)	33 (17.28%)	

Table III: Multivariate Analysis of Mortality Predictors

	RR (Relative Risk)	CI (95%)	p value
Volume of hematoma	0,19	0,115-0,308	1,11.10-11
Ventricular flooding	0,20	0,123-0,331	1,06.10-6
Glasgow's score	3,90	1,734-9,345	0,001

Clinical Examination Data

High blood pressure was the most common of the risk factors with a proportion of 59.53%. The motor deficit was the first reason for consultation in 56.89% of cases. All the elements collected during the clinical examination are summarized in Table II.

Data from Supplementary Examinations

The supra-tentorial stage was the preferred location of the hematoma representing 94.43% of cases. The volume of the hematoma was less than 30 cm3 in 56.01% of cases. The main data from the brain scan are summarized in Table II.

Ich Score and Mortality

The mean ICH score was higher in deceased patients (2.4) compared to survivors. Among patients who had an ICH score of 3 and above, 76.47% had died, while for patients whose ICH score was between 0 and 2, only 23.53% of deaths were recorded.

Evolution and Mortality

The average length of hospital stay was 9.5 days (ranges: 0 and 37 days). The mortality rate of the study population was 32.84%. This mortality rate was higher in women (34.67%) than in men (31.41%) with a p-value of 0.14. The average age of deceased patients was higher than that of survivors (56.29 years versus 52.43 years and p-value=0.71). The average Glasgow score was 8 in deceased patients and 12.88 in survivors. Table II presents the univariate analysis predictive of the MORTALITY of VHVC in the study population. After this first univariate analysis which made it possible to retain predictive factors of mortality ($p<0.05$), a logistical regression with multivariate analysis between the previous factors made it possible to identify 3 main predictive factors of mortality which are a volume of hematoma greater than 30 ml (RR: 0.19; p = 1.11 10-6, ventricular flooding (RR: 0,20 ; p =1.06 .10-6) and a low Glasgow score (RR: 3.9; p=0.001).

Discussion

We conducted a prospective, multicenter, descriptive, and analytical study over a period of 12 months (January 1 to December 31, 2020) in the three university hospitals in Togo with the aim of determining the predictive factors of mortality of a patient suffering from AN AVCH.

Socio-Demographic Data

Our study included 341 patients whose average age was 53.7 ± 12 years with male predominance (sex ratio M/F = 1.27). These data are comparable to those of previous studies conducted in Togo by Anayo [11] and in Congo by Mahoungou [14] which reported an average age of 52.46 years and 53 years respectively. On the other hand, in France, Gauthier [15] reported a higher average age of 74 years. These results are consistent with the low socio-economic standard of living of the stroke patient in Sub-Saharan Africa as reported by Akinyemi et al. in 2021 in their review of the profile, progress, prospects and priorities during AVCs [16] compared to that of developed countries [15]. The predominance of the male sex has also been reported in the literature [14,17,18] thus testifying to the risk factor for AVCH that constitutes this sex.

Clinical Examination Data

Hypertension was the most common risk factor (59.53%) in our study followed by chronic alcoholism. Hypertension was also correlated with death. These facts are reported in the literature. Indeed, most authors recognize hypertension as not only the greatest risk factor for stroke [19] but also as a factor aggravating bleeding [4,14,20] thus causing an increase in the volume of the hematoma when it is poorly managed in the acute phase. The main reasons for consultation in our study were motor deficit, impaired consciousness and aphasia in proportions of 56.89%, 24.34% and 12.90% respectively. The predominance of these symptoms as a reason for consulting AVCH was reported by Damorou et al. in Togo in 2008 [21] and by Arboix et al. in Spain in 2009 [22]. Considering the Glasgow score, there was a correlation in terms of mortality when the Glasgow score is less than 8 (p=0.001). Coma is therefore an independent predictor of mortality during AVCH. The latter's study showed a correlation to mortality in the Glasgow score when it was less than 9. This is explained by the fact that the coma would be related to the intracranial hyper pressure caused by the

bleeding. However, our hospital structures do not have sufficient technical platforms to monitor intracranial pressure, especially in coma patients.

Data from Supplementary Examinations

The supra or sub tentorial localization of cerebral hematoma was not correlated with death in our study. However, the presence of cerebral hemorrhage in the ventricular system was statistically associated with death. Indeed, ventricular contamination was found in 72.32% of deceased patients and 34.50% of survivors (p= 1.06.10-6). Previous studies published by Hallevi [23], Staykov [24] and other authors have also proven the direct relationship between the amount of blood in the ventricles and a low probability of survival. More than 75.54% of the deceased patients had a hematoma volume greater than 30 ml. This rate was strongly associated with death with a p-value of 1.11.10-11 and an odd ratio of 0.19. This correlation was made by Anayo et al in 2017 in Togo [11] and by Broderick et al. in their studies of 1993 [25] and 2007 [26]. On the other hand, Broderick [26] and Steiner [27] specify that the prognostic value of the volume of the hematoma taken alone is inconsistent.

ICH Score and Mortality

In our study, the average ICH score was 2.45 for deceased patients. Mortality was very high (76.43%) when the ICH score was greater than or equal to 3. This correlation has also been reported in several studies according to the literature. Indeed, Hemphill et al. [13] reported 1-month mortality of 72% when the ICH score was 3. This rate reached 100% for scores of 5 and 5.

Conclusion

Our multicenter study conducted in all the University Hospitals of Togo confirms the already known notion of the high lethality related to hemorrhagic AVCs. It made it possible to find the predictors of mortality of hemorrhagic AVCs in our context. These elements were essentially the low level of consciousness, the location of the hematoma in the ventricles or at the sub tentorial stage and a volume of the hematoma greater than 30 ml. It thus seems obvious that in the case of any patient in whom evidence of a hemorrhagic stroke is made, any action should be taken to reduce the effects of these predictive factors by acting effectively on hypertension in the acute phase. Indeed, it is the elevation of blood pressure that remains the element acting on the increase in the volume of the hematoma, then favoring an increase in intracranial pressure which in turn promotes the decline of consciousness.

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