

Hypertension and intracerebral hemorrhage in Brazzaville*

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ABSTRACT

Hypertension is not only an important risk factor, but also an important cause of spontaneous intracerebral hemorrhage. Its high prevalence in Africa reflects a high incidence of cerebral hemorrhage ranging from 30% to 60% against 10% to 20% in industrialized countries. The aim of our study was to determine the role of hypertension before the onset of intracerebral hemorrhage and its variations during the first three months. This was a longitudinal study conducted at the University Hospital of Brazzaville from 1st January to 31st August 2012 with all patients admitted for intracerebral hemorrhage. Patients with subarachnoid or pure intraventricular hemorrhage were excluded. The study variables were: history of hypertension, knowledge of its history, treatment, blood pressure on admission and during the first 3 months and the relationship between blood pressure and evolution. Statistical analysis was performed using the software SPSS 16.1. The significance level was set at $p < 0.05$. During the study 261 patients were hospitalized for stroke, of which 82 (31.42%) were for intracerebral hemorrhage. The mean age was 55 ± 11 years and sex ratio of 2 men:1 woman. Hypertension was found in 80.5% of cases, of which 65.2% had known hypertension, but 82.6% had discontinued treatment. The mean systolic blood pressure was 194 ± 41 mm Hg and diastolic 104 ± 20 mm Hg. The location was deep in 85.71%. The normalization of blood

pressure was obtained from the second week. After adjusting for confounders using logistic analysis, only uncontrolled hypertension was associated significantly and independently associated with a higher mortality rate ($p = 0.042$).

Keywords: Hypertension; Cerebral Hemorrhage; Brazzaville

1. INTRODUCTION

The hemorrhagic stroke or intra cerebral hematoma (ICH) is the extravasation of blood into the brain parenchyma. Its incidence is 9 - 15 cases per 100.000 persons [1]. There are racial variations of hypertension prevalence which is higher among blacks and Asians than the rest of the world [2,3]. It represents 10% to 30% of stroke [4,5]. ICH is the most severe and the most deadly subtype. Chronic hypertension is not only the first risk factor, but also the primary cause of ICH in 60% of cases [6,7]. Arteriosclerosis and micro-Charcot-Bouchard aneurysms which may rupture at deep penetrating arterioles explain the hematoma [8,9]. A high blood pressure is regularly observed in the acute phase of ICH [10], most often associated with an increase in the volume of hematoma, or a poor prognosis [6]. Although studies have been conducted on the management of blood pressure in ICH [11, 12], however, in sub-Saharan Africa, the prevalence of hypertension is high with a lower prevalence of stroke in general populations [13].

In Brazzaville (Congo), 32.5% of the population are hypertensive [14]. Furthermore, stroke is a frequent reason

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for hospitalization, and represents the first hypertensive emergency in Brazzaville University Hospital [15].

The aim of our study was to assess the role of hypertension before the onset of ICH, and its variations during the first three months, as well as its impact on prognosis.

2. METHODS

This is a longitudinal study conducted at the University Hospital of Brazzaville, services of Neurology, Emergency and Intensive Care Unit from 1st January to 31st August 2012 for a period of 8 months. The study population consisted of patients admitted for ICH in these services. We included all patients hospitalized for hemorrhagic stroke confirmed by CT scan without contrast injection, regardless of age and sex. Informed consent was obtained either from the patient when he was not conscious and aphasic, either from a close family member when the patient was unconscious or in case of severe aphasia. We excluded all patients hospitalized for suspicion of stroke not confirmed by brain CT-scan, patients with normal scan or signs of ischemic stroke, isolate subarachnoid hemorrhage, intraventricular hemorrhage, hemorrhagic infarction, head trauma, brain tumor-induced hemorrhage, or patients in whom informed consent was not obtained. The diagnosis of hemorrhagic stroke was confirmed by the presence of an intraparenchymal hyperdensity with or without spontaneous ventricular break. The study variables were: age, sex, vascular risk factors such as the history of hypertension defined as systolic blood pressure (SBP or PAS in French) ≥ 140 mmHg and/or diastolic blood pressure (DBP or PAD in French) ≥ 90 mmHg or the existence of antihypertensive treatment in. Knowledge of hypertension, its duration, the time between ICH onset and the time of hospitalization, adherence, control, daily monitoring, the location and the site of the hematoma, the severity of hypertension at admission, the initial severity stroke by the NIHSS score, the progression of the disease and outcomes (death or survivorship) of patient. The evolution was evaluated on the third day (D3 or J3 in French) on the seventh day (D7 or J7 in French), the fourteenth day (D14 or J14 in French), one month (M1), two months (M2) and three months (M3 or J90 in French).

3. STATISTICAL ANALYSIS

The data collected were entered in Excel, and then analyzed using the SPSS version 16.1 on Windows. The qualitative variables were expressed as frequency (n) or proportions (%) and quantitative variables as mean \pm standard deviation (SD). The chi-square test was used to compare proportions, while Student-t test was used to compare means. Statistical significance was set for the probability $p \leq 0.05$.

4. RESULTS

Of 689 patients in these services, 261 (37.88%) were admitted for stroke, among them 86 (32.95%) cases of ICH with 82 cases of intra-parenchymal hemorrhage (31.42%) and 4 cases (1.53%) of subarachnoid hemorrhage.

A total of 82 cases of ICH, there were 51 (63.4%) men and 31 (36.6%) women with a sex ratio of 2 men: 1 woman. The mean age of patients was 55 ± 11 years (range 26 to 83 years).

Table 1 shows the frequency of various risk factors.

In terms of frequency of risk factors, hypertension was the first with 80.5 % of patients. Twenty-three hypertensive patients were adherent to hyp 19 (82.6%) had discontinued treatment before hospitalization. Hypertension was found in 80.5% of cases whose 65.2% had known hypertension but 82.6% had discontinued treatment. Only 4 (17.4%) had not interrupted the assessment of the longitudinal follow-up. On admission, the mean systolic blood pressure (SBP) was 194.51 ± 41.31 mmHg, with a range from 100 to 270 mmHg. Diastolic blood pressure (DBP) averaged 104.51 ± 20.44 mmHg, with a range from 70 to 170 mmHg. **Figure 1** shows the levels of blood pressure on admission.

In terms of initial severity, the NIHSS score at admission average was 14.9 ± 7.3 , with a range from 2 to 30.

The electrocardiogram had revealed left ventricular hypertrophy (LVH) in 42 (63.6%) on 66 hypertensive.

The average time for completion of the CT scan was 2.4 ± 2 days, with ranging from 1 to 14 days.

Ventricular break of hemorrhage was noted in 24 (29.4%) patients. The hematoma was supratentorial in 92.7% and 6.1% in infratentorial. The average volume of the hematoma was 24 ± 17 ml.

The deep site was the most frequent (55%) followed by lobar site in 29% (**Figure 2**).

The management of blood pressure involved the administration of intravenous nicardipin for all patients with blood pressure $\geq 160/110$ mmHg, and all known hypertensive patient were treated by combination of Enalapril and Hydrochlorothiazide.

Figure 3 depicts the changes of SBP and DBP across the time of the monitoring which showed a constant normalization of blood pressure from the second week to the end of the follow-up (3 months).

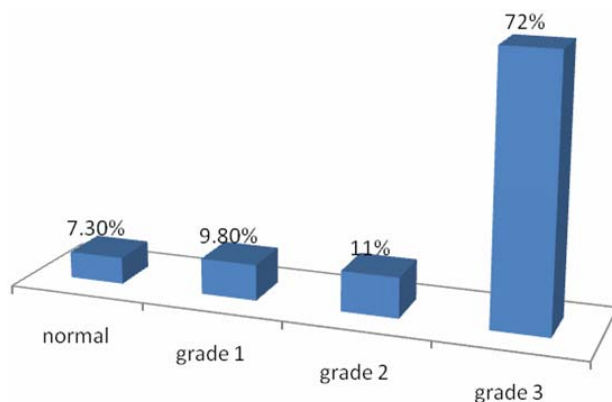
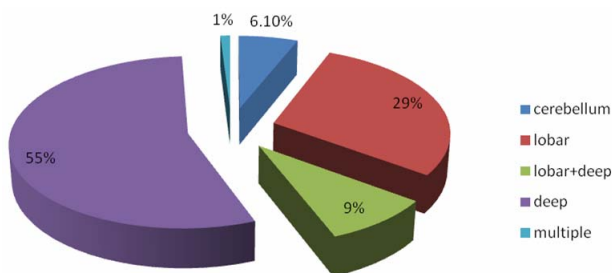
The incident mortality rate was 37.8% ($n = 31/82$ patients). After adjusting for age, sex, history of hypertension, and initial severity, multivariate analysis identified only uncontrolled hypertension was associated significantly and independently associated with higher mortality rate ($p = 0.042$) (**Table 2**).

5. DISCUSSION

We conducted a prospective study, including all patients

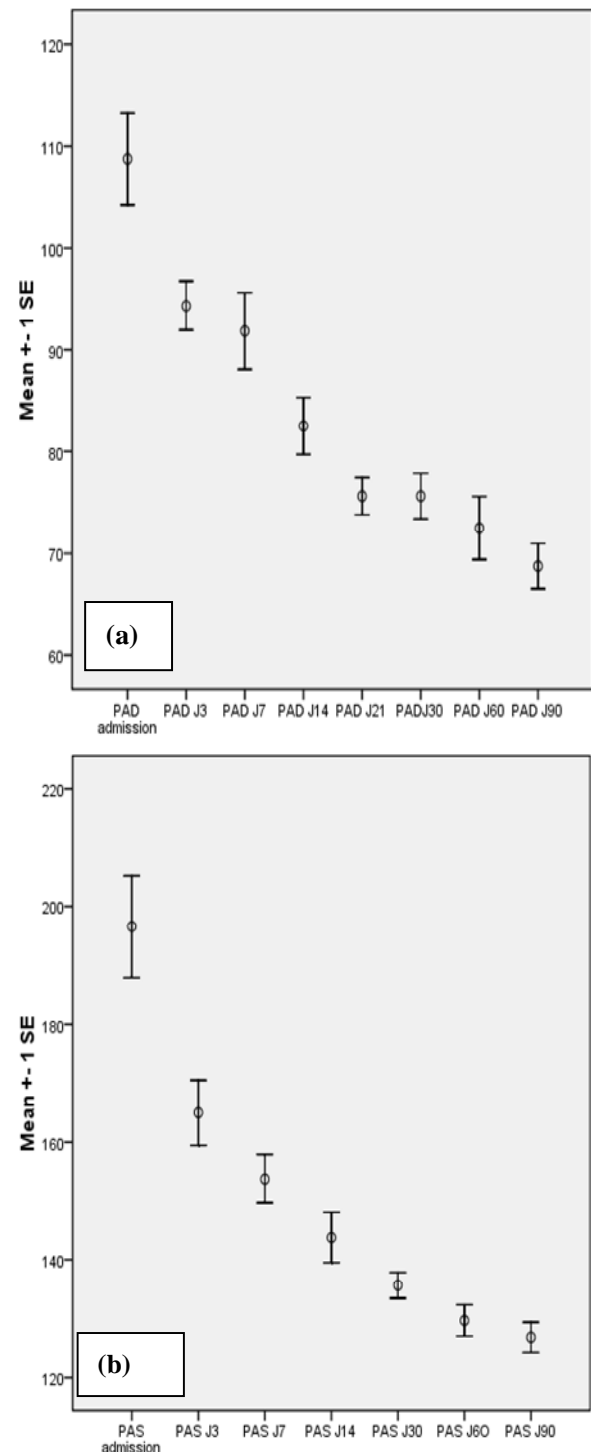
Table 1. Frequency of risk factors.

Risk Factors	Number	%
Hypertension	66	80.5
Sedentarity	49	59.8
Smoking	13	15.9
Diabetes	2	2.4
Alcohol	56	68.3
Hypercholesterolemia	28	65.1

**Figure 1.** Different levels of blood pressure at admission.**Figure 2.** Distribution of bleeding anatomical sites of the brain.

admitted to University Hospital of Brazzaville for ICH. Likewise, this study involved a small number of patients. But it allowed us to estimate the impact of uncontrolled hypertension in cerebral hemorrhage in Central Africa.

The ICH rate was estimated at 32.95% during the study period. Our results were different from those of the most Western literature where the incidence of cerebral hemorrhage is between 10% and 20% [16,17]. This difference can be explained in two ways, first, the fact that our study was purely performed in hospital, so that our findings cannot be generalized to the Congolese population. It may not reflect the true incidence. Second, the higher frequency of ICH is well known among black individuals [5,18]. In INTERSTROKE multicenter study conducted in 22 countries, O'Donnell *et al.* [19] reported a frequency of 9% in the industrialized countries, 22% in South East Asia, 26% in South America and 34% in Africa. Belo *et al.* [20] in a study of the characteristics of stroke in Black Africans from Togo, found incidences of ICH between

**Figure 3.** Changes in blood pressure during the first three months, SBP (a) and DBP (b). Legend: PAD = DBP, PAS = SBP, J = D (day).

28% and 60%. Our hospital frequency of ICH (32.95%) was consistent with that interval. from Sagi *et al.* in different African countries[21] Adoukonou *et al.* [13] showed 12 African studies report a frequency ICH ranging from 21% to 60.1% which is consistent with our

Table 2. Associations between variables and outcomes.

Parameters	Population n(%) or mean \pm SD	Death n(%) mean \pm SD	Survivor n(%) mean \pm SD	P-Value
Hypertension	66(80.5)	25(37.9)	41(62.1)	0.607
Alcohol	56(69.1)	22(39.3)	34(60.1)	0.490
Sedentarity	49(59.8%)	20(40.8%)	29(59.2)	0.327
Smoking	13(15.9)	6(46.2)	7(53.8)	0.352
Diabetes	2(2.4)	2(100)	0(0)	0.140
SBP	194.5 \pm 41.3	190.3 \pm 34.1	197 \pm 45.2	0.042
DBP	104.5 \pm 20.4	104.5 \pm 19.2	104.5 \pm 21.4	0.847
Location				
• Supratentorial	76(92.7)	30(39.5)	46(60.5)	0.504
• Supra + infra	1(1.2)	0(0)	1(100)	
• Infratentorial	5(6.1)	1(20)	4(80)	
Site				
• Lobar	24	9	15	0.835
• Deep	45	18	27	
• Lobar and deep	7	3	4	
• Cerebellum	5	1	4	
• Multiple	1	0	1	

results. The high frequency and observed is related to the prevalence of hypertension in Brazzaville which varies between 32.6% and 43% [14,22], hypertension is not only a risk factor, but the main cause of ICH. Its frequency in stroke patients ranges from 40% to over 80% [21]. Also this increase in frequency reflects the systematic implementation of a brain scan for suspected stroke as also reported by Ossou-Nguet [23].

The mean age of our patients was 55 ± 11 years and very similar to those of Ossou-Nguet *et al.* [24], Raveloson *et al.* in Madagascar [25], Benedict *et al.* in Djibouti [26], and Sagi *et al.* across several sub-Saharan African countries [21].

Regarding hypertension, 80.5% of our patients had a previous hypertension. Our results were similar with most African and Western studies as reported by Manno *et al.* [17], Ossou-Nguet *et al.* [24], Raveloson *et al.* [25], Shoemaker *et al.* [27], Chuang *et al.* [28], and Li *et al.* [29].

In our study, 34.80% of patients did not know their hypertension status. This high rate of ignorance of hypertension reflects the weaknesses of management awareness and screening of hypertension which are essential way to fight against hypertension. Our results confirmed those of Raveloson *et al.* with 70.59% ignorant of hypertension [25]. The history of hypertension did not influence the prognosis. Our results were very similar to those of Ossou-Nguet *et al.* in Brazzaville [24], and Cheung and Zouin China [30]. However, Chuang *et al.* in Taiwan showed that hypertension was associated with earlier death with only 29.4% hypertensives among all participants [28]. This difference could be explained by the magnitude (over 80%) of hyperten-

sion in the study populations from Ossou-Nguet *et al.* [24], Cheung *et al.* [30], and the present study.

The response rate to the steps of the monitoring was low and estimated only 34.90% in the present study and similar with that of 29.1% reported by Ravelosonin Madagascar [25]. Of 39 hypertensive patients, more than half (59%) received treatment against hypertension. However, the number of untreated hypertension is relatively large (41%), highlighting the lack of communication, the denial or offers of health care, but also low economic level. The present percentage of treated hypertensive obtained in our study exceeded that of 29.4% observed by Raveloson [25].

With a mean SBP of 194.5 mmHg and a mean DBP 104.5 mmHg from our study was consistent with that of Cheung and Zouin China [30] in China and Matsukawa *et al.* in Japan [31]. The later pressures were higher than those found by Chuang *et al.* in Taiwan [28]. Both ethnic and environmental factors may explain severity of hypertension in black Africans and Indians [32].

The increase in SBP was significantly associated with death as evidenced by Ossou Nguet *et al.* [24], Hu *et al.* [32] and Béjot *et al.* [33]. The mean NIHSS score at admission was 14.9 ± 7.3 . Our results corroborate those of Dowlathahi [34] who obtained an average of 13. A high NIHSS score (over 20) was a predictor of mortality at 30 days and poor recovery at 3 months as reported by some authors [24,30].

The ventricular hypertrophy found in our hypertensive patients was the main complication and well established as one of coronary heart disease and should be recognized in the management of hypertension [35].

The supratentorial location represented 92.7% against

6.1% infratentorial location. These results were consistent with most studies [36]. Indeed the main causes of cerebral hemorrhage including hypertension, arteriovenous malformations and amyloid angiopathy induce more supratentorial hematoma than infratentorial hematoma.

The deep site was most frequent (55%) and followed by lobar site representing 29% and cerebellar site for 6.1%. This distribution was consistent with data from the literature [29,36]. The deep location is the predilection of the hematoma related to hypertension at determining micro-aneurysms of perforating arteries. The location of the hematoma did not influence the prognosis as also reported by Cheung and Zou [30] and by Godoy [36]. Ventricular break frequently encountered was observed in 29.4%. These data are congruent with those of Raveloson *et al* [25], Dowlathshahi *et al.* [34] who found 36.4% and 33%. It was associated with death ($p = 0.044$) as described in the literature [30,36], respectively.

The mortality rate at 30 days (1 month) was 35.4%. This result is in the range of mortality rates described in Black Africans in Togo [20] and France [27,36]. However, the mortality rate reported in this work was lower than that found by Raveloson *et al.* in Madagascar [25]. The difference in these mortality rates is due to the fact that these authors have worked on too small samples of 34 patients. The mortality rate at 48 hours was 15.9%. He corresponded almost to half of the 30-day mortality. The mortality rate at 7 and 14 days was double the rate of 48 precisely for 25.7% and 34.2%, respectively. Our results differed from those of Ossou-Nguet *et al.* in Congo and who found a mortality rate at 14 days for 13% in the Neurology Department [24]. This difference is explained by the fact that his work had an inclusion bias. We have included not only patients from Neurology but also in Intensive Care and Emergency, and the hospital system in our context is organized so that patients a severe stroke are often directly oriented to intensive care not in neurology service.

6. CONCLUSION

Hypertension remains a major risk factor of mortality and most frequently found in the intracerebral hemorrhage. In sub-Saharan Africa, as in the Congo, its high prevalence contrasts with the weakness of management awareness, support and especially patient education. Better control of blood pressure would not only reduce the incidence of cerebral hemorrhage, but also reduce mortality.

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