Convulsive status epilepticus in an emergency department in Cameroon

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Introduction

In Africa, few epidemiological data are available on status epilepticus (SE). Studies carried out in sub-Saharan Africa have found a hospital-based prevalence varying between 5.28 and 10.86% [1,2]. Clinically there are two presentations: the convulsive SE (CSE) and the non-convulsive SE (NCSE) [3]. The commonest causes are: cerebrovascular accidents, antiseizure medications (ASM) disruptions, and central nervous system (CNS) infections [4]. In Africa, the most frequent etiologies are vascular and infectious [2,5–7]. Current management recommendations are based on studies from developed countries [8]. In Cameroon, a resource-limited African country, the scarcity of ASM pointed out in the international recommendations and the restrictions in diagnostic tools, leaves very few therapeutic possibilities for the best management of patients suffering from SE. This study aimed to determine the prevalence of CSE, to describe the clinical and etiological pattern, and evaluate the outcome of CSE in a tertiary health care center in Cameroon.

Material and methods

Study design

The Douala General Hospital is the main referral health facility in the city of Douala (economic capital of Cameroon). This hospital comprises a Medico-Surgical Emergency Department (MSED) which functions 24/7. This cross-sectional study was carried out from December 2019 to May 2020 in the MSED. Ethical approval was obtained from the Institutional ethics committee of the University of Douala (N ° 2141/CEI-UDo/01/2020/T).
Results

During the study period, 2,601 patients were received at the MSED of the DGH, including 53 cases of CSE (hospital-based prevalence of 2.03%). The mean age was 49.19 ± 18.07 years, with males representing 62.3% of cases. Patients were mainly located inDouala (94.3%) and only 17% of cases came to the hospital in an ambulance. Patients with epilepsy accounted for 26.4% of cases, and 57.1% of them were on ASM. Focal CSE was found in 54.7% of patients. Seizures lasted at least 30 min in 22.6% of cases. Brain imaging (CT scan or MRI) was performed in 92.4% of patients. Etiologies were led by stroke followed by CNS infections (Table 1).

Concerning the treatment, 84.9% (n = 45) of patients received first-line treatment containing (either Diazepam 10 mg IV repeated once if necessary) with seizure cessation in 75.5% (n = 34) of these cases. Eight patients reached the MSED just after seizure cessation and were not exposed to any ASM. In the second line treatment, 20.7% (n = 11) of patients received either Clonazepam 1 mg IV (n = 7) or Phenobarbital 200–600 mg (n = 3). After the second line treatment, 9.4% (n = 5) of patients developed RSE and were admitted in the intensive care unit (ICU) on Propofol (Fig. 1).

The mean duration of hospitalization (MDH) was 11.7 ± 5.8 days. And the mean time from admission to death was 4.1 ± 2.9 days (Table 2).

![Fig. 1. Treatment protocol administered to patients with CSE at their admission in the MSED of the Douala General Hospital.](image)

| Etiologies                                      | n  | %  |
|------------------------------------------------|----|----|
| Stroke                                         |    |    |
| Ischemic stroke                                | 7  | 13.2|
| Intracerebral hemorrhage                       | 4  | 7.5 |
| Sub-arachnoid hemorrhage                       | 2  | 3.8 |
| CNS infections                                 |    |    |
| Cerebral toxoplasmosis                         | 4  | 7.5 |
| Bacterial meningitis                           | 2  | 3.8 |
| Cryptococcal meningitis                        | 1  | 1.9 |
| Viral encephalitis                             | 1  | 1.9 |
| Severe malaria                                 | 1  | 1.9 |
| ASM modifications                              |    |    |
| ASM withdrawal                                 | 7  | 13.2|
| ASM change                                     | 1  | 1.9 |
| Brain tumor                                    |    |    |
| Meningioma                                     | 2  | 3.8 |
| Cavernoma                                      | 2  | 3.8 |
| Oligodendrioglioma                             | 1  | 1.9 |
| Cerebral metastasis                            | 1  | 1.9 |
| Glioblastoma                                   | 1  | 1.9 |
| Brain trauma                                   |    |    |
| Acute sub-dural hematoma                       | 4  | 7.5 |
| Hemorrhagic contusion                          | 2  | 3.8 |
| Chronic sub-dural hematoma                     | 1  | 1.9 |
| Metabolic disorders                            |    |    |
| Hypoglycemia                                   | 3  | 5.7 |
| Uremic syndrome                                | 3  | 5.7 |
| Hyperglycemia                                  | 1  | 1.9 |
| Eclampsia                                      | 1  | 1.9 |
| Unknown                                        | 1  | 1.9 |

ASM: antiepileptic medication; CNS: central nervous system.

Table 1
Etiologies of convulsive status epilepticus.

| Period                               | Mean (SD) |
|--------------------------------------|-----------|
| Time from admission to GP consultation (minutes) | 10.1 (3.8) |
| Time from admission to first treatment (minutes) | 8.2 (3.6)  |
| Time from admission to first line ASM (minutes) | 12.1 (6.2) |
| Time from admission to brain imaging (hours)    | 3.5 (1.6)  |
| Duration of hospitalization (days)            | 11.7 (5.8) |
| Time from admission to death (days)           | 4.1 (2.9)  |

GP: general physician.

Table 2
Time and duration important for management of patients.
In-hospital mortality was 16.9% (n = 9), and RSE was significantly associated to death (p = 0.03; OR: 10.5 (CI 1.44–76.28). Details on univariate analysis are found on Table 3.

Table 3
Univariate analysis to determine factors associated to mortality.

| Variables               | n (%)       | p-value | OR (IC 95%) |
|-------------------------|-------------|---------|-------------|
| Age groups              |             |         |             |
| <60                     | 33 (56.6)   | –       | Ref         |
| ≥60                     | 20 (37.7)   | 0.05    | 4.61(0.99–21.33) |
| Gender                  |             |         |             |
| Male                    | 33 (62.2)   | 0.71    | 1.40(0.32–5.97) |
| Preexisting epilepsy    |             |         |             |
| Yes                     | 14 (26.4)   | 0.99    | 0.76(0.13–4.19) |
| CSE type                |             |         |             |
| Generalized CSE         | 24 (45.3)   | 0.16    | 0.28(0.53–1.53) |
| Focal CSE               | 29 (54.7)   | 0.16    | 3.50(0.65–18.75) |
| Seizure duration        |             |         |             |
| <30 min                 | 41 (77.4)   | 0.4     | 1.94(0.40–9.32) |
| ≥30 min                 | 12 (22.6)   | –       | Ref         |
| RSE                     | 5 (9.4)     | 0.03    | 10.50(1.44–76.28) |
| Etiologies              |             |         |             |
| Ischemic stroke         | 7 (13.2)    | 0.58    | 2.22(0.35–13.84) |
| Hemorrhagic stroke      | 4 (7.5)     | 0.99    | 0.97(0.10–9.51) |
| CNS infections          | 9 (16.9)    | 0.33    | –           |
| ASM modifications       | 9 (16.9)    | 0.32    | –           |
| Brain tumor             | 7 (13.1)    | 0.58    | 2.22(0.35–13.84) |
| Metabolic disorders     | 8 (15.2)    | 0.58    | 2.22(0.35–13.84) |
| Brain trauma            | 7 (13.2)    | 0.99    | 0.79(0.08–7.51) |
| Unknown cause           | 1 (1.8)     | 0.17    | –           |

ASM: antiseizure medication; CSE: convulsive status epilepticus; RSE: refractory status epilepticus.

In the study, 26.4% of patients had pre-existing epilepsy. Two studies conducted in Nigeria and Madagascar found 23.7% to 28.7% of cases with pre-existing epilepsy [1,15]. However, other studies have reported a higher frequency of pre-existing epilepsy [12,17]. In general, people with epilepsy account for 30 to 50% of SE cases [23].

In more than 20% of cases, seizures lasted ≥ 30 min. Cissé et al., and Gams et al. reported prolonged seizures (more than 30 min) in the majority of cases [2,5]. The permanent presence of a critical care physician could contribute to lower percentage of prolonged seizures in the MSED of the Douala General Hospital. In addition, there was a marked reduction in the mean time for general physician consultation from 23 min in 2014, to 10 min in this study; and the mean time to first treatment from 26 min in 2014 to 8 min in this study (12 min for first line anticonvulsant) [24]. The risk of occurrence of irreversible neuronal damage increases with the duration of seizure [25]. Focal CSE was observed in more than half of cases. Several studies also found a predominance of focal CSE [12,16,17,19]. However, many authors reported a predominance of generalized seizures [5–7,14,15,18]. EEG is usually recorded after complete seizure cessation. EEG was performed in less than one third of cases, and the pattern was abnormal in six patients. In Senegal, Gams et al. reported that EEG was performed in only 10% of patients and 7% of these patients presented with anomalies [5]. Anyway, the EEG recording should not delay the treatment.

The mean age around 50 was also reported in Senegal and Thailand [5,11]. However, other studies have found a lower mean age, particularly in Brazil and Ivory Coast [12,13]. This could be explained by the difference in methodology. Patient aged ≥ 60 accounted for 37.7% of cases in our study. Studies in Iran and Senegal found 22.4% and 37.6%, respectively, of patients aged ≥ 60 [5,14]. This high proportion of the elderly could be explained by the epidemiological transition in Africa with a rise of cardiovascular diseases more frequently affecting the elderly. The male predominance of SE was reported by other studies carried out in Africa [1,7,15]. The higher frequency of SE in men is probably related to the gender difference of strokes and head trauma related activities (such as motorbike driving). However, some studies have reported a female predominance [14,16].

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**Discussion**

This hospital-based study on CSE represents the first interest on this topic in our setting. The prevalence of 2.03% found is lower than the prevalence reported in other Sub-Saharan African (SSA) countries [1,2,9]. Our study was carried out in an emergency department receiving patients from different specialties, whereas other SSA studies had been carried out exclusively in neurology departments or in ICU. Using the same operational definition of CSE (seizure lasting > 5 min), and the age cut-off of 16 years old, Kantanen et al. found a four-fold increase in incidence of SE compared to the previous ILAE definition (seizure lasting > 30 min) reported earlier in Europe [10].

In-hospital mortality was 16.9% (n = 9), and RSE was significantly associated to death (p = 0.03; OR: 10.5 (CI 1.44–76.28). Details on univariate analysis are found on Table 3.
as the first line before switching to Clonazepam if necessary. The second line treatment consisted of IV Clonazepam and Phenobarbital. IV Phenobarbital or IV Valproate administered as a second line treatment by Poursadeghfard et al., had shown an efficacy of 3.7% and 2.2% respectively [14]. Greater efficacy was reported after administration of IV Phenytoin/Fosphenytoin [29]. About 9.4% of patients who presented with RSE were admitted, into ICU. Langer and Fontaine reported RSE in 12% of patients with CSE [29]. There is no difference in the incidence of RSE in developing and developed countries. RSE occurs in 29 to 43% of SE cases [30]. In resource-limited settings where access to ASM is limited, injectable diazepam and phenobarbital may be effective option for the management CSE in adults.

The in-hospital mortality was 16.9%. A lower mortality rate was found in Germany by Knake et al. [9.4%] and by Coeytaux et al. [7.6%] in Switzerland [17,19]. Vignatelli et al. found 39% mortality [16]. In Africa, SE mortality is between 21.3 and 24.8% with a disparity depending on the patient’s age [5,6,15]. In developed countries, the use of standardized treatment protocol, the availability of ASM and high standard emergency departments and ICU may contribute to this lower mortality. RSE was statistically associated to death in our study. For Owolabi et al., duration of seizure, delay in initiation of treatment and RSE were significantly associated with death [15]. Stupor or coma, NCSE, and age greater than 64 years were considered poor outcome factors, while a history of previous seizures was considered a good outcome factor [30]. Prolonged seizures increase the risk of irreversible neuronal damage and death [25].

Conclusion

Cameron is a developing country in Africa where few data are available on the treatment approach to CSE. Our cross-sectional study found the most common cause of CSE was stroke followed by CNS infections. Outcomes were similar to multicenter outcomes using a protocol to guide treatment of CSE, yet despite treatment, one in 10 patients exhibited refractory SE with significant in-hospital mortality. Despite geographic differences and resource limitations, similarities exist between developing and developed countries treating patients with CSE when an organized approach to treatment is followed.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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