

Epileptic Seizure States: Sociodemographic, Diagnostic, and Therapeutic Aspects—A Two-Center Study in Two University Hospitals in N'djamena

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Abstract

Introduction: Status epilepticus (SE) is a medical emergency defined by persistent or recurrent epileptic seizures. This bicentric study aims to describe the diagnostic characteristics of SE in Chad. **Methodology:** This was a prospective descriptive cross-sectional study conducted from January to December 2025 (12 months) at the National Reference University Hospital and La Renaissance University Hospital in N'Djamena, including all patients aged 15 years or older hospitalized for SE confirmed clinically or by electroencephalography. Data were collected from the neurology and intensive care units. **Results:** Among 1132 patients admitted for neurological hospitalization, 80 cases of SE were identified, representing 7.06%. The mean age was 45.7 ± 17.24 years. The male-to-female ratio was 2.47. At admission, 68.8% presented with convulsive seizures and 81.3% had generalized seizures. Generalized tonic-clonic status epilepticus represented 96.3% of cases. Altered consciousness (Glasgow score ≤ 8) was observed in 46.2%. Computed tomography, performed in 52.5% of patients, showed ischemic stroke (AVCI) in 21.4%. Electroencephalography, performed in 32.5% of cases, revealed abnormalities in 73.1%. The main etiologies were head trauma (27.5%) and cerebrovascular diseases (26.3%). Arterial



hypertension (25%) and epilepsy (17.6%) were the predominant comorbidities encountered. Diazepam was used as first-line therapy in 73.7%. Second-line treatment was necessary in 95% of cases (phenobarbital 39.5% or phenobarbital-sodium valproate combination 26.3%). **Conclusion:** The frequency of SE was 7.06%, confirming its major clinical significance.

Keywords

Status Epilepticus, Bicentric Study, Chad

1. Introduction

The World Health Organization (WHO) defines status epilepticus (SE) as “an epileptic seizure that persists long enough or recurs at sufficiently short intervals to create a stable and sustained epileptic condition” [1]. The diagnosis of generalized tonic-clonic status epilepticus (GTCSE) is based on clinical findings, whereas non-convulsive status epilepticus (NCSE) requires electroencephalographic confirmation. GTCSE is the most common and most severe form of status epilepticus [2].

In the United States, a systematic review published in 2020 reported an incidence of 18.3 to 41 cases per 100,000 people [3].

In Mali, status epilepticus accounted for 8% of non-traumatic neurological emergencies in a study published in 2024 [4]. In Burkina Faso, a 2022 study showed that 72.5% of EME cases occurred in patients with no history of epilepsy [5]. In Madagascar, in 2022, 54.71% of EME cases were found in patients with a known history of epilepsy [6]. In Cameroon, a 2021 publication reported a hospital prevalence of 2.03%, with known epilepsy patients accounting for 26.4% of cases [7].

This two-center study was conducted to describe the diagnostic aspects of status epilepticus at the capital’s two main university hospitals.

2. Methods

We conducted a descriptive cross-sectional study with prospective data collection over a 12-month period from January 1 to December 31, 2025, involving all patients admitted to the neurology and intensive care units at La Référence Nationale University Hospital, as well as to the internal medicine and intensive care units at La Renaissance University Hospital in N’Djamena. Included were all patients aged 15 years or older who were hospitalized for a clinically diagnosed EME (convulsive EME) or an EEG-diagnosed EME (non-convulsive EME). Pregnant women with seizures were not included.

3. Results

During the study period, 1132 patients were seen in the neurology department. Of

these, 80 cases of status epilepticus (SE) were identified, representing 7.06% of neurological conditions.

The largest age group was 30 - 44 years (35%). The mean age was 45.7 ± 17.24 years (range: 16 - 79 years). The sex ratio was 2.47 in favor of men. Patients were from N'Djamena in 80% of cases. Housewives accounted for 23.7% of cases, and 55% of patients had a medium socioeconomic status (**Table 1**).

Table 1. Sociodemographic characteristics.

Characteristics	n	%
Age Group		
<30 years old	13	16.2
30 to 44 years old	28	35.0
45 to 59 years old	18	22.5
≥ 60 years old	21	26.3
Gender		
Male	57	71.3
Female	23	28.7
Place of Origin		
N'Djamena	64	80.0
Outside N'Djamena	16	20.0

Hypertension and epilepsy were the most common comorbidities, found in 25% and 17.6% of cases, respectively. The time to admission was less than 12 hours in 38.8% of cases, with a mean of 58.1 ± 6.5 hours (range: 1 - 240 hours). Patients were admitted for seizures in 68.8% of cases, compared with 31.2% for altered consciousness or weakness on one side of the body (**Figure 1**).

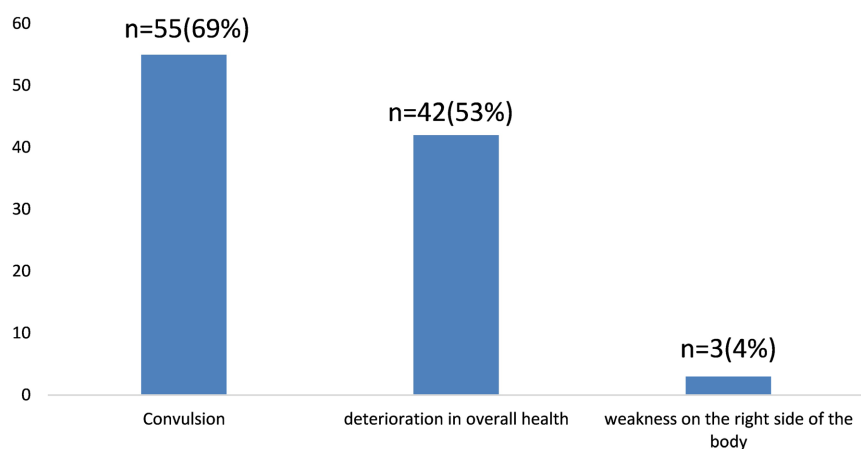


Figure 1. Distribution by reason for admission.

At admission, the initial seizure was generalized in 81.3% of cases, of which

generalized tonic-clonic status epilepticus (GTCSE) accounted for 96.3%; the remaining 3.7% consisted of seizures of undetermined or focal origin. Impaired consciousness with a Glasgow Coma Scale score of ≤ 8 was noted in 46.2% of patients (mean: 9.8 ± 3.0).

Cerebral computed tomography (CT), performed in 52.5% of patients ($n = 42$), was normal in 26.2% of cases ($n = 11$) and showed an ischemic stroke in 21.4% of cases ($n = 9$), 89% of which ($n = 8$) were sylvian in location.

The electroencephalogram (EEG), performed in 32.5% of patients ($n = 26$), was normal in 26.9% of cases ($n = 7$) and abnormal in 73.1% of cases ($n = 19$). The main abnormalities found were diffuse slowing (30.8%, $n = 8$), generalized spikes and waves (19.2%, $n = 5$), diffuse spikes and waves and polyspikes (15.4%, $n = 4$), and focal hemispheric spikes and waves (7.7%, $n = 2$) (**Table 2**).

Table 2. Breakdown by EEG.

EEG	n	%
Widespread slowdown	8	30.8
Generalized wavefronts	5	19.2
Wave tips and diffuse multi-tips	4	15.4
Hemispherical focused wavefronts	2	7.7
Normal	7	26.9
Total	26	100

The main causes were traumatic brain injury (TBI, 27.5%), cerebrovascular diseases (26.3%)—including strokes (11.3%, $n = 9$) and vascular epilepsy (15%, $n = 12$)—and severe malaria (22.5%, $n = 18$) (**Table 3**).

Table 3. Breakdown by etiology.

Etiology	n	%
Cerebrovascular disease (acute or sequelae)	21	26.3
Metabolic	4	5
Poor adherence to antiepileptic treatment	6	7.5
Unknow causes	5	6.2
Severe malaria	18	22.5
Traumatic brain injury	22	27.5
Cerebral toxoplasmosis	2	2.5
Brain tumor	2	2.5
Total	80	100

In the complete blood count, leukocytosis was found in 32.5% of cases and anemia in 21.3% of cases. The serum electrolyte panel, performed in 74 patients, showed hypokalemia in 12.2% of cases and was normal in 78.4% of cases.

Diazepam was used as first-line therapy in 73.7% of patients, followed by midazolam (18.7%). Second-line treatment was required in 95% of cases, primarily with phenobarbital (39.5%) or the combination of phenobarbital and sodium valproate (26.3%). Third-line treatment was administered in 17.5% of patients, with thiopental used in 50% of cases and midazolam in 28.6% of cases. A nasogastric tube (NGT) was placed in 61.3% of patients, and orotracheal intubation (OTI) with mechanical ventilation was performed in 37.5% of patients (**Table 4**).

Table 4. Therapeutic aspects.

Therapeutic Aspects	n	%
First-line Treatment		
Clonazepam	1	1.3
Diazepam	59	73.7
Diazepam + clonazepam	2	2.5
Diazepam + midazolam	2	2.5
Midazolam	15	18.7
Midazolam + clonazepam	1	1.3
Second-line Traitement		
Levetiracetam	5	6.6
Phenobarbital	30	39.5
Phenobarbital + levetiracetam + phenytoin + sodium valproate	2	2.6
Phenobarbital + sodium valproate	20	26.3
Phenobarbital + levetiracetam	6	7.9
Phenobarbital + levetiracetam + sodium valproate	8	10.5
Phenobarbital + phenytoin	1	1.3
Sodium valproate	4	5.2
Third-line Traitement		
Midazolam	4	28.6
Midazolam + fentanyl	2	14.3
Midazolam + propofol + fentanyl	1	7.1
Thiopental	7	50

4. Discussion

The prevalence of status epilepticus (SE) in our study was 7.06%, a finding that falls within the mid-range of data reported in the literature for sub-Saharan Africa. This rate is significantly higher than those reported by Gams Massi *et al.* in Cameroon in 2021 (2.03%) and by Gbalou *et al.* in Côte d'Ivoire in 2024 (1.1%) [7] [8]. In contrast, it remains lower than the prevalence rates observed by Rajaonarison *et al.* in Madagascar in 2022 (16.93%) and by Donamou *et al.* in Guinea in 2020

(12.3%) [6] [9].

These discrepancies among the various African studies suggest several possible explanations. Methodologically, the Guinean and Malagasy studies included all patients, including the pediatric age group, in whom the incidence of EME is higher (particularly due to acute infections and febrile encephalopathies). Conversely, our study was strictly limited to the adult population, which could, a priori, underestimate our prevalence. Furthermore, the Ivorian and Cameroonian studies included all emergency department admissions without restriction but reported lower prevalence rates, which could suggest other explanatory factors.

The mean age of our population was 45.7 ± 17.24 years (range: 16 to 79 years), a finding consistent with that reported in other African studies [6] [7]. In contrast, in European studies, particularly those from Italy and Switzerland, the mean age was significantly higher [9] [10]. This intercontinental disparity reflects profoundly distinct demographic and health realities. On the one hand, it is consistent with the age structure of the African population, which has historically been younger due to a demographic transition that remains incomplete. On the other hand, it reflects the socioeconomic progress of industrialized countries, where increased life expectancy—linked to better access to care, healthier lifestyles, and universal health coverage—contributes to the gradual aging of the general population.

The most common comorbidities were hypertension (25%), followed by epilepsy (17.6%). Similar results have been reported in other studies [9] [11]. Changes in lifestyle and demographic transitions—which favor the rise of noncommunicable diseases at the expense of infectious diseases—may explain this trend related to hypertension.

EMETCG (status epilepticus characterized by generalized tonic-clonic seizures) accounted for 96.3% of cases, a finding also reported by other African authors [6] [7]. In contrast, Vijjala, in Switzerland, reported a frequency of convulsive SE of 52.43%, followed by non-convulsive SE in 37.86% of cases [10]. Access to care and the availability of diagnostic resources in developed countries, compared to sub-Saharan African countries, may explain this difference. Furthermore, in the context of medical practice in sub-Saharan Africa, and more specifically in Chad, generalized seizures are the best known, which explains why patients presenting with this symptom are seen more frequently than those with other types of seizures.

The Glasgow Coma Scale score was ≤ 8 in 46.2% of cases, with a mean of 9.8 ± 3.0 (range: 5 to 15). These results are consistent with those of other African series [8] [12]. Encephalopathy, especially generalized encephalopathy, leads, through its various pathophysiological mechanisms, to a rapid deterioration of consciousness in the absence of appropriate and prompt treatment.

In our study population, a CT scan was performed in 52.5% of cases ($n = 42$). The results were normal in 26.2% of cases, and an ischemic stroke was observed in 21.4% of cases. In a Guinean study, Cissé *et al.* (2017) reported a CT scan rate of 73.33%, with ischemic stroke (ICS) found in 36.36% of cases and hemorrhagic stroke (HS) in 27.27% [13]. Labodi Lompo, in Burkina Faso in 2022, reported a

CT scan rate of 70.3%, with sequelae in 51.6% of cases and acute stroke in 21.9% [5]. The prevalence of ischemic strokes in our study (21.4%) is comparable to that reported by Labodi Lompo in Burkina Faso (21.9%) [5], although our CT scan rate was lower (52.5% versus 70.3%). This discrepancy in imaging rates, due to the high cost and limited availability of CT scanners in our setting, suggests that the actual prevalence of strokes may be underestimated. Indeed, if access to CT scanning were more widespread, it is likely that a greater number of strokes (as the cause of EME) would be diagnosed.

EEGs, performed in 32.5% of patients ($n = 26$), revealed abnormalities in 73.1% of cases ($n = 19$), primarily characterized by diffuse slowing (30.8%) and generalized spike-waves (19.2%). These figures are lower than those reported in Somalia (37% generalized discharges) and Côte d'Ivoire (42.5% spike-waves) [11] [14], due to the unavailability of EEG and the lack of continuous monitoring in our setting. Despite these limitations, the high prevalence of generalized abnormalities confirms the frequency of generalized seizures and suggests a predominance of generalized epilepsy in our population, underscoring the urgent need to strengthen diagnostic capabilities in neurophysiology.

The predominant causes of EME in our study were TBI (27.5%) and stroke (26.3%), consistent with the data from Donamou *et al.* [9]. This predominance of traumatic and vascular causes reflects the African context, characterized by road safety issues and a high prevalence of cardiovascular disease. In contrast, the Italian series by Mutti *et al.* and the Swiss series by Vijjala *et al.* show a clear predominance of vascular and neoplastic causes [10] [11]. This disparity illustrates the influence of sociodemographic, environmental, and medical factors on the etiological profile of EME. A preventive approach, therefore, appears to be the most appropriate in our context.

The first-line treatment for EME is based on benzodiazepines. In our study, diazepam was the most commonly used drug (73.7%), followed by midazolam (18.7%), which is consistent with the data from Côte d'Ivoire reported by Gbalou *et al.* [8] (69.44% for diazepam, 11.11% for clonazepam). This practice contrasts with that reported in Italy by Mutti *et al.* [10], where lorazepam predominates, in line with recommendations (37.5%). This disparity is primarily due to the greater availability and lower cost of diazepam in our healthcare facilities, making it a pragmatic and effective alternative for the management of EME in resource-limited countries. It should be noted, however, that diazepam, although widely used, has a shorter half-life than lorazepam and is associated with an increased risk of respiratory depression, hence the need for rigorous clinical monitoring during its administration.

5. Conclusion

In this study, the frequency of 7.06% of status epilepticus confirms its major clinical significance. The epidemiological characteristics (young population, male predominance) and etiological factors (head trauma, cerebrovascular accidents,

malaria) reflect a reality distinct from the Western context. The low rates of neuroimaging (52.5%) and electroencephalography (32.5%) constitute major obstacles to comprehensive diagnosis.

Author Contributions

Conceptualization: Christian Madjirabe Ngarndiguina and Mahamat Saleh Mahamat Souleymane; Methodology: Christian Madjirabe Ngarndiguina and Ousmane Mahamat Alkher; Software: Mahamat Saleh Mahamat Souleymane, Foksouna Sakadi, and Carlos Othon Guelngar; Validation: Foksouna Sakadi and Christian Madjirabe Ngarndiguina; Formal analysis: Christian Madjirabe Ngarndiguina; Investigation: Mahamat Saleh Mahamat Souleymane; Resources: Christian Madjirabe Ngarndiguina; Data curation: Nodje-Assal Ndohe Ngrabe and Melom Nderbe Christelle; Writing—original draft preparation: Christian Madjirabe Ngarndiguina; Writing—review and editing: Christian Madjirabe Ngarndiguina and Carlos Othon Guelngar; Visualization: Zenal Abidine Adoum Hamad, Carlos Othon Guelngar, Foksouna Sakadi, Diponbe Doufene, and Kamis Dakissia; Supervision: Yannick Canton Kessely; Project administration: Christian Madjirabe Ngarndiguina; Funding acquisition: Christian Madjirabe Ngarndiguina. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

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

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