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Evaluation of Epileptic States at the Cocody University Hospital (Côte d'Ivoire): Clinical, Etiological, and Therapeutic Aspects

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Abstract: Here is still no precise definition of non-convulsive status epilepticus in the literature. Although it is characterized by a change in the patient's baseline neurological status associated with continuous epileptic activity on the electroencephalogram (EEG), its clinical manifestations are highly variable and may include a more or less profound alteration of consciousness, behavioral changes, sensory, non-convulsive motor, dysautonomic or cognitive manifestations. The aim of this study was to determine the clinical, aetiological and therapeutic aspects of status epilepticus at Cocody University Hospital. A socio-demographic study was carried out to determine the prevalence of status epilepticus according to age, gender and department at Cocody University Hospital. The hospital prevalence of status epilepticus was 1.1%, with emergency medical services and neurology departments accounting for 33.33% and 30.56%, respectively. The most common age group was over 60 years, accounting for 25% of patients. Cranioencephalic CT scans in 58 of 72 patients (53.45%) showed no abnormalities of the brain. However, some patients had recurrent pathologies such as stroke (15.52%), PEIC (13.79%) and encephalitis (10.34%). This study should be extended to other hospitals to shed light on these important issues. The findings of this study will contribute significantly to the existing body of knowledge about non-convulsive status epilepticus and will provide valuable insights into the clinical, etiological, and therapeutic aspects of this condition at Cocody University Hospital.

Keywords: Epileptic Seizures, Therapeutic, Diagnostic Urgency, Hospital-Based Study

1. Introduction

Status epilepticus is the extreme form of an epileptic seizure and is considered a medical emergency [21]. It is characterized by continuous or successive seizures without regaining consciousness for at least 5 minutes [16]. Status epilepticus (SE) is a frequent occurrence in both known epileptic patients and patients without epilepsy. However, epileptic status are not a single entity, or even a homogeneous one, but rather a symptom with a variety of clinical and electroencephalographic manifestations, which may or may not be convulsive, generalized or focal. Known since [7], epileptic status states are pathological conditions that vary greatly in terms of clinical expression, age of onset, etiology, and prognosis. It is evident that epileptic status states are very common emergencies. However, their incidence and prevalence are not accurately known. Therefore, it is likely that the available data underestimates the true frequency of the condition. The annual incidence of convulsive and non-convulsive MEE in France ranges from 10 to 41 per 100,000 population [31], and is twice as high in developing countries as in industrialized countries, ranging from 19.3% to 57.1% [4]. Incidence is higher in children and adults over 60 [31]. Regarding age distribution, it is bimodal, with one frequency peak observed in childhood and the other among those over 60 years of age [10]. Two studies,

namely Assi in 2015 and Doumbia in 2013, have been carried out in inpatient neurology departments. To standardize the management in our practice; we conducted this study at Cocody University Hospital. The aim is to investigate the clinical, etiological, and therapeutic aspects of epileptic status epilepticus at University Hospital of Cocody.

2. Materials and Methods

2.1. Material

2.1.1. Study Setting

Our study took place in the University Hospital of Cocody. The University Hospital has several departments dealing with status epilepticus, including the neurology department, medical emergencies, paediatric emergencies and intensive care.

2.1.2. Study Population

The study population consisted of patients admitted to neurology, emergency medicine, paediatrics and intensive care units. This study was conducted over a one-year period from 06 April 2021 to 06 April 2022.

2.1.3. Inclusion Criteria

Patients hospitalized in the above-mentioned departments who presented with status epilepticus were selected for our study.

2.1.4. Criteria for Exclusion

Patients who presented with an epileptic seizure that did not meet the diagnostic criteria for status epilepticus and whose medical records were incomplete were excluded from our study.

2.2. Method

2.2.1. Type of Study

We conducted a prospective cross-sectional study with descriptive and analytical aims.

2.2.2. Sampling

The sample was random and included all patients admitted to the neurology, medical emergency, paediatric emergency and intensive care Departments of the Cocody University Hospital during the study period, taking into account the inclusion and exclusion criteria.

2.2.3. Statistical Analysis

Data entry and analysis of the results were carried out using Epi-info7 and Excel. All continuous variables are expressed as averages, and discontinuous variables as percentages.

3. Results

3.1. Socio-Demographic Data

3.1.1. Prevalence

The prevalence of status epilepticus was calculated at service level according to age and sex. The hospital prevalence of status epilepticus was 1.1%.

3.1.2. Prevalence at Service Level

The prospective study of patients presenting with status epilepticus showed that the majority of patients came from emergency and neurology departments, with 33.33% and 30.56% respectively. As for intensive care and paediatric services, we observed a low rate of patients presenting with mal-epileptic states with 15% and 11% respectively (Table 1).

3.1.3. Prevalence by Age

A study of the prevalence of mal-epileptic states according to age revealed that the most common age group was over 60 years, accounting for 25% of patients. There was also a significant proportion of patients aged between 31 and 45 (22.22%) (Figure 1).

3.1.4. Prevalence by Sex

Our study population was predominantly male (54.2%). The sex ratio was 1.2 (Figure 2).

3.2. Clinical Aspect

3.2.1. Patient History

The clinical study revealed a history of illness among mal epileptic patients. The majority (40.28%) were victims of intoxication. In addition to this majority, there were cases of patients suffering from hypertension (26.76%), epilepsy (23.6%), or having epileptic parents (18.06%). A minority of patients also had a history of disease such as diabetes (15.71%) or HIV (12.50%) (Table 2).

3.2.2. Types of Status Epilepticus Seizures in Patients

We recorded three types of seizures in the patients. A large proportion of patients (58.3%) had generalized status epilepticus, while the others had either focal status epilepticus (40.3%) or convulsive status epilepticus (1.4%) (Figure 3).

3.3. Duration of Seizures

With regard to the duration of the seizures in the patients with epilepsy, we observed three intervals. Most of the seizures (75%) lasted less than 5 minutes. Seizures lasting between 5 and 10 minutes and between 10 and 30 minutes, we recorded 5.56% and 19.44% of patients respectively (Table 3).

3.4. Distribution by Precipating Factor

Regarding the factors triggering epilepticus status, our results showed that the majority of patients (42%) did not known the factor triggering the seizures. However, 20% of patients attributed the onset of seizures to fever, 3% to a change in or discontinuation of treatment and 2% to a lack of sleep or the use of toxic drugs (Figure 4).

3.5. Paraclinical Assessment

3.5.1. Cranioencephalic CT Scan

The cranioencephalic CT scan performed in only 58 of the 72 patients revealed that a large proportion of patients (53.45%) had no abnormalities of the encephalon. However,

some patients had recurrent pathologies such as stroke (15.52%), PEIC (13.79%) and encephalitis (10.34%). In addition, there were rare cases of cortico-subcortical atrophy (2%), haematoma (1%) and empyema (1%) (Table 4).

3.5.2. Magnetic Resonance Imaging

Magnetic resonance imaging was performed on 17 patients (23.63%). The results of the various examinations revealed that the patients generally presented with either a stroke or neoplasia (37.29%) (Table 5).

3.5.3. Electroencephalography

The electroencephalogram revealed the presence of spike waves (42.50%), poly-spikes (12.50%) and triphasic waves (12.50%). Diffuse slow waves (12.50%) and focal waves (5%) were also observed (Figure 5).

3.5.4. Etiologies

We investigated the aetiologies of status epilepticus in all our patients. In adults, the main causes were infectious (35.9%), vascular (17%) and metabolic (13.2%) (Figure 6). In children, the main causes were infectious in 47.4%, vascular in 15.8% and malformative and toxic in 10.5% (Figure 7).

3.5.5. Treatment and Progress

(i). Treatment

All our patients have received less than one antiepileptic drug. For the first-line antiepileptic drug, diazepam was used in 69.44% of patients, clonazepam in 11.11%, followed by midazolam in 4.17%. Second-line antiepileptic treatment was mainly sodium valproate in 58.33% of patients (Table 6).

(ii). Evolution

The average length of hospital stay in our study was 16 days, with extremes ranging from 02 to 43 days. Death occurred in 29.1% of patients (Figure 8). Among the factors associated with mortality, vascular aetiologies in children were significantly associated with mortality (Table 7).

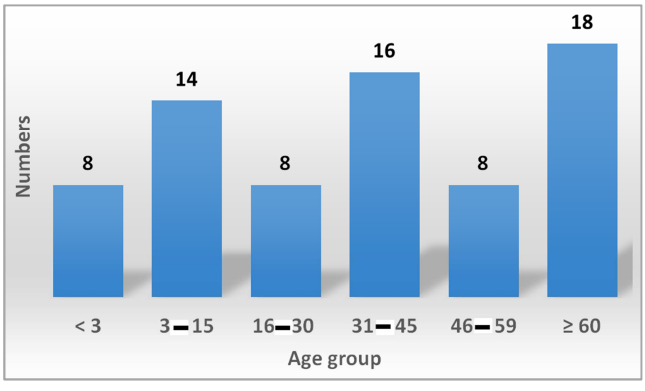


Figure 1. *Status epilepticus patients by age group.*

Table 1. *Patient distribution by reception department.*

Service	Numbers	Percentage (%)
Neurology	22	30,56
Paediatric emergencies	11	15,28
Medical emergencies	24	33,33
Reanimation	15	20,83
Total	72	100,00

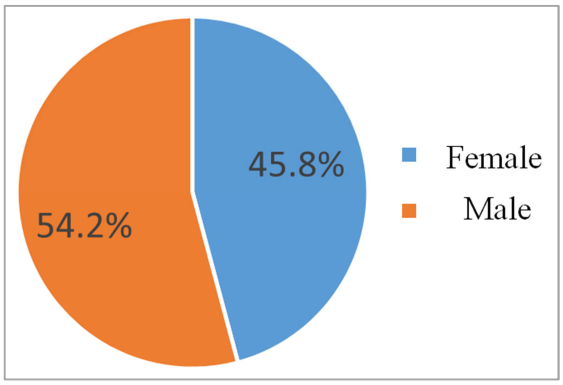


Figure 2. *Distribution of patients with status epilepticus by sex.*

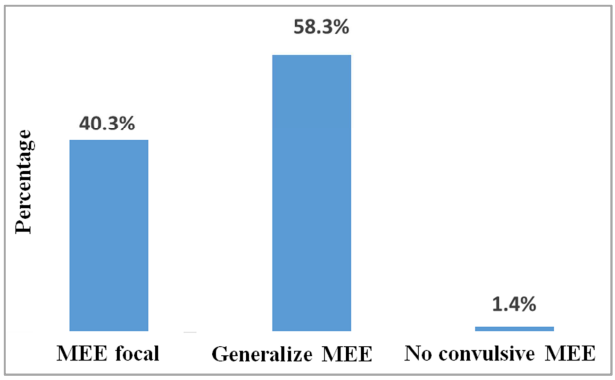
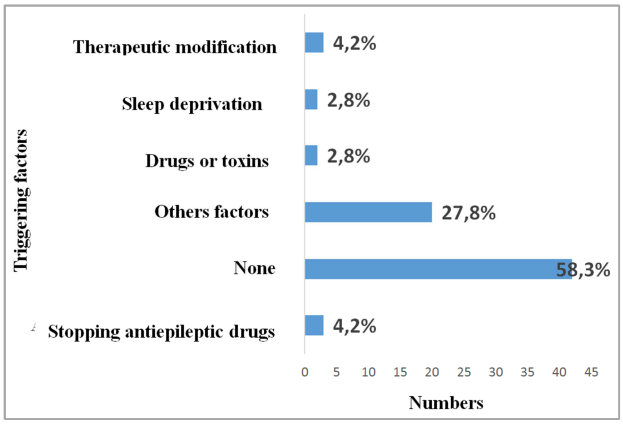


Figure 3. *Distribution by type of crisis.*



Other factors: fever, stress

Figure 4. *Distribution of seizures by triggering factor.*

Table 2. *Distribution of patients based on medical and surgical history.*

Previous history	Numbers	Percentage (%)
Familial epilepsy	13	18,06
Epileptic	17	23,6
Intoxication *	29	40,28
Heart disease	1	1,39
Traumatic injury	4	5,63
HIV	9	12,50
Psychological and developmental	8	11,11

Previous history	Numbers	Percentage (%)
HTA	19	26,76
Diabetes	11	15,71
Stroke	8	11,43

Intoxication*: alcohol, tobacco, traditional toxins, and illicit substances

Table 3. *Patient distribution by status epilepticus duration.*

Episode length (minutes)	Numbers	Percentage (%)
<5 minutes	54	75,00
5-10 mn	4	5,56
10-30 mn	14	19,44
Total	72	100,00

Table 4. *Distribution of patients by results of cranioencephalic CT scan.*

Cranioencephalic CT scan results	Numbers	Percentage (%)
Stroke	9	15,52
Cortico-subcortical atrophy	2	3,45
Empyema	1	1,72
Subdural haematoma	1	1,72
Subdural haematoma	1	1,72
Encephalitis	6	10,34
PEIC	8	13,79
Normal	31	53,45
Total	58	100,00

Table 5. *Distribution of patients by magnetic resonance imaging results.*

Cranioencephalic MRI results	Numbers	Percentage (%)
Stroke	7	41,18
Normal	1	5,88
Encephalitis	1	5,88
Malformation	2	11,76
Neoplasia	6	35,29
Total	17	100,00

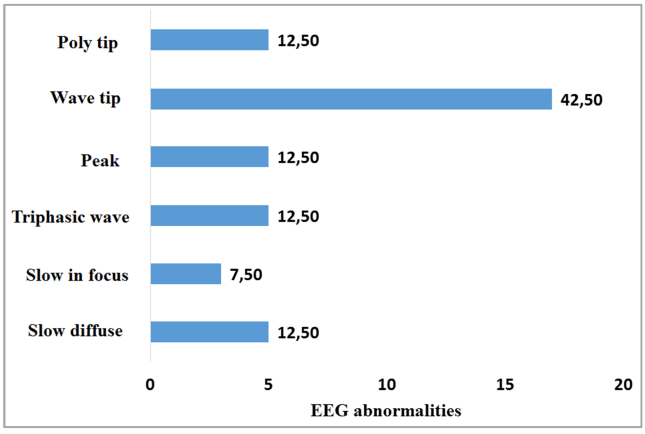


Figure 5. *EEG abnormalities.*

Table 6. *Distribution of patients by type of anti-epileptic medication initiated.*

Antiepileptic treatment	Numbers	Percentage
Anti-epileptic drug 1st intention	(n=72)	
Diazepam	50	69,44
Clonazepam	8	11,11
Midazolam	3	4,17
Diazepam+ Midazolam	11	15,28
Basic anti-epileptic drugs (2nd line)	(n=72)	
Lacosamide	1	1,39
Sodium Valproate	42	58,33
Phenobarbital	12	16,67

Antiepileptic treatment	Numbers	Percentage
Carbamazepine	16	22,22
Leviteracetam	8	11,11
Lamictal	1	1,39
Sodium Valproate +Carbamazepine	2	12,50
Sodium Valproate + Phénobarbital	7	48,33
Sodium Valproate + Leviteracetam	2	25,00
3rd line treatment		
General anaesthesia	14	19,44

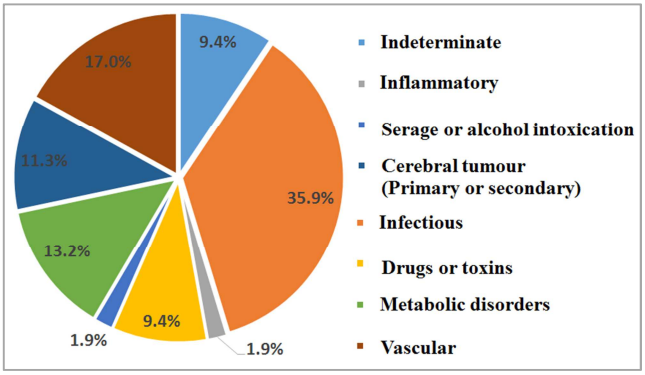


Figure 6. *Distribution of patients by aetiology in adults.*

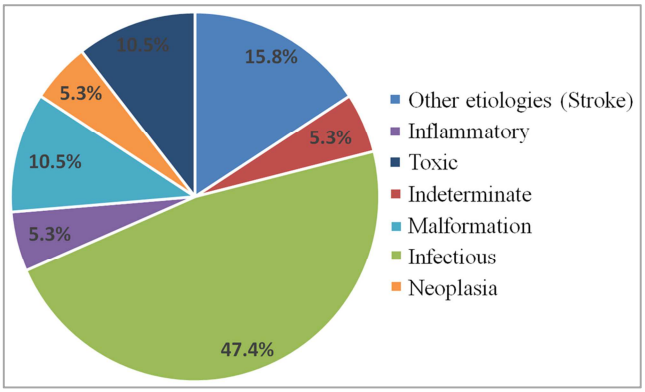


Figure 7. *Distribution of patients by etiology in children.*

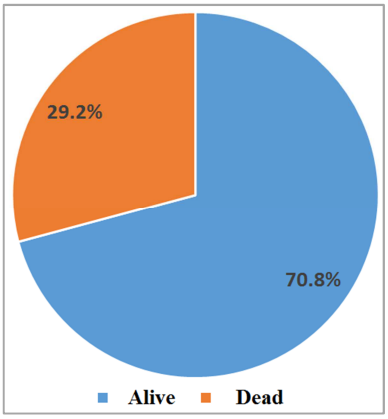


Figure 8. *Distribution by patient outcome.*

Table 7. *Childhood etiologies associated with mortality.*

ETIOLOGY	Mortality		*p*	OR [95%]
	YES	NO		
Vascular	2	1	*0,04*	14[0,8-235]
Infectious	1	8	*0,67*	0,6[0,1-6,6]
Toxics/drugs	0	2	*0,38*	-

ETIOLOGY	Mortality		*p*	OR [95%]
	YES	NO		
Inflammatory	1	0	*0,09*	-
Neoplasia	1	0	*0,09*	-
Malformations	0	2	*0,38*	-
Undetermined	0	1	*0,55*	-

4. Discussion

4.1. Sociodemographic Characteristics

The hospital prevalence in our study was low (1.1%). Data on the epidemiology of status epilepticus are rare in Africa. Most data are from hospital series. In Madagascar, Raveloson *et al.* reported a prevalence of 5.28% [35]. In Guinea, [9] reported a prevalence of 10.86%. This low prevalence rate could be explained by the fact that our patients were recruited from a single university hospital. The mean age of our patients 36.5 ± 25.48 years is close to that reported by [13] who reported a mean age of 37.1 years in their 2013 study. However, mean ages of 34.6, 44.5 and 47.7 years were found in Burkina Faso [22], Madagascar [35] and Guinea [9] respectively. These different studies confirm that the young population is the most affected. In contrast to Sub-Saharan Africa, in the developed country series, MEE seems to be more common at the extreme ages of life, and affecting more people in the under 2 to 10 and over 60 age groups [14]. A male predominance of MEE has been observed in the most studies [17], California [42, 11], including our own, without any real explanation being found [14].

4.2. Clinical Characteristics

In series from Sub-Saharan Africa, a history of epilepsy has been observed in very different proportions ranging from 9.9% to 33% [13], including our own with a proportion of 23.61%. However, in European studies, the Germany prospective study [19] found 50% epilepsy. The Swiss study found 43% of patients known to have epilepsy [10], while the Italian study found 39% with epilepsy [41]. The American study in Virginia found a history of epilepsy in 42% [11]. This difference suggests a different aetiological profile of MEE in sub-Saharan Africa compared with developed countries and maybe related to an underestimation of the history of MEE patients, which is most often based on patient or family reports relatives in the absence of documented evidence [27]. In the medical and surgical history, intoxication was present in the majority of cases (40.28%), followed by hypertension (26.76%). This notion of intoxication seems to be ignored in some studies, but it represents an important triggering and facilitating factor, responsible for the occurrence of status epilepticus. In our study, the semiology of MEE was dominated by generalized attacks in 58.3% of cases. Our results are similar to those of [13, 22, 25, 39], who found a predominance of generalized attacks in 70%, 41.4%, 78.8% and 74% respectively. This confirms the predominance of this type of seizure, which is unanimously reported in studies from sub-Saharan Africa. In series from developed countries, the semiology of MEE was dominated by focal seizures in two-thirds to three-quarters of cases [10], whereas in sub-Saharan Africa, low proportions of focal seizures were reported, ranging from 9.1% to 47.8% [13], compared to 40.8% in our series. This could be explained by methodological differences between the studies, as some included only convulsive seizures and others only generalized convulsive seizures, excluding non-convulsive seizures. In our study, focal seizures with secondary tonic-clonic bilateralisation accounted for 2.78% of all EMEs; this rate is low compared with studies from developed countries, which reported 19.3% of cases in Germany, one third of cases in Switzerland, 43% in the United States and two thirds of cases in Italy [10]. This low rate in our study compared with series from developed countries could be explained by the fact that this focal form with secondary bilateralisation is underdiagnosed because it is most often seen in the generalized convulsive phase; the focal onset is sometimes not recognized or ignored and therefore confused with tonic-clonic generalized epileptic seizures. CT scans were performed in 58 patients, of whom 31 (53.45%) had a normal result; magnetic resonance imaging was performed in 17 patients, of whom 7 (41.18%) had suffered a stroke. We note that more patients underwent cerebral CT than cerebral MRI, which could be explained by its affordability for our patients.

4.3. Electrophysiological and Aetiological Data

Although EEG is not necessary for the diagnosis of GCTE, it should be performed as soon as possible if MEE is suspected, especially in patients with epilepsy, benzodiazepine withdrawal, persistent disorders of consciousness after a seizure, or brain injury with fluctuating neurological symptoms [38]. In our study, the aetiologies were dominated by infectious causes in 35.9% and 47.4% of adults and children, respectively. According to the literature review, the aetiologies of EME in sub-Saharan Africa are dominated by infectious causes, acute central nervous system (CNS) infections and acute febrile cerebral infections. Acute CNS infections accounted for 78.5% [28], 68% [22], 46.2% [13], 41.5% [2] and 36.1% [30] of the causes of EME in Congo, Senegal, Côte d'Ivoire, Nigeria and Ethiopia respectively. However, the Guinean and Kenyan studies reported lower rates of acute central nervous system (CNS) infections at 14.4% (Mendes et al., 2016) and 8% of cases respectively [35]. The acute CNS infections that cause most seizures and EMEs in developing countries are acute bacterial meningitis, acute viral encephalitis, neuromalaria and neurocysticercosis [37]. Other relatively common causes are dominated by vascular causes, imbalance in antiepileptic treatment and metabolic disorders [28]. The vascular causes are a relatively common cause of MEE in sub-Saharan Africa: 12.6% in Ethiopia [30], 14.6% in Nigeria [2], and 17% of causes in our study. With the exception of the studies by [9] in Guinea and [13] in Côte d'Ivoire, where vascular causes represented 46.7% and 46.2% respectively. The high incidence in developing countries, favoured by ecological conditions, low socioeconomic levels and low vaccination coverage, could explain the predominance of infectious

causes. In developed countries, the top three causes of seizures in adults are brain injury (stroke in 80% of cases) in 19%, withdrawal or acute alcohol intoxication in 18% and underdosing of antiepileptic drugs in 17% [20].

4.4. Therapeutic and Developmental Data

Numerous professional societies have issued recommendations, all of which have in common the establishment of a therapeutic algorithm consisting of first-line benzodiazepine-based treatment, second-line treatment and treatment of refractory status epilepticus (RSE). All our patients received adjunctive antiepileptic drugs for the first epileptic seizure. Diazepam was used in 69.44% of our patients, compared with 11.11% for clonazepam and 4% for midazolam. In Guinea, [9] showed in their study that the first-line treatment was benzodiazepine alone in 93.33% of cases. The efficacy of first-line benzodiazepines is the area that has been the subject of the highest quality clinical trials. They have all shown that benzodiazepines are at least as effective as other therapeutic classes, with a rapid onset of action and very good tolerability, including after reinjection 5 to 10 minutes after failure [6].

It is therefore recommended that a protocol service be established to support the healthcare team [31]. Strict application of a first-line protocol would increase the chances of resolving a generalized MEE by a factor of 6.8 [3]. This is all the more important as the recommendations are unlikely to be followed spontaneously in everyday practice [18].

Injectable second-line treatment was only available with phenobarbital in our study. 12 patients received injectable phenobarbital; the most commonly used second-line treatment was sodium valproate in 42 patients (58.33%). The treatment regimen in the 2018 French, Formalised Expert Recommendations (RFE) proposed valproate, phenytoin and phenobarbital at equivalent levels, with a small reservation for levetiracetam, "given an evaluation considered to be less" [32]. According to the literature, approximately 20% of EMEs progress to EMER and 13% to larval EME [29]. In our study, MEE was refractory in 19.44% of patients. The average length of hospital stay in our study was 16 days, with extremes ranging from 02 to 43 days. Seizures resolved on treatment in 70.8% of patients. Mortality occurred in 21 patients (29.1%); the majority of patients died of sepsis (11 patients), which explains the predominance of infectious aetiologies in our study. The mortality rate in our study is lower than in the study by [9], who found a mortality rate of 43.33%. The high mortality in their study could be because a 3rd line treatment consisting of general anaesthesia was not considered in any of these patients.

5. Conclusion

MEE is a therapeutic and diagnostic emergency that requires vigorous management based on pre-established protocols. At Cocody University Hospital, MEE mainly affects patients over 60 years of age, with generalized forms dominating the clinical picture and infectious causes dominating the aetiology in both adults and children. The mortality rate of MEE remains high. The prognosis of patients depends on the quality and speed of treatment, which can be improved by the prevention and effective treatment of meningoencephalitis and vascular accidents, and by early and effective resuscitation.

Authors' Contributions

NO contributed to writing this manuscript; GKL and KKNA contributed to revising the manuscript. GKL and NAT contributed to the study design. AMH and CASPA performed all the data analyses.

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Conflicts of Interest

The authors declare that they have no competing interest.

References

[1] Alvarez V., Westover M. B., Drislane F. W., Dworetzky B., Curley D., Lee J. W. (2014). Evaluation of a clinical tool for early etiology identification in status epilepticus. Epilepsy; 55: 2059-68.

[2] Amare A., Zenebe G., Hammack J., Davey G. (2008). État de mal épileptique: présentation clinique, cause, résultat et facteurs prédictifs de décès chez 119 patients éthiopiens. Épilepsie. avril; 49(4): 600-7.

[3] Aranda A., Foucart G., Ducassé J. L., Grolleau S., McGonigal A., Valton L. (2010). Generalized convulsive status epilepticus management in adults: a cohort study with evaluation of professional practice. Epilepsia; 51: 2159-67.

[4] Assi B., Aka-Diarra E., Amon-Tano M., Tano C., Yapo-Ehounoud C. (2015). Etat de mal épileptique: expérience de la prise en charge dans le service de Neurologie de Cocody (Abidjan/Cote d'Ivoire). Rev Int Sc Med.; 17: 66-70.

[5] Baldy-Moulinier M., Crespel A. (1995). Physiopathologie des états de mal épileptiques, effets systémiques et neuronaux. Réan Urg; 4(4bis): 413-418.

[6] Brophy G. M., Bell R., Claassen J., Alldredge B., Bleck T. P., Glauser T. (2012). Neurocritical Care Society Status Epilepticus Guideline Writing Committee. Guidelines for the evaluation and management of status epilepticus. Neurocrit Care; 17: 3-23.

[7] Calmeil L. F. (1824). De épilepsie, étudiée sous le rapport de son siège et de son influence sur la production de l'alinéation mentale. Paris: Thèse de l'Université de Paris.

[8] Chapman M. G., Smith M., Hirsch NP. (2001). Status epilepticus. Anaesthesia; 56: 648-59.

[9] Cissé A. F., Tassiou N. R., Barry S. D., Sakadi F., Bah A. K., Nyas-sinde J. (2017). Evaluation de la prise en charge des états de mal convulsifs. Afr J Neurol Sci. 1 Janv; 36(2): 13-23.

[10] Coeytaux A., Jallon P., Galobardes B., Morabia A. (2000). Incidence of status epilepticus in French- speaking Switzerland (EPISTAR). Neurology; 55: 693-7.

[11] DeLorenzo R. J., Hauser W. A., Towne A. R., Boggs J. G., Pellock J. M., Penberthy L. (1996). A prospective, population-based epidemiologic study of status epilepticus in Richmond, Virginia. Neurology; 46: 1029-35.

[12] Dham B. S., Hunter K., Rincon F. (2014). The epidemiology of status epilepticus in the Unites States. Neurocrit Care. 1 juin; 20(3): 476-83.

[13] Doumbia-Ouattara M., Aka-Diarra E., Kouamé-Assouan A., Kouassi L., Diakité I., Sonan-Douayoua T. (2013). Etats de mal épileptiques (EME) dans le service de neurologie du centre hospitalier et Universitaire de Yopougon en Côte d'Ivoire. North African and Middle East Epilepsy Journal; 2(6): 17-19.

[14] Dupont S., Crespel A. (2009). Etats de mal épileptiques: épidémiologie, définitions et classifications. Rev Neurol (Paris). 1 avr; 165(4): 307-14.

[15] De Lorenzo R. J., Towne A. R., Pellock J. M., Ko D. (1992). Status epilepticus in children, adults, and the elderly. Epilepsia; 33: 15-25.

[16] Glauser T., Shinnar S., Gloss D., Alldredge B., Arya R., Bainbridge J. (2016). Evidence-Based Guideline: Treatment of Convulsive Status Epilepticus in Children and Adults: Report of the Guideline Committee of the American Epilepsy Society. Epilepsy Currents; 16(1): 48-61.

[17] Hesdorffer D., Logroscino G., Cascino G., Annegers J., Hauser W. (1998). Incidence of status epilepticus in Rochester, Minnesota, 1965-1984. Neurology; 50: 735-40.

[18] Hill C., Parikh A., Ellis C., Myers J., Litt B. (2017). Timing is everything: where status epilepticus treatment fails. Ann Neurol 2017; 82: 155-65.

[19] Knake S., Rosenow F., Vescovi M., Oertel W. H., Mueller H. H., Wirbatz A. (2001). Incidence of status epilepticus in Germany: a prospective, population based study. Epilepsia; 42: 714-8.

[20] Legriel S., Azoulay E., Resche-Rigon M., Lemiale V., Mourvillier B., Kouatchet A. (2010). Functional outcome after convulsive status epilepticus. Crit Care Med; 38: 2295-303.

[21] Leitinger M., Kalss G., Rohracher A., Pilz G., Novak H., Hofler J. (2015). Predicting outcome of status epilepticus. Epilepsy and behavior; 49: 126-130.

[22] Lompo D. L., Somé N. E., Ouédraogo A. M., Nanéma H., Diallo O., Napon C. (2020). Les états de mal épileptiques dans un hôpital de troisième niveau à Ouagadougou (Burkina Faso). African and Middle East Epilepsy Journal; 9(4): 1-9.

[23] Lowenstein D. H., Alldredge B. K. (1998). Status epilepticus N Engl J Med; 338: 970-6.

[24] Lowenstein D. H., Bleck T., Macdonald R. L. (1999). It is time to revise the definition of status epilepticus. Epilepsia; 40: 120-122.

[25] Mbodj I., Ndiaye M., Sene F., Sow S. P., Sow H. D., Diagana M. (2000). Prise en charge de l'état de mal épileptique dans les conditions de pays en développement. Neurophysiol Clin; 30: 165-9.

[26] Mendes A., Sampaio L. (2016). Brain magnetic resonance in status epilepticus: a focused review. Seizure; 38: 63-7.

[27] Munyoki G., Edwards T., White S., Kwasa T., Chengo E., Kokwaro G. (2010). Clinical and neurophysiologic features of active convulsive epilepsy in rural Kenya: a population based study. Epilepsia; 51(12): 2370-2376.

[28] Neligan A., Shorvon S. D. (2010). Frequency and prognosis of convulsive status epilepticus of different causes: a systematic review. Arch Neurol; 67(8): 931-40.

[29] Novy J., Logroscino G., Rossetti A. O. (2010). Refractory status epilepticus: a prospective observational study. Epilepsia; 51: 251-6.

[30] Ogunniyi A., Bademosi O., Ogunniyi J. O., Osuntokun B. O., Adeuja A. O. (1992). Aetiology of status epilepticus in Ibadan: a neurological study. West Afr J Med; 11(4): 263-267.

[31] Outin H. (2009). Etat de mal convulsif généralisé de l'adulte en situation d'urgence et en réanimation. Presse Médicale. 1 déc; 38(12): 1823-31.

[32] Outin H., Blanc T., Vinatier I. (2009). Prise en charge en situation d'urgence et en réanimation des états de mal épileptiques de l'adulte et de l'enfant (nouveau-ne´exclu). Recommandations formalisées d'experts sous l'égide de la Société de réanimation de langue française. Revue neurologique, 165: 297–305.

[33] Outin H., Gueye P., Alvarez V., Auvin S., Clair B., Convers P. (2018). Prise en charge des états de mal épileptiques. Recommandations formalisées d'experts. Med Intensive Reanim; 16: 48–61.

[34] Pro S., Vincenzini E., Rocco M., Spadetta G., Randi F., Pulitano P. (2012). An observational electro-clinical study of status epilepticus: From management to outcome. Seizure; 21: 98-103.

[35] Raveloson N. E., Rakotonirina H. M., Rakotoarivony S. T., Andrianjatovo J. J., Randriamiarana J. M., Sztark F. (2009). Caractéristiques de l'état de mal épileptique de l'adulte; Revue d'anesthésie-réanimation et de médecine d'urgence; 1(2): 7-10.

[36] Sadarangani M., Seaton C., Scott J. A. (2008). Incidence and outcome of convulsive status epilepticus in Kenyan children: a cohort study. Lancet Neurol; 7(2): 145-150.

[37] Shimogawa T., Morioka T., Sayama T., Haga S., Kanazawa Y., Murao K. (2017). The initial use of arterial spin labeling perfusion and diffusionweighted magnetic resonance images in the diagnosis of nonconvulsive partial status epileptics. Epilepsy Res; 129: 162-73.

[38] Singhi P. (2011). Infectious causes of seizures and epilepsy in the developing world. Developmental Medicine & child Neurology; 53(7): 600-609.

[39] Szurhaj W., Engrand N. (2018). États de mal épileptiques: avancées récentes. Presse Med. https://doi.org/ 10.1016/j.lpm.2018.01.018

[40] Tabarki B., Yacoub M., Selmi H., Oubich F., Barsaoui S., Essoussi A. S. (2001). Infantile status epilepticus in Tunisia. Clinical etiological and prognostic aspects. Seizures; 10(5): 365-9.

[41] Trinka E., Cock H., Hesdorffer D., Rossetti A. O., Scheffer I. E., Shinnar S. (2015). A definition and classification of status epilepticus- report of the ILAE Task Force on classification of status epilepticus. Epilepsia; 56: 1515-23.

[42] Vignatelli L., Tonon C., D'Alessandro R. (2003). Incidence of short-term prognosis of status epilepticus in adults in Bologna, Italy. Epilepsia; 44: 964-8.

[43] Wu Y. W., Shek D. W., Garcia P. A., Zhao S., Johnston S. C. (2002). Incidence and mortality of generalized convulsive status epilepticus in California. Neurology; 58: 1070-6.