


Infant and Child Seizures at the “Hôpital Spécialisé Mère-Enfant Blanche GOMES” of Brazzaville (Congo)

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Abstract

Goal: Describe the clinical, etiological, and therapeutic characteristics of convulsions in infants and children admitted to the Hôpital Spécialisé Mère-Enfant Blanche GOMES in Brazzaville (Congo). **Method:** A descriptive study with prospective collection from October 1, 2021, to October 31, 2022. Children from 1 month to 17 years old admitted for a convulsive seizure were collected during the study period. Children who died on arrival were excluded. The clinical, paraclinical, therapeutic, and evolutionary parameters were studied. The data was processed by Epi-info version 7.0 software. **Results:** Out of 1050 pediatric admissions (newborns excluded), 120 (11.43%) cases of convulsive seizures were recorded. The mean age was $4.26 \pm$ four years (range: one month and 16 years old), with a sex ratio of 0.93. Fever was present in 93 (77.5%) patients. In 71 (59.17%) children, the seizure was tonic-clonic and tonic in 36 (30%) cases. The episodes lasted less than 15 minutes in 80 (66.67%) children and more than 15 minutes in the remainder. Generalized seizures accounted for 82.5% of cases, and 59 (49.17%) children presented with impaired consciousness on admission. Seizures were linked to malaria in 58 patients (48.33%), purulent meningitis in 10 (8.33%) cases, febrile seizures (30.83%), and comitality in 10 cases (8.33%). Anticonvulsants were required in 79 (65.83%) patients. The first-line Diazepam was the most commonly used anticonvulsant (60%). Parenteral anti-malaria treatment was used in 63 patients

(52.5%), with artesunate in 95.23% of cases. Antibiotic therapy was administered to 62 (51.66%) patients. The treatment combines an anti-malaria and an antibiotic and was used in 15 patients (12.5%). Fourteen deaths (11.67%) were recorded in the series, including eight (57.14%) for cerebral malaria and four (28.57%) for severe meningitis. **Conclusion:** Convulsive seizures are frequent in children at the Hôpital Spécialisé Mère-Enfant Blanche GOMES. Infectious etiologies remain dominant in our context. Improving hospital care requires proper administration of anticonvulsants, early and appropriate etiological diagnosis and treatment.

Keywords

Convulsive Seizures, Infants-Children, Brazzaville

1. Introduction

Convulsive seizures are a frequent reason for consultation in pediatrics. Often associated with fever, then called febrile convulsions, convulsive seizures can be the initial manifestation of a serious cerebral pathology [1] [4]. Five percent (5%) of all children will have one or more seizures, of varying severity; always posing as a priority the problem of their cause and their immediate therapeutic management [1]. The immediate management, within 24 hours, of children admitted for seizures in the context of fever remains a matter of concern. Recognition of the different characteristics of seizures in infants and young children in the acute phase seems to be essential to establishing adequate care for these children [2]. A review of the Cochrane Database in 2008 recalled that the lack of data on the treatment of convulsive seizures in children prevented the provision of an indisputable therapeutic approach [3]. This latest position was reiterated by French experts in 2009 [4]. In 2018, the same Cochrane Database review compared the effectiveness of Lorazepam and Midazolam to that of Diazepam in convulsive illnesses in children, again without concluding a clear superiority of one or the other molecule. [5]. If the management of convulsive seizures is a therapeutic emergency, the etiological treatment is just as important.

Our study aimed to describe the clinical, etiological and therapeutic characteristics of convulsive seizures in infants and children (newborns excluded) at the Hôpital Spécialisé Mère-Enfant Blanche GOMES in Brazzaville

2. Methodology

This was a descriptive study with prospective data collection. The study population consists of all patients aged 1 month to 17 years, admitted to the pediatric department of the Hôpital Spécialisé Mère-Enfant Blanche GOMES in Brazzaville (Congo) between October 1, 2021 and October 31, 2022, for a seizure. Children who died on arrival were excluded, as were those who had not undergone any paraclinical assessment. In addition to socio-demographic parameters, the follow-

ing were taken into account: the circumstances of the birth, personal and family history of convulsive seizures, temperature, duration of the seizure, topography of the seizure, results of the thick drop in the search for plasmodium falciparum hematozoa, analysis of cerebrospinal fluid, electroencephalogram, and possibly computed tomography and magnetic resonance imaging of the brain, therapeutic modalities and immediate evolution. Data processing and analysis were carried out using Epi-info version 7.2.5.0 software.

3. Results

3.1. Frequency

During the period from October 1, 2021 to October 31, 2022, the Blanche Gomes Specialized Mother-Child Hospital in Brazzaville recorded 1,050 new pediatric admissions (newborns excluded), including 120 cases of convulsive seizures, *i.e.*, one hospital frequency of 11.43%.

3.2. Age

The average age in the series was 4.26 ± 4 years, and the median was 2.75 years, with extremes of one month and 16 years.

3.3. Sex

The sex ratio ($G = 58/F = 62$) was 0.93.

3.4. Origin

In this series, 71 patients (59.17%) came from home and 49 (40.83%) from a lower-level health establishment. Children aged one month to five years represented 72.5% of cases.

Table 1 presents the distribution of patients according to socio-demographic characteristics.

Table 1. Distribution of patients according to socio-demographic characteristics.

		Number(n)	Proportion (%)
Age (years)	[1 month, 1 year]	46	38.33
	[2, 5]	41	34.17
	[6, 16]	33	27.50
Sex	Male	58	48.33
	Female	62	51.67
Origin	Residence	71	59.17
	Health institution	49	40.83

3.5. Background

Among the 120 patients recruited, 29 (24.17%) had already presented at least one

previous convulsive attack, 3 (2.50%) had a history of cerebral malaria and 2 (2.67%) had a congenital cerebral malformation (cerebellar atrophy and vernix agensis). Caesarean section was the mode of delivery for 8 (6.67%) children. The other 112 (93.33%) were born vaginally. **Table 2** presents the distribution of patients according to history.

Table 2. Distribution of patients according to history.

		Number (N = 120)	Proportion (%)
Cry delayed at birth	No	108	90.00
	Yes	12	10.00
Neonatal resuscitation	No	110	91.67
	Yes	10	8.33
Birth weight	Less than 2500 g	5	4.17
	Greater than 2500 g	115	95.83
Hospitalization in the neonatal period	No	110	91.67
	Yes	10	8.33
Previous seizure	No	91	75.83
	Yes	29	24.17
Neurological diseases	None	112	93.33
	Encephalitis	2	1.67
	Meningitis	1	0.83
	Cerebral malaria	3	2.50
	Brain malformations	2	1.67
Convulsion in siblings	No	117	97.50
	Yes	3	2.50

3.6. Clinical Aspects

Fever was present in 93 (77.5%) patients. The seizure was tonic-clonic in 71 (59.17%) patients and tonic in 36 (30%) patients. Seizures lasted less than 15 minutes in 80 (66.67%) patients, while 40 (33.33%) had an attack lasting more than 15 minutes. Generalized seizures represented 82.5% (99 patients), and 59 (49.17%) patients had a disturbance of consciousness on admission. **Table 3** presents the distribution of patients according to clinical signs on admission.

3.7. Paraclinical Aspects

The blood smear test for plasmodium falciparum hematozoa was positive in 53 (44.17%) patients. Cerebrospinal fluid analysis was performed in 36 (30.00%) patients. It allowed the conclusion of meningitis in 10 (8.33%) patients. **Table 4** shows the distribution of patients following paraclinical examinations.

Table 3. Distribution of patients according to clinical signs on admission.

		Number (N = 120)	Proportion (%)
Fever	No	27	22.50
	Yes	93	77.50
Type of seizures	Tonic	36	30.00
	Clonic	9	7.50
	Tonico-clonic	71	59.17
	Absence	1	0.83
	Atonic	3	2.50
Topography of the seizures	Localized	18	15.00
	Generalized	99	82.50
	Hemicorporeal	3	2.50
Altered consciousness	No	61	50.83
	Yes	59	49.17
Sphincter release	No	91	75.83
	Yes	29	24.17
Neurological deficit	No	119	99.17
	Yes	1	0.83

Table 4. Distribution of patients according to paraclinical examinations.

		Number (N = 120)	Proportion (%)
Blood smear	Positive	53	44.17
	Negative	37	30.83
	Not carried out	30	25.00
CSF analysis	Sterile	26	21.67
	Germs isolated	2	1.67
	Cytology in favor of meningitis	8	6.67
	Not carried out	84	70.00
EEG	Normal	2	1.67
	Comituality	7	5.83
	Not carried out	111	92.50
Brain CT	No	119	99.17
	Yes	1	0.83
Brain MRI	No	119	99.17
	Yes	1	0.83

3.8. Diagnostic Aspects

The diagnosis of cerebral malaria was retained in 53 patients (44.17%), followed by febrile convulsions, in 37 patients (30.83%). Febrile convulsions were related to nasopharyngitis in 19 patients (15.83%), acute bronchopneumopathy in 10 patients (8.33%), tonsillitis in four patients (3.33%), digestive infection in three patients (2.50%) and urinary infection in one patient (0.83%). Comitiality was confirmed in seven patients (5.83%) and suspected in three others (2.5%). **Table 5** reports the distribution of patients according to etiologies.

Table 5. Distribution of cases of convulsion according to etiologies.

	Number (N = 120)	Proportion (%)
Cerebral malaria	58	48.33
Febrile seizure	37	30.83
Meningitis	10	8.33
Comitiality	7	5.83
Suspicion of comitiality	3	2.50
Digestive infection complicated by severe sepsis	2	1.67
Seizure and dehydration stage 3	1	0.83
Extra dural hematoma	1	0.83
Tetanus	1	0.83

3.9. Therapeutic Aspects

Anticonvulsants were necessary for 79 (65.83%) patients. Diazepam alone as first-line treatment was used in 60% of cases. Phenobarbital was associated with 36 patients (30%). Parenteral antimalarial treatment was used in 63 (52.5%) with artesunate in 95.23% of cases. Antibiotic therapy was administered to 62 (51.67%) patients. Treatment combining an anti-malarial agent and an antibiotic was used in 19 patients (15.83%). **Table 6** presents the distribution of patients according to therapeutic modalities.

Table 6. Distribution of patients according to therapeutic aspects.

	Number (N = 120)	Proportion (%)
Not used	41	34.17
Diazepam	36	30,00
Anticonvulsivants Phenobarbital	4	3.33
Diazepam + Phenobarbital	36	30.00
Midazolam + Diazepam + Phenobarbital	3	2.50
Intubation No	117	97.50

Continued

	Yes	3	2.50
Antimalarial (n = 63)	Artesunate	60	95.23
	Quinine	3	4.77
Antibiotics (n = 43)	Beta lactam alone	20	46.51
	Quinolone alone	3	6.97
	Beta lactam + Aminocide	7	16.29
	B lactam + aminoglycoside + quinolone	9	20.93
	Others	4	9.30
Mixed treatment:	Anti-malarial and antibiotic	19	15.83

3.10. Evolutionary Aspects

Convulsive status epilepticus was observed in 30 (25%) patients. Fourteen deaths (11.67%) were reported in the series, including eight (57.14%) for cerebral malaria and four (28.57%) for serious meningitis. The average hospitalization time was 4.3 days, with extremes of one to 20 days. The different evolutionary modalities are reported in **Table 7**.

Table 7. Distribution of patients according to evolving modalities.

	Number (N = 120)	Proportion (%)
Convulsive status epilepticus	30	25.00
Motor deficit at exit	1	0.83
Department exit type		
Healing	100	83.33
Healing with Aftereffects	5	4.17
Referred	1	0.83
Deceased	14	11.67

4. Discussion

The hospital frequency in this series of 11.43% is fairly consistent with data from both sub-Saharan and Western literature. Diawara *et al.* in Mali found a hospital frequency of 16.58% [6]. In Japan, Nishiyama Masahiro *et al.* found a frequency of 12.1% [7]. In the USA and Europe, the prevalence of seizures varies from 2% to 5% [8]-[11]. The frequency of seizures varies depending on geographic areas, but several studies have also cited genetic and environmental factors [9] [10] [12]-[20]. The sex ratio (G = 58/F = 62) was 0.93, almost balanced.

The average age of our series is 4.62 years. The age group from 1 month to 5 years was the most represented (72.5%). Sahin *et al.* [21] reported a mean age of 5.4 years and a sex ratio of 0.8. The series by Mwipopo *et al.* [22] reported 91% of

children aged 1 month to 5 years. Convulsive seizures remain common in pediatrics, with a clear predominance in children under 6 years old.

A history of convulsive seizure was found in 24.17% of patients. Kaputu Kalala *et al.* in Kinshasa, in a group of children with generalized convulsive seizures, found 32% of previous convulsions, and the existence of a previous convulsive seizure would be statistically correlated with an unfavorable outcome [2].

Fever was found in 77.5% of patients on admission. In the series by Mwipopo *et al.* [22], fever was present in 91% of children. The strong tendency to self-medicate with paracetamol before consulting a pediatrician in our context of practice and the methodological differences would explain the difference in these results. Convulsions in the context of fever, often severe and recurrent, are common in Sub-Saharan Africa. Their frequency varies between 3 and 38% in different studies [23] [24].

The seizure was tonic-clonic in 71 (59.17%) patients and generalized in 82.5% of cases. Most studies report the predominance of tonic-clonic and generalized characteristics of convulsive seizures in infants and young children [22] [25] [26].

Cerebral malaria was the most common etiology (48.33%). Infectious causes in general, malaria in particular, remain the primary etiology of convulsive seizures in children in Sub-Saharan Africa [25] [25]-[32]. Febrile seizures came in second place (30.83%) and were mainly linked to nasopharyngeal or upper respiratory infection. Febrile seizure is a major challenge in pediatric practice due to its high incidence in young children and its tendency to recur [33]. The cause of febrile seizures is multifactorial. Febrile seizures are generally thought to result from a vulnerability of the developing central nervous system to the effects of fever, associated with underlying genetic predisposition and environmental factors [34]. Febrile seizure is an age-dependent response of the immature brain to fever. During the maturation process, there is enhanced neuronal excitability that predisposes the child to febrile seizures [35]. As such, febrile seizures mainly occur in children before the age of three when the epileptogenic threshold is low [35].

The use of anticonvulsants was necessary in 79% of cases. Diazepam intrarectally was the first-line anticonvulsant (60% of cases). It was associated with Phenobarbital with an electric syringe pump in 30% of cases. In the series by Sahin *et al.* [21], intravenous Midazolam was the first-line treatment in 48.9% of cases, and their study took place in an intensive care unit. Midazolam is a water-soluble benzodiazepine that can be administered in several routes, including intravenous, intramuscular, and oral to stop seizures. A study carried out in Kenya published in 2008 showed that administration of midazolam at the currently recommended dose (0.3 mg/kg) made it possible to quickly reach median maximum plasma concentrations of Midazolam between 64 and 616 ng/ml, with few clinically significant cardio-respiratory effects [36]. In this study, the authors report that a single dose of Midazolam terminated (within 10 minutes) seizures in all children (100%), 75% and 63% after IV, IM and buccal administration respectively. The Cochrane Database review in 2018 reported that the intravenous effectiveness of

Midazolam was correlated with the time to obtain the venous line [5]. A formulation of oral Midazolam (BUCCOLAM®) has obtained European Marketing Authorization. This molecule has proven equivalent or greater effectiveness than rectal diazepam without there being a greater risk [37]. This formulation will surely change our practices. In our series, midazolam was only used in three patients, and no patient received phenytoin, despite the fact that convulsive status epilepticus was observed in 25% of cases. The rarity of Phenytoin and the lack of possibility of intubating children in our context should push us towards the frequent use of Midazolam both in the periphery and in our reference health establishments. As for the etiological treatment, IV artesunate was the most used molecule in our series (95.33%), followed by antibiotic therapy based on Betalactamine (Ceftriaxone in particular). In 15% of cases, patients received an anti-malarial agent and a parenteral antibiotic concomitantly. This reflects the predominance of infectious causes in Sub-Saharan Africa and the insufficiency of the technical platform in our context, which does not allow certain examinations with etiological purposes to be carried out urgently.

5. Limits of the Study

Genetic and metabolic factors were not reported in this study due to insufficient technical resources and low purchasing power. The low socioeconomic level explains this low purchasing power. The implementation of universal health coverage could overcome this problem.

6. Conclusion

Convulsive seizures remain frequent in current pediatric practice in Congo. They can take various clinical forms, even if generalized seizures remain the most common. Most children presenting with a convulsive seizure had no particular pathological history. The etiologies are still dominated in our context by malaria, but febrile convulsions make up a large part of it. Symptomatic treatment is subject to discussion. However, benzodiazepines remain the first choice with the type and route of administration varying from one country to another. The management of convulsive seizures could be improved in our practice by the adequate use of anticonvulsants pre- and intra-hospital. Etiological treatment depends on the promptness and precision of paraclinical examinations.

Conflicts of Interest

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

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