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Epidemiological and clinical features of epileptic patients in Goma, Democratic Republic of the Congo

Abstract

Introduction: Epilepsy is one of the most common neurological conditions but the majority of epileptic patients in sub-Saharan African countries do not receive appropriate treatment. In the Democratic Republic of the Congo (DRC), very few epidemiological studies have been conducted on epilepsy. The objective of this study was to describe socio-demographic characteristics, the type of epileptic seizures, and etiological factors of these seizures in a hospital cohort of epileptic patients followed at the Neuropsychiatric Hospital Center in Goma (in the DRC).

Materials and methods: This was a cross-sectional study of 917 epileptic patients received in neurology consultation at the Neuropsychiatric Hospital Center in Goma (in the DRC) from January 1st, 2017 to December 31st, 2021.

Results: The median age of patients was 16 years, the median age of the patients at onset of seizures was 13 years and the median time between onset of seizures and consultation was 8.0 months; 14.2% of had a family history of epilepsy. Generalized tonic-clonic seizures were the most frequent (76.7%), followed by motor focal impaired awareness seizures (5.2%) and non-motor focal aware seizures (3.6%). The etiologic factor was found in 444 (48.4%) patients and was dominated by chronic alcoholism (20.9%), neurocysticercosis (17.6%), meningitis (14.6%), malnutrition (11.3%), cerebral malaria (8.3%), and head injury (7.7%).

Conclusion: This study provides an epidemiological overview of epilepsy in Goma city. The etiological factors and types of seizures will dictate the best possible treatment options.

Keywords: epilepsy, seizures, etiology, goma

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Introduction

Epilepsy is a brain disease defined by at least two unprovoked seizures (or reflexes) spaced more than 24 hours apart, or an unprovoked seizure (or reflex) and a probability of onset of subsequent seizures in the next 10 years similar to the general risk of recurrence (at least 60%) observed after two unprovoked seizures, or a diagnosis of an epileptic syndrome.[1] According to the World Health Organization (WHO), around 50 million people worldwide suffer from it, making it one of the most common neurological conditions. About 80% of people with epilepsy (PWE) live in low- and middle-income countries where the rate of new cases is up to twice as high as in developed countries with annual incidence between 30 and 50 per 100,000 inhabitants.[2] Due to delayed diagnosis and frequently ineffective therapy, epilepsy continues to be a significant disease throughout Africa. In Sub-Saharan Africa (SSA), the majority of epileptic patients do not receive adequate care. Epilepsy prevalence varies greatly from country to country and from region to region. However, these differences in epilepsy prevalence could be explained by the study setting (urban or rural), the variety of etiologies, the existence of genetic factors predisposing to epilepsy in certain populations, and the type of surveys conducted (hospital or door-to-door survey in the general population).[3–6] In a recent meta-analysis based on 38 published studies, Owolabi et al.[7] estimated the prevalence of SSA epilepsy to be 9 per 1,000 people (95% confidence interval (95% CI): 8.0-9.9 per 1,000 persons) for active epilepsy and 16 per 1,000 persons (95% CI: 12.3-19.7 per 1,000 persons) for lifetime epilepsy, but this estimate was a median figure generated from these studies. These authors found that prevalence was highest in Central Africa at 30.2 per 1,000 people (95% CI: 6.2 to 66.7 per 1,000 persons) and that the prevalence of active epilepsy in rural areas was twice as high as in urban areas.[7]. More than 800,000 people are thought to have epilepsy in the Democratic Republic of the Congo (DRC), where very few epidemiological studies on this condition have been conducted.[8]

Etiologies of epilepsy are diverse; they can be infectious, vascular, neoplastic, metabolic, genetic, or degenerative. Head injuries can also cause epilepsy immediately or several years later. Stroke and neurodegenerative diseases may be etiological factors of epilepsy in the elderly.[9] The present study aims to describe socio-demographic characteristics, the type of epileptic seizures, and etiological factors of these seizures in a hospital cohort of epileptic patients followed at the Neuropsychiatric Hospital Center in Goma (in the DRC).

Materials and methods

Study framework and design

This cross-sectional descriptive study was conducted at the Neuropsychiatric Hospital Center in Goma, North-Kivu province, the eastern DRC (city with about 2 million inhabitants). This hospital is the only hospital in North-Kivu province to provide specialized services in neuropsychiatry and has a bed capacity of 100 patients. Epilepsy prevalence in the community is unknown.

Study population and variables

The present study includes all adults and children admitted for epilepsy. We reviewed the admissions registry from January 1st, 2017 to December 31st, 2021 for patients diagnosed with epilepsy and/or a history of use of anti-epileptic drugs. Following data were collected using a form with a variety of variables and was obtained

after manually reviewing available medical records: age, gender, age of patient at onset of seizures, length of time between first seizure and first medical visit, family history of epilepsy, etiologic factor, seizure type, and anti-epileptic treatment administered. Patients excluded from the study were those for whom there was insufficient data regarding the diagnosis or incorrect diagnosis of epilepsy. Data were extracted into a standard form and prepared for statistical analysis.

Case definitions

Different epileptic seizures were grouped in order to build cohesive entities based on the most recent official classification of the various varieties of epileptic seizures published by the Classification and Terminology Commission of the International League Against Epilepsy (ILAE) 2017.[1]

Clinical diagnosis of epilepsy was based on the operational definition of epilepsy by Fisher et al.[1] defining epilepsy by at least two unprovoked seizures (or reflexes) spaced more than 24 hours apart, or an unprovoked seizure (or reflex) and a probability of onset of subsequent seizures over the next 10 years similar to the general risk of recurrence (at least 60%) observed after two unprovoked seizures, or a diagnosis of an epileptic syndrome. The diagnosis of neurocysticercosis (NCC) was chosen according to the diagnostic criteria proposed by Del Brutto et al.[10] For the semiology of seizures occurring at home, seizures were defined on the basis of a detailed analysis of the interview conducted by the first author (FMP). Family members were asked to film patients with a smartphone and bring the videos to the hospital. Patients and/or family members also participated in screenings of videos describing patient-related seizures.[3] These videos are available at https://www.chusj.org/fr/soins-services/E/Epilepsie/Nos-videos

Standard electroencephalogram (EEG) (n = 571) and brain imaging (n = 342) were performed as needed and on patients' own funds. There were no ictal or interictal EEGs or video-EEGs. Patients with acute symptomatic seizures, or paroxysmal non-epileptic events were excluded.

Statistical analyzes

Data entry and processing was performed using STATA® version 16 software. Descriptive analysis was performed using proportions for qualitative variables (frequencies and percentages), and medians and interquartile range (IQR) for quantitative variables not normally distributed after Shapiro test verification. The Mann-Whitney *U* test or the ANOVA test (when recommended) were used to compare medians between different categories of variables and a p-value < 0.05 was considered significant.

Results

Patients ranged in age from 2 months to 88 years with a median age of 16 years (IQR: 7 - 26); the mean age was 19.4±16.1 years. The age group most represented was 10-19 years (Figure 1). Male sex was 59.4% giving a sex ratio H/F of 1.47. Generalized seizures were the most predominant seizures (81.8%), followed by focal seizures (16.0%), and undetermined seizures (2.2%) (Figure 2). When patients were grouped by etiology, 51.6% of the patients were unknown, 19.6% were infectious, 19.4% were metabolic, and 9.4% were structural (Table 1).

The median age of patients with seizures was 13 years (IQR: 5 - 23) and a mean of 16.9±15.5 years. The median age at onset of seizures in male patients (14 years) was not statistically higher than in female patients (13 years; p=0.7089). The median age at onset of seizures in patients with a family history of epilepsy (13 years) and those without (13 years) were not statistically different (p=0.9168). Median ages at onset of seizures were 13 years, 14 years and 11.5 years respectively in patients with generalized seizures, those with focal seizures, and those with indeterminate seizures; no statistically significant differences were noted (p=0.1763). The ANOVA test shows a statistically significant difference in the comparison of different median ages when epileptic seizures occurred between different types of etiologies (p=0.0065) (Table 1).

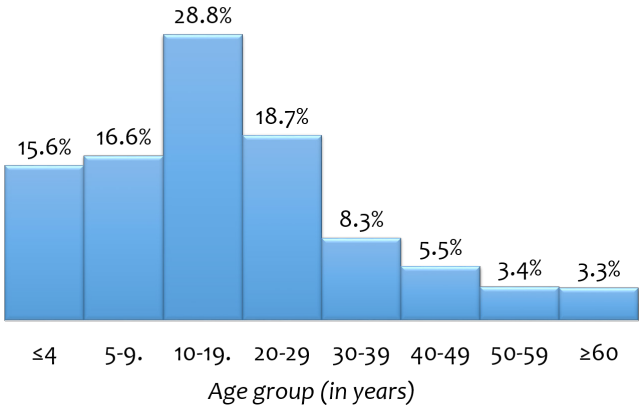

Figure 1 Distribution of patients by age at the medical visit

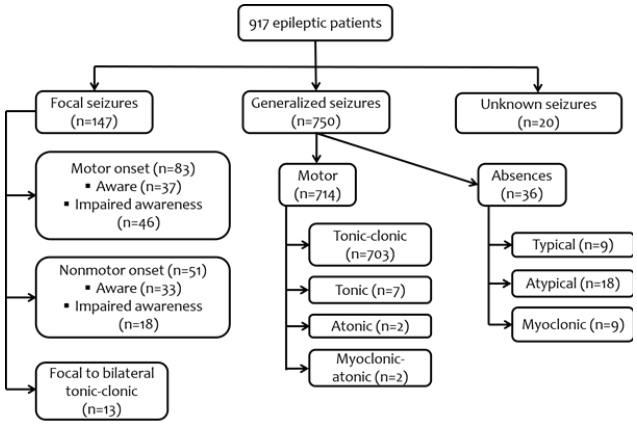

Figure 2 Extended operational classification of seizure types in our cohort (n=917)

Table 1 Characteristics of 917 patients with median age at onset of seizures

Variable	N=917 *n (%)*	Median age (interquartile range)	p
Gender			0.7089
Male	545 (59.4)	14.0 (4 – 25)	
Female	372 (40.6)	13.0 (6 – 20)	
Family history of epilepsy			0.9168
Present	130 (14.2)	13.0 (5 – 25)	
Absent	787 (85.8)	13.0 (5 – 23)	
Seizure type			0.1763
Generalized onset	750 (81.8)	13.0 (5 – 23)	
Focal onset	147 (16.0)	14.0 (5 – 25)	
Unknown onset	20 (2.2)	11.5 (1 – 18)	
Etiologic factor			0.0065
Unknown	473 (51.6)	13.0 (6 – 20)	
Infectious	180 (19.6)	12.0 (4 – 29)	
Metabolic	178 (19.4)	18.0 (7 – 29)	
Structural	86 (9.4)	7.0 (2 – 20)	

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Table 2 presents the distribution of patients by etiologic factor and type of seizure and shows that, regardless of etiologic factor, generalized seizures predominate. Generalized tonic-clonic seizures were the most frequent (76.7%), followed by motor focal impaired awareness seizures (5.2%) and non-motor focal aware seizures (3.6%) (Figure 2).

Table 2 Distribution of patients by etiologic factor and type of seizure

Etiologic factor	Seizure type			Total (N=917)
	Generalized onset (n=750)	Focal onset (n=147)	Unknown onset (n=20)	
Unknown	377 (79.7%)	84 (17.8%)	12 (2.5%)	473
Infectious	153 (85.0%)	24 (13.3%)	3 (1.7%)	180
Metabolic	154 (86.5%)	20 (11.2%)	4 (2.3%)	178
Structural	66 (76.7%)	19 (22.1%)	1 (1.2%)	86

The median time between onset of seizures and medical visit was 8 months (IQR: 29 days - 36 months) and the mean of 27 months (range: 7 days and 504 months). The etiologic factor was only found in 444 (48.4%) patients. The main etiologies were chronic alcoholism (20.9%), confirmed or probable neurocysticercosis (NCC) (17.6%), meningitis (14.6%), malnutrition (11.3%), cerebral malaria (8.3%), head injury (7.7%), hypocalcemia (5.0%), perinatal anoxo-ischemic encephalopathy (4.5%), and brain malformations (4.5%) (Table 3).

Table 3 Distribution of 917 patients by etiologic factor

Etiologic factor	Number(n=917)	Percentage
Unknown	473	51.6
Chronic alcoholism	93	10.1
Neurocysticercosis	78	8.5
Meningitis	65	7.1
Malnutrition	50	5.5
Cerebral malaria	37	4.0
Head injury	34	3.7
Hypocalcemia	22	2.4
Perinatal anoxo-ischemic encephalopathy	20	2.2
Brain malformations	20	2.2
Stroke	6	0.7
Brain tumor	6	0.7
Hydro-electrolytic disorders	6	0.7
Endocrine disorders	4	0.4
Glycemic disorders	3	0.3

With regard to the EEG, 346 (37.7%) patients had not performed an EEG and 571 (62.3%) had performed an EEG. Of these, 82.0% (468/571) of the patients had a pattern compatible with epilepsy and 18.0% (103/571) of the patients with a normal pattern.

Discussion

Epilepsy is a neurological condition that can be experienced at any age.[2] This study reports a mean age of 19.4 ± 16.1 years (range: 2 months and 88 years) and the age group most represented was 10-19 years. This mean age is comparable to 20.0 ± 15.1 years reported by Mukuku et al.[3] in Lubumbashi (in DRC). In a Pakistani study, Jawaid et al.[11] found a mean age of 21.4 ±3.2 years. In studies in SSA and other developing countries, the mean age of epileptic patients ranges from 15 to 20 years,[12,13] unlike in developed countries where epilepsy has a bimodal distribution (i.e. one peak after a few years of birth and the other peak occurs after 65 years).[14]

This study reported a high male representation (sex ratio H/F of 1.47). This male predominance has been reported by several authors.[3,6,15,16] and could be explained by the social impact of epilepsy, as young girls of marriageable age tend to hide their epilepsy.[3,17] These gender differences could also be explained by different etiologies and gender-related risk factors.[18]

In our series, generalized tonic-clonic seizures were the most frequent (76.7%). Studies in SSA have shown a strong representation of generalized tonic-clonic seizures[3,14] and elsewhere.[11] There is a good identification of generalized tonico-clonic seizures by the casework. Indeed, these seizures are the most dramatic. Absence seizures, myoclonic seizures, and other generalized seizures were also reported. On the other hand, the prevalence of focal to bilateral tonic-clonic seizures, whose focal onset is challenging to identify based solely on the clinical presentation, is underreported.[3]

Epilepsy is a very complex pathological entity and its etiology is not often found in SSA, where clinicians generally have only the simplest laboratory investigations, the etiological diagnosis is based mainly on the interrogation and clinic features.[3] In our series, the etiologic factor was found in only 444 (48.4%) patients. Main etiologies identified were chronic alcoholism, NCC, meningitis, malnutrition, cerebral malaria, and head injury.

Chronic alcoholism is the leading etiological factor in epilepsy in our series (10.1% of the epileptic patients). This proportion is comparable to 9% reported by Bora et al.[8] in Lubumbashi (DRC) and 12% found by Onwuekwe et al.[19] in southeastern Nigeria. In a Chinese study, Zhao et al.[16] found that alcoholism was the etiologic factor for epilepsy in 13.9%. Samokhvalov et al.[20] in a meta-analysis, reported that consuming alcohol was significantly related with a higher chance of developing unprovoked seizures and epilepsy, and that these risks increased strongly with alcohol consumption. The long delay between the onset of intoxication (on mean age 10 years) and the onset of seizures in alcoholics[21] calls for the gradual onset of an epileptogenic state. According to some authors, multiple factors such as hypoxia, brain injuries and long-term changes in neuronal excitability are likely to be responsible for this relationship between epilepsy and chronic alcohol consumption.[15,20] Some authors have correlated this alcoholic epilepsy with cerebral atrophy, which was observed in 75% of alcoholic epileptic patients.[23] However, other authors did not find any differences in the level of cerebral atrophy in alcoholic patients with or without seizures.[24,25] Other authors have referred to the role of head injuries in the highest frequency of seizures.[26]

In this study, NCC is the second risk factor identified in our patients. In most parts of the world, NCC is endemic; in these endemic regions, it accounts for about 30% of epilepsy cases.[27] In SSA, NCC appears to be the most prevalent central nervous system parasitosis,[3,6,13,28] and cysticercosis prevalence in epileptic patients ranges from 5% to 50%.[13,17] In the DRC, due to inadequate or nonexistent diagnostic tools and a lack of epidemiological surveys, the prevalence of NCC is poorly understood; however, clinical cases and case series have been published.[29–32]

Meningitis is reported as an etiologic factor in 14.6% of our patients in whom the etiologic factor was found. Meningitis and bacterial

encephalitis frequently lead to seizures, including meningococcal meningitis. In the study by Mukuku et al.,[3] meningitis was found in 25% of the patients with known etiology. Mbonda et al.[33] had found 18% of epilepsies in 144 children hospitalized for bacterial meningitis in Yaoundé (Cameroon).

Of the 444 patients with known etiology, 11.3% were found to be malnourished. The prevalence of undernutrition among African epileptic patients not hospitalized is high: 22.1% in a Beninese study of all ages (compared with 9.2% for the control population, $p<0.001$),[34] and 25.4% in a large population of epileptic patients under 15 years in various African countries.[35] Links between malnutrition and epilepsy are complex. Undernutrition appears to be able, through many mechanisms, most of which remain unexplored, to promote the onset of seizures and possibly epilepsy diseases.[36]

Cerebral malaria is found in 8.3% of patients with known etiology in our series. Cerebral malaria has been identified as a potential cause of epilepsy in tropical regions. Several mechanisms have been implicated in the epileptogenesis process after the acute episode of cerebral malaria. These are: (1) the occurrence of structural damage to the brain, mainly in the form of vascular-ischemic lesions developing due to the sequestration of parasitized erythrocytes; (2) Durck's malarial granuloma, consisting essentially of reactive astrocytes; (3) generalized hemorrhages and deep ischemic lesions observed in postmortem studies of cerebral malaria.[37] A few epidemiological studies have previously been conducted confirming this link between cerebral malaria and epilepsy.[38–40]

Regarding head injury, it was recorded in 7.7% of our patients—or 3.7 percent of all our patients—in whom the etiologic cause had been identified. According to a study conducted in Nigeria by Ogunniyi et al.,[41] there is a 13-fold increased chance of developing epilepsy following a head injury. According to Sander and Shorvon[42] a mean of 8% of epileptic patients have a history of a head injury; in developed countries, this rate is thought to be closer to 5%. Head injuries were largely recorded in adult patients in this study; this shows the need to educate the public to put in place safety measures to reduce the frequency of head injuries.

Conclusion

This study provides an epidemiological overview of epilepsy in the city of Goma. Etiological factors and seizure types dictate the best possible treatment options. We found that the most common causes of seizures in our population were chronic alcoholism, central nervous system infections and head injury. The most common seizure type was generalized tonic-clonic seizure. This study also highlights the need to raise awareness of harmful effects of chronic alcoholism. For optimal patient management, early detection and treatment of parasite infestations are crucial. Further epidemiological studies of epilepsy in other provinces of the DRC are needed because etiological factors differ from population to population and therefore management strategies differ.

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None.

Conflicts of interest

The author declares that there are no conflicts of interest.

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