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Original Research Article

Prevalence and Causes of Seizures in Patients with Alcohol Use Disorder

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Abstract: ***Introduction***: Epilepsy is a chronic disease with a very high prevalence in developing countries. While the links between alcohol and epileptic seizures are now well established, the clinical context of alcohol-related seizures remains debated. Several studies carried out in emergency departments and neurology wards have shown that alcohol use disorder (AUD) is associated with 40% to 50% of seizures observed in adult patients admitted for epileptic seizures, making AUD the main risk factor for seizures in adults. There are few epidemiological studies on the prevalence of epilepsy in patients with alcohol use disorder (PWAUD) and alcoholism in patients living with epilepsy (PWE). ***Objectives***: We aimed to investigate the prevalence and aetiologies of epileptic seizures in chronic alcohol abusers in three Yaoundé referral hospitals over the last 10 years (January 2006 to December 2015). ***Methodology***: A retrospective descriptive study was conducted on Cameroonian chronic alcoholics who presented at least one epileptic seizure and were hospitalised between January 2006 and December 2015 in the internal medicine units of three referral hospitals in Yaoundé. The sampling method was consecutive and exhaustive. ***Results***: We obtained 250 chronic alcoholics aged between 25 and 89 years, with an average age of 54.26 ± 30.27 years. Eighty per cent consumed between 60 and 100g of alcohol per day. The prevalence of epileptic seizures in chronic alcoholics was 16.4%. The majority of seizures were generalised (61%), and mainly tonic-clonic (48.8%). The most common causes were infectious, with cerebral toxoplasmosis being the most frequent infectious aetiology (22%). Other aetiologies included toxic causes (alcohol withdrawal 17.1% and acute intoxication 7.3%); vascular causes (14.6%); traumatic causes (9.8%) and undetermined causes (9.8%). ***Conclusion***: The prevalence of epileptic seizures in chronic alcohol abusers in Cameroon is very high. These seizures have various aetiologies and are mainly caused by CNS infections, of which cerebral toxoplasmosis is the most frequent cause. Alcohol withdrawal is the most common toxic cause, and alcohol is the only poisonous agent found.

Keywords: Prevalence, Epileptic Seizures, Chronic Alcohol Abuse.

INTRODUCTION

Epilepsy is a chronic disease that is defined by the spontaneous recurrence of epileptic seizures. Epidemiologically, it is one of the most prevalent neurological disorders globally, affecting approximately 50 million individuals [1]. In Cameroon, epilepsy represents a significant public health concern, with an estimated prevalence of 5.8% in the Mbam locality and 9.86% in outpatient adult neurology clinics in the capital, Yaoundé [5]. Some authors posit that alcoholism is a cause of epileptic seizures or a mere precipitating factor [6, 7]. Similarly, it is postulated that the consumption of 50 to 300 grams of alcohol daily is associated with an increased risk of seizures, with a relative risk of 10 in comparison to abstinence [8]. In a hospital setting, some studies have estimated that 10-20% of admissions are attributable to alcohol-related issues. The aetiology of epileptic seizures is multifaceted, with potential causes including traumatic brain injury, infection of the nervous system, metabolic disorders, intoxication or drug withdrawal. However, the majority of cases are attributed to alcohol withdrawal [8]. In a retrospective study published in 2015 by Nwani *et al*., in Nigeria, infectious causes were the most common in 36.2% of

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patients (n=34) out of 94 cases admitted for acute seizures. Toxic causes accounted for only 7.4% (n=7), while alcohol withdrawal was found in only 3.2% of cases (n=34) [11]. In a retrospective study carried out in the neurology units of Yaoundé Central Hospital, the most common risk factors were chronic alcoholism (26.35%), HIV infection (22.48%) and familial epilepsy (14%). The most common aetiologies were infectious (40.30%), vascular (10.07%) and traumatic (9.30%). The most prevalent condition was cerebral toxoplasmosis (18%), which is associated with HIV infection. In light of the findings above, our study was designed to ascertain the prevalence and aetiologies of epileptic seizures in chronic alcohol abusers across three Yaoundé referral hospitals over the past decade, from January 2006 to December 2015.

METHODOLOGY

Type and Site of Study

A descriptive and retrospective study was conducted in the internal medicine wards of three hospitals in the city of Yaoundé: the Central Hospital (YCH), the General Hospital (YGH), and the University Teaching Hospital (YUTH). The hospitals were selected based on their status as exemplars within the wider Cameroonian healthcare system. Furthermore, they offer several advantages in terms of geographical location, the possibility of complementarity, and the autonomy of services.

The study spanned a 10-year period, from January 2006 to December 2015, with data collection occurring for eight months, from October 2015 to May 2016.

Population and Ethical Clearance

Our study population consisted of patients with chronic alcohol dependence who had been hospitalized between January 2006 and December 2015. And whose medical records had the required data. Beforehand, we obtained ethical clearance from the Institutional Ethics and Research Committee (IERC) of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I, as well as authorisation for data collection from the directors of the hospitals concerned.

Procedure

Following the acquisition of ethical clearance, research authorisations were sought and obtained from the hospitals. Subsequently, the medical records of patients who had been hospitalised at the YCH, YGH and YUTH during the study period were retrieved from the archives of the neurology department. Files that met the specified inclusion criteria were retained and subjected to analysis.

Data Collection

Data were collected using a questionnaire. We retrieved and analysed the following variables: Socio-demographic variables: nationality, age, gender, profession, etc. Clinical variables: reason for consultation, history of chronic alcoholism (determined based on objective declared alcohol consumption (DAC)**)**, daily volume of alcohol consumed, type of epileptic seizures, and aetiological diagnosis.

Calculating the sample size

To calculate the sample size, we used the Cochrane formula***:***

$$N = \{\varepsilon^2 \times p \times (1 - p)\} / l^2$$

N= sample size,

ε= constant whose value depends on the accepted statistical risk. For a risk of 5%, as was the case in our study, **ε** is 1.96.

l=precision *level* (here 10%)

P= estimated prevalence of epileptic seizures in chronic alcoholics, taking into account the fact that:

- In Cameroon, epilepsy is a public health problem, with an estimated prevalence of 5.8% in the Mbam region [1, 3].
- Overall, it had been estimated that epileptic seizures were 3 times more frequent in chronic alcoholics [13, 14].

$N = [1.96^2 \times 0.174 \times (1-0.174)]/0.1^2 =$ **55**

This Corresponds to a Minimum Sample Size of 55 Patients

Analysis Statistics

The data obtained were entered into an input mask designed with CSpro (Census and Survey Processing System) version 6.0, and analysed using SPSS (Statistical Package for the Social Sciences) version 21. Categorical variables were presented in counts and percentages and scale variables in means and standard deviations.

Ethical Considerations

The study was carried out following the standards of the competent national and institutional committees on human experimentation and with Helsinki's declaration of 1975 revised in 2008. The entire procedure was approved by the Institutional Ethics and Research Committee (IERC) of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I (Ref: N°0057/UYI/FMSB/VDRC/DAASR/CSD on 11/05/2016). Authorisations were obtained from the Directors of the selected hospitals. The questionnaires were completed carefully and the data were analysed in complete confidentiality. The results of this survey will be used only for research purposes.

RESULTS

Socio-Demographic Characteristics of the Population

We analysed a total of 250 cases. The mean age was 54.26 ± 30.27 years, with 80.8% (i.e. 4/5) male representation; for a male/female sex ratio of 4.2.

Table I: Distribution of gender in the study population

Gender	Counts	Percentages (%)
Male	202	80,8
Female	48	19,2
Total	250	100,0

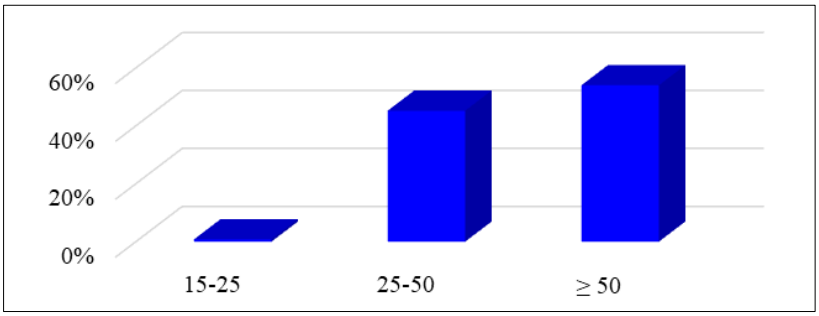

Figure 1: Distribution according to age group

Clinical Characteristics

Only about 10.8% of the population came to or were taken to consultations for epileptic seizures.

Table II: Distribution according to chief complaint

	Counts	Percentages (%)
Epileptic seizure	27	10,8
Other	223	89,2
Total	250	100,0

The majority of the study population (80.8%) consumed between 60 and 100 grams of alcohol per day.

Table III: Distribution of alcohol consumption by gender

Sex	Male		Female		Total	
Volumes	Counts	Percentages (%)	Counts	Percentages (%)	Counts	Percentages (%)
60-100 g	162	64,8	40	16,0	202	80,8
100-200g	34	13,6	6	2,4	40	16,0
200-300g	5	2,0	1	0,4	6	2,4
≥300g	1	0,4	1	0,4	2	0,8
Total	202	80,8	48	19,2	250	100,0

The mean volume of alcohol consumed was 86.83 ± 83.52 ranging from 60 to 382 g/d. Patients with epileptic seizures had a mean volume of alcohol consumed of 91.02 ± 90.58 ranging from 61 to 320 g/d.

Table IV: Distribution according to average volume of alcohol consumed in millilitres (ml)

Type of population	General population	Patients with epileptic seizures
Maximum volume in ml	382	320
Average volume in ml	86,83 ± 83,52	91,02 ± 90,58
Minimum volume in ml	60	61

Distribution According to Type of Crisis

The most prevalent type of seizure was the generalized seizure (61%). Among these, tonic-clonic generalized seizures were the most common (48.8%).

Table V: Distribution according to type of crisis

Classes	Types of crisis	Counts	Percentages (%)	Total
Focal crises	Simple partial seizures	8	**19,5**	39
	Complex partial seizures	1	2,4	
	Partial seizures with secondary generalization	7	17,1	
Generalised crises	Tonic-clonic generalized seizures	20	**48,8**	**61**
	Tonic generalized seizures	1	2,4	
	Generalized myoclonic seizures	4	9,8	
Total		41	100,0	100

Aetiologies and Prevalence of Epileptic Seizures

In our study population, the prevalence of epileptic seizures in chronic alcoholics was 16.4%, with a ratio of almost 1:6. The most common aetiologies were infectious (41.4%), with cerebral toxoplasmosis the most common in 22% of cases.

Table VI: Distribution according to aetiology and prevalence of epileptic seizures

Aetiological groups	Causes	Counts		Percentages (%)	
Infectious causes	**Cerebral toxoplasmosis**	**9**	**17**	**22,0**	**41,4**
	Neuromeningeal cryptococcosis	1		2,4	
	Meningoencephalitis	2		4,9	
	Encephalitis	2		4,9	
	Meningitis	1		2,4	
	Cerebral abscess with common germs	2		4,9	
Toxic causes	Acute alcohol intoxication	3	10	7,3	24,4
	Alcohol withdrawal	**7**		17,1	
Vascular causes	Ischaemic stroke	**3**	6	7,3	14,6
	Haemorrhagic stroke	1		2,4	
	Vascular epilepsy	2		4,9	
Traumatic causes	Post-traumatic epilepsy	**2**	4	4,9	9,8
	Subdural haematoma	**2**		4,9	
Undetermined causes		4	4	9,8	9,8
Total		41	41	100	100

Etiologies and Prevalence by Sex

Male patients presented mainly with alcohol withdrawal (17.1%), ischaemic stroke (7.3%), post-traumatic epilepsy (4.9%), subdural haematoma (4.9%), and undetermined causes (9.8%). On the other hand, the majority of female patients had cerebral toxoplasmosis (14.6%).

Table VII: Distribution of aetiologies by sex

Aetiological groups	Causes	Male		Female		Total	
		Counts	Percentages (%)	Counts	Percentage (%)	Counts	Percentage (%)
Infectious causes	Cerebral toxoplasmosis	3	7,3	**6**	**14,6**	9	22,0
	Neuromeningeal cryptococcosis	1	2,4	0	0,0	1	2,4
	Meningoencephalitis	2	4,9	0	0,0	2	4,9
	Encephalitis	1	2,4	1	2,4	2	4,9
	Meningitis	1	2,4	0	0,0	1	2,4
	Cerebral abscess with common germs	2	4,8	0	0,0	2	4,8
Toxic causes	Acute alcohol intoxication	2	4,9	1	2,4	3	7,3
	Alcohol withdrawal	**7**	**17,1**	0	0,0	7	17,1
Vascular causes	Ischaemic stroke	**3**	**7,3**	0	0,0	3	7,3
	Haemorrhagic stroke	1	2,4	0	0,0	1	2,4
	Vascular epilepsy	2	4,9	0	0,0	2	4,9
Traumatic causes	Post-traumatic epilepsy	**2**	**4,9**	0	0,0	2	4,9
	Subdural haematoma	**2**	**4,9**	0	0,0	2	4,9
Undetermined causes		**4**	**9,8**	0	0,0	4	9,8
Total		22	53,7	19	46,3	41	100,0

DISCUSSION

Sociodemographic Characteristics

Most patients were at least 50 years (54%). The mean age was 54.26 ± 30.27 years. This value is almost similar to the 54.1 ± 41.1 years reported by Oreste *et al*., [15], and comparable to the mean age of 47 years found by Gaches *et al*., [16].

Our population was predominantly male (80.8%). Daryanan *et al.,* [17], Aldrich *et al.,* [18], and Couvillers *et al.,* [19], who reported 93%, 85.1%, and 66.7% respectively, also reported a male predominance. Other authors found almost equal proportions of men and women: Halioua *et al* [20] 55% and Semenou *et al.,* [21]. 53% or a female predominance of 56.2% found by Gaches *et al.,* [16]. The predominance of men in our study could be explained by the fact that alcohol

consumption is increasingly an opportunity for conviviality and sharing. As a result, it very often involves men. In contrast, the French study by Gaches *et al.*, found a female predominance, maybe because certain French regions, particularly the Nord-Pas-de-Calais region where it was conducted, have high proportions of female alcoholism.

Clinical Characteristics

The Presenting Complaint

In our population, 10.8% came or were brought to consultation for epileptic seizures. In contrast, Daryanan *et al.,* and Mbonda *et al.,* reported respectively 46% and 54.7% epileptic seizures as the reason for consultation in their studies [17-22]. This disparity could be explained by the fact that Daryanan *et al.'s* study population consisted of alcohol abusers admitted for withdrawal syndrome, a population with a high risk of presenting with epileptic seizures. Mbonda *et al.,* on the other hand, had a population of HIV-positive patients in whom they were looking for the aetiologies of epileptic seizures. HIV-infected patients usually develop neurological complications, of which epileptic seizures are one of the common manifestations. We have 11% in the USA [23], 3 to 17% in South Africa [24], and 33% in France [25].

Volume of Alcohol Consumed

In our study, the mean volume of alcohol consumed in the group of patients who had presented with seizures was 91.02 ± 90.58. This value is in line with that of an Italian multicentred study which found a daily consumption of more than 59.4 g at the origin of epileptic seizures [14].

The risk of seizures appeared in men and women from a consumption of more than 50 g/day [13]. In addition, daily alcohol consumption of 50 to 300g increased the risk of seizures by a factor of 10 compared with abstainers [7].

The Type of Crisis

The most frequently encountered seizures in our study were generalized seizures (61%). Our results are comparable to those of Satishchandra *et al.,* [26], Chadha *et al.,* [27], and Mbonda *et al.,* [22], who found 63%, 65.2% and 66% generalised seizures respectively.

The predominance of generalised seizures may be due to the difficulty experienced by clinicians in classifying seizures during consultations, making this report unclear [12], especially if described by a next-of-kin of the patient.

Prevalence of Epileptic Seizures in Chronic Alcoholics

In our study, we found a prevalence of 16.4%. Studies carried out in Cameroon in the general population show a prevalence ranging from 1.06 to 4.90%, or even 6%. Other studies, notably those by Nwani *et al.,* [11], Narayanan *et al.,* [28], and Bleck *et al.,* [29], found prevalences of acute symptomatic seizures in adults of 5.2%, 2.1% and 3.5% respectively. This shows a clear increase in the prevalence of epileptic seizures in chronic alcohol abusers. This could be explained by the fact that chronic alcoholism lowers the epileptogenic threshold and increases the risk of seizures. Studies carried out in emergency and neurology departments have shown that alcoholism is associated with 40 to 50% of seizures observed in adult patients admitted for an epileptic seizure, making alcoholism the main risk factor for seizures in adults [30-35].

Aetiologies and Prevalence of Epileptic Seizures

Infectious Aetiologies

In our study, infectious causes were the most common aetiologies of epileptic seizures, with 17/41 cases (41.4%). Cerebral toxoplasmosis was the most frequent infection, with 9/41 cases (22%), followed by encephalitis and meningoencephalitis (4.9%), and neuromeningeal cryptococcosis (2.4%).

This result differs from those obtained by Kuate *et al*., and Millogo *et al.* who found respectively 56.7% and 65% of epileptic seizures linked to toxoplasmosis [36. 37]. This disparity in prevalence could be explained by the fact that Kuate *et al.,* selected the most severe and immunocompromised HIV patients, which would increase the probability of having patients with cerebral toxoplasmosis, which according to Njamnshi *et al.,* accounts for 17.5% to 50% of neurological complications due to HIV in Cameroon [38].

Toxic Aetiologies

Toxic causes represented the second most common aetiological group of epileptic seizures with 24.4% (n = 10/41), and alcohol withdrawal was the predominant aetiology with 7/41 cases or 17.1%. This result is comparable to the 14% found by Towne *et al*., [39]. However, it differs from the 39% reported by Lowenstein and Alldredge [40], and the 5% reported by McKeon *et al.,* [41]. In addition, alcohol was the only toxic agent found. This result is consistent with that found by Kuate *et al*., [12]. This high prevalence of alcoholic aetiology in our study could be correlated with the current situation in Cameroon in terms of consumption of alcoholic beverages, with an exponential growth in consumption rates, i.e. 7.8 to 8.4 litres of pure alcohol per inhabitant aged 15 and over between 2003 and 2010 [42].

Vascular Aetiologies

Vascular causes were the third aetiological group of epileptic seizures with 14.6% (n = 6/41). In our study, stroke accounted for 9.7% of cases (n = 4/41). This result is comparable to the 5.7% reported by Rathlev *et al*., [41]. Vascular epilepsy was a cause of seizures in 4.9% (n = 2/41). This is consistent with the literature, which confirms that vascular epilepsy tends to occur in 2.4% to 6.3% of patients [43, 44]. This higher incidence

of vascular epilepsy found in our study may be related to sub-optimal management of the acute phase of stroke and the presumed complications of such management. In a prospective multicentre trial, most epilepsies occurred within 2 days and almost half (43%) within 24 hours of stroke [45].

Traumatic Aetiologies

Traumatic causes were a cause of seizures in 9.8% of cases (n = 4/41). Post-traumatic epilepsy accounted for 4.9% (n = 2/4) in our study, this prevalence is similar to the 5% found by Towne *et al*., [46]. It differs from the 9.30% found by Kuate *et al.,* [12], and the 18% found by Bin Bayoka [47]. Head trauma is a frequent cause of epilepsy in adolescents and adults, with a wide variety of lesional mechanisms, all correlated with the severity of the trauma.

Undetermined Aetiologies

In our series, they were 9.8% (n = 4/41). This result is similar to the 9.3% reported in Burkina Faso by Millogo *et al.,* [37]. Still, it differs from the results of other studies, notably the 38% reported by Dam *et al*., [48], and the 30.23% reported by Nwani *et al*., [11]. The frequency of epileptic seizures of undetermined cause varies according to country and level of development. Some authors estimate that, depending on advances in neuroradiology, this percentage could be between 20 and 40% (Preux *et al*., 2005; Weber, 1998).

CONCLUSION

The prevalence of epileptic seizures in chronic alcohol abusers in Cameroon is high (16.4% or 1/6 patients) compared with the estimated prevalence of epilepsy in the general population of Cameroon. These seizures have a variety of aetiologies and are mainly caused by infections of the Central Nervous System, of which cerebral toxoplasmosis is the most common. Alcohol withdrawal is the most common toxic aetiology, with alcohol being the only toxic agent found. Stroke is the most common vascular aetiology of epileptic seizures.

DECLARATION BY THE AUTHORS

Conflicts of Interest: We have no conflicts of interest to declare

Authors' Contributions

EBENDENG E. Laurent Patrick TATAH Y. Godwin and Ngarka Leonard participated in the design, data collection, data analysis and writing of the manuscript. TATAH Y. Godwin, Ngarka Léonard, NTONE E. Félicien and NJAMNSHI K. Alfred participated in the design, data analysis and drafting of the manuscript.

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Ethical Approval and Consent

The authors certify that all the procedures used for the elaboration of this work comply with the standards of the competent national and institutional committees on human experimentation and with the Helsinki's Declaration of 1975 revised in 2008. The entire procedure was approved by the Institutional Ethics and Research Committee (CIER) of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I (Ref: N°188/UYI/FMSB/VDRC/DAASR/CSD on 12/05/2023). Authorizations were obtained from the selected hospitals. The questionnaires were completed anonymously and the data were analysed confidentially.

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Data Availability: The data presented in this article are available free of charge from the authors on request.

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