



# Seizure-Related Injuries among Patients with Epilepsy at the Douala General Hospital, Cameroon: A Retrospective Cohort Study

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## Abstract

**Background** Seizures can lead to injuries in patients with epilepsy (PWE). This study seeks to determine the 1-year incidence, types, and associated factors of seizure-related injuries in PWE compared with that of patients without epilepsy.

**Methods** A retrospective cohort study was carried out at the Douala General Hospital, Douala, Cameroon. Patients with active epilepsy within the past 5 years were compared to patients without epilepsy after matching them by age and gender during a 12-month period. Data was collected from patient records using a questionnaire and analyzed using the SPSS version 20 software. The chi-square test was used to compare the proportions of injuries at a significant level of  $p < 0.05$  and a confidence interval (CI) of 95%.

**Results** A total of 155 participants were recruited in each group. Note that 51.6% were males, and the mean age was  $25.46 \pm 16.35$  years. The 1-year incidence of all injuries was 26.5% in PWE against 16.8% among patients without epilepsy, respectively ( $p = 0.038$ ; odds ratio = 1.8, 95% CI: 1.03–3.10). Soft tissue injury was higher in PWE (82.9%,  $p < 0.05$ ) compared to those without epilepsy (50%), whereas patients without epilepsy had more cases of burns compared to PWE ( $p < 0.05$ ). PWE and having frequent seizures with falls and those on more than one antiseizure medication had an increased risk of injuries ( $p < 0.05$ ).

**Conclusion** PWE have a double risk of having mild soft tissue injuries attributed to epileptic seizures. The risk is increased in PWE having seizures with falls and those taking more than one antiseizure medication.

## Keywords

- epileptic seizures
- physical injuries
- antiseizure medication

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## Introduction

Epilepsy is a common disease in Cameroon with the highest prevalence worldwide reported in the Mbam valley, though prevalence studies on the whole country have not yet been done.<sup>1–3</sup> Most patients with epilepsy (PWE) in the country seek medical attention more than a year after the onset of seizures, and they do so directly in referral centres.<sup>4</sup> The management of epilepsy is still a major challenge in Cameroon, very difficult mainly due to lack of human and material resources, limited access to antiseizure medications, and the stigma associated with epilepsy.<sup>5–7</sup> Seizures are unforeseen events that can cause physical injury, especially when associated with loss of consciousness, and occurring in high-risk environments. Several studies in Cameroon have focused on the psychological impact and the stigma associated with epilepsy, however, there is scarcity of data on physical injuries that patients living with epilepsy endure. This study aimed at determining the 1-year incidence of physical injuries attributable to seizures in PWE attending the Douala General Hospital, Douala, Cameroon and compared it with that of patients without epilepsy.

## Materials and Methods

### Study Design

We carried out a retrospective cohort study in the Douala General Hospital in the Neurological Unit of the Internal Medicine Department from January 1 to December 1, 2017.

### Study Setting

The Douala General Hospital is a third-level reference hospital in the country and the Central Africa zone and is also a university teaching hospital. The hospital offers facilities like neurophysiologic studies (electroencephalogram and electromyogram), imaging studies (computed tomography scan, magnetic resonance imaging, ultrasonography, etc.), and laboratory analysis with international standards among other facilities. Patient files and records are kept in alphabetical order and classified according to the attending neurologist.

### Study Population

The population of interest was all patients diagnosed with epilepsy at the Douala General Hospital and have had at least one seizure over the past 5 years, that is, from 2010 to 2016. However, those with active neurological, psychiatric, or other comorbid conditions (diabetes mellitus, hypertension, stroke, etc.) were excluded. Using an exhaustive sampling method, files of PWE were selected from the records and incomplete files were excluded. This constituted the exposure group, and these were matched according to age ( $\pm 1$  year) and gender with another group of patients without epilepsy selected randomly from the general population as the unexposed group.

Sociodemographic and clinical data on epilepsy were collected from the files of PWE, and the patients were interviewed at follow-up visits in the outpatient department,

or by telephone for the occurrence of physical injuries, due to seizures, over the study period.

Data collection of patients without epilepsy was done in public places or institutions like schools or markets. Verbal and written consent were obtained before questionnaire administration.

The questionnaire included sociodemographic questions (age, gender, occupation, and educational level), clinical questions on epilepsy (age at onset of epilepsy, age at diagnosis, types and frequency of seizures, seizures with fall, antiseizure medications used), and information on physical injury in the past 12 months. We defined some terms as follow:

- PWE: people with clinical and/or electrophysiologic diagnosis of epilepsy and confirmed by a neurologist.
- Patients without epilepsy: people in the general population who have never experienced a seizure in the past.
- Injury: harm or hurt; damage inflicted on the body by an external force.
- Epilepsy type: This was done according to the 2017 International League Against Epilepsy classification of epilepsies as follows; generalized epilepsy, focal epilepsy, combined generalized and focal epilepsy, and unknown.<sup>8</sup>

### Data Analysis

The incidence of physical injury was determined by dividing the number of epileptic patients who sustained at least one seizure-related injury within a period of 12 months with the total number of epileptic patients at the start of the study. The chi-square test was used to compare the proportions of physical injury in people with and without epilepsy, at a significance level of  $p < 0.05$  and a confidence interval (CI) of 95%. SPSS version 20.0 was used for statistical analysis. A patient could have more than one type of injury during the study period (e.g., both a limb fracture and a burn), but each type of injury was counted only once per patient during the 1-year period. Injuries that were not seizure-related in PWE was not considered as an injury. The factors that could predict injury were found using binary logistic regression with their respective odds ratios (ORs) at 95% CI.

## Ethical Considerations

This study was approved by the Institutional Review Board of the Faculty of Health Sciences, University of Buea, Buea, Cameroon (Ref: 2018/144/UB/SG/IRB/FHS of 31.01.2018) and administrative approval and authorization to carry out the research in the Douala General Hospital was obtained from the Director General of the hospital (Ref: No. 009/AR/MINSANTE/HGD/DM/01/18).

## Results

A total of 155 participants were enrolled out of the 239 files reviewed, giving a response rate of 89%. Eighty of the PWE (51.6%) were male. The male:female ratio was 1.1:1. The mean age of PWE was  $25.46 \pm 16.5$  years, with a range from 2 to 86 years. More than half ( $n = 78$ , 50.3%) of the study

participants were less than 20 years old, and only 11% ( $n=17$ ) of them were above 50. The mean age at seizure onset was  $19.52 \pm 16.37$  years and the mean age at diagnosis was  $21.31 \pm 16.33$  years. More than half ( $n=81$ , 52.3%) of PWE had had no seizures for the past 1 year and 38.1% ( $n=59$ ) had 1 to 12 seizures. This gives a cumulative percentage of 90.3%, meaning only less than 10% of PWE had more than one seizure a month. Generalized epilepsies were the most common type of epilepsy among the participants ( $n=111$ , 71.6%) of all seizures ( $p < 0.001$ ). The other types include focal epilepsies and unknown type. A total of 106 (68.4%) PWE had seizures that led to falls, and of these, 91.5% ( $n=97$ ) had generalized epilepsy ( $p < 0.001$ ). The antiseizure medications used were valproate in 76 PWE (49.0%), carbamazepine in 37 (23.9%), phenobarbital in 17 (11.0%), clonazepam in 9 (5.8%), clobazam in 8 (5.2%), and lamotrigine in 2 (1.3%). However, 2.7% of PWE ( $n=5$ ) were on traditional remedy and 15.4% ( $n=28$ ) were not on any antiseizure medication. Twenty epileptics (12.9%) were on more than one antiseizure medication.

The 1-year incidence of overall physical injury (having at least one injury) was 26.5% ( $n=41$ ) among those with epilepsy and 16.8% ( $n=16$ ) among those without epilepsy ( $p = 0.038$ , OR = 1.8, 95% CI: 1.03–3.10). Soft tissue injury was the only type of injury that was significantly high ( $p < 0.001$ )

in PWE compared to those without epilepsy (►Table 1). Tongue bites accounted for this high level. Burns (7.3% vs. 26.9%) were higher in patients without epilepsy at a significant level ( $p = 0.038$ ); however, all cases of burns in PWE were due to flames. Head injury was also high in PWE, but the value was not applicable statistically because we had no case among patients without epilepsy.

There were more cases of road traffic accidents ( $p = 0.02$ ) in patients without epilepsy ( $n = 11$ , 7.1%) than in PWE ( $n = 2$ , 1.3%). There was no case of drowning in PWE. Injuries occurred mostly at home in PWE, as opposed to injuries occurring in the streets in patients without epilepsy as shown in ►Table 2.

There was no significant difference between PWE and patients without epilepsy regarding medical attention and hospitalization following injury (►Table 3).

As shown in ►Table 4, after binary logistic regression analysis, having a fall during seizures and using more than one antiseizure medication were associated with physical injury.

## Discussion

This hospital-based retrospective study aimed at determining the incidence of physical injury attributable to seizures in

**Table 1** Comparison of types of injuries between PWE and patients without epilepsy

Injury	PWE N (%)	Non-PWE N (%)	OR (95% CI)	p-Value
Burn	3 (7.3)	7 (26.9)	0.2 (0.05–0.92)	<b>0.038</b>
Scald	0	2 (28.6)		0.298 <sup>a</sup>
Flame	3 (100)	0		0.002 <sup>a</sup>
Chemical	0	1 (14.3)		0.490 <sup>a</sup>
Thermal	0	4 (57.1)		0.091 <sup>a</sup>
Soft tissue injury	34 (82.9)	13 (50)	4.9 (1.59–14.88)	<b>0.004</b>
Abrasion	11 (32.4)	5 (38.5)		0.689
Laceration	8 (23.5)	7 (53.8)		0.046
Hematoma	2 (5.9)	1 (7.7)		0.841
Tongue bite	13 (38.2)	0		0.009 <sup>a</sup>
Head injury	13 (31.7)	0		<b>0.001</b>
Abrasion	9 (69.2)	0		
Laceration	2 (15.4)	0		
Intracranial hematoma	0	0		
Contusion	2 (15.4)	0		
Dental injury	2 (4.9)	1 (3.8)	1.2 (0.11–14.89)	0.842
Tooth loss	2 (100)	0		0.089 <sup>a</sup>
Jaw fracture	0	1 (100)		0.089 <sup>a</sup>
Fracture	1 (2.4)	3 (11.5)	0.2 (0.02–1.95)	0.126
Upper limb	0	2 (66.7)		0.230 <sup>a</sup>
Lower limb	1 (100)	1 (33.3)		0.0230
Vertebrae	0	0		
Pelvis	0	0		
Dislocation	1 (2.4)	1 (2.4)	1	1
Drowning	0	2 (7.7)	0.9 (0.83–1.03)	0.07 <sup>a</sup>
Multiple injury	8 (19.5)	2 (7.7)	2.9 (0.57–14.94)	0.186

Abbreviations: CI, confidence interval; OR, odds ratio; PWE, patient with epilepsy.

**Table 2** Place of occurrence of injuries among patients with and without epilepsy

Place of injury	PWE, N (%)		OR (95% CI)	p-Value
	Yes	No		
House	30 (73.2)	6 (23.1)	9.1 (2.9–28.6)	< 0.001
School	5 (12.2)	1 (3.8)	3.5 (0.4–31.6)	0.243
Street	2 (4.9)	15 (57.7)	0.04 (0.01–0.19)	< 0.001
During sleep	2 (4.9)	0	0.4 (0.06–2.53)	0.253
Workplace	2 (4.9)	1 (11.5)	1.0 (0.89–1.04)	0.312
Recreational activities	0	1 (3.8)		0.206

Abbreviations: CI, confidence interval; OR, odds ratio; PWE, patient with epilepsy.

**Table 3** Medical attention and hospitalization following injury

Variables	PWE N (%)	Non-PWE N (%)	p-Value
Medical attention	19 (46.3)	16 (61.5)	0.225
Hospitalization	7 (17.1)	5 (19)	0.822

Abbreviation: PWE, patient with epilepsy.

**Table 4** Factors associated with physical injury in people with epilepsy

Factors	Physical injury in PWE		OR (95% CI)	p-Value
	Yes	No		
Type of epilepsy				
Generalized (motor)	36	75	0.4 (0.08–1.69)	0.196
Focal	0	28	0.0	0.998
Generalized (nonmotor)	0	7	0.0	0.999
Unknown	1	1	0.8 (0.03–17.51)	0.858
Combined generalized and focal	4	3		
Number of seizures/years				
0	4	76	0.1 (0.01–1.42)	0.09
1–12	30	30	2 (0.17–23.25)	0.580
13–24	5	4	2.5 (0.16–38.6)	0.512
25–36	1	2	1 (0.04–29.81)	1.0
> 36	1	2	8.6 (2.50–29.41)	0.001
Seizures with fall	106	49	2.6 (1.00–6.92)	0.049
Use of > 1 ASM	20	135		
Duration of illness from onset of seizure				
0–2	30	12	0.1 (0.28–3.32)	0.960
3–5	14	33	1.0 (0.30–3.44)	0.997
6–10	10	39	0.6 (0.18–2.16)	0.448
> 11	5	12		
Duration of illness from time of diagnosis				
0–2	15	31	1.8 (0.71–4.55)	0.220
3–5	16	46	1.3 (0.52–3.17)	0.583
6–10	10	37	0	0.998
Compliance to ASMs	13	28	0	0.999
Aura	11	30		

Abbreviations: ASM, antiseizure medication; CI, confidence interval; OR, odds ratio; PWE, patient with epilepsy.

patients living with epilepsy. Our findings suggest that PWE were 1.8 times more likely to sustain a physical injury in 12 months, than those without epilepsy. Soft tissue injury was the only type of injury that was significantly high in PWE, and tongue bites accounted for this high level. The other types of injuries in PWE were head injury, burns, dental injury, fracture, and dislocation.

These results are similar to those of van den Broek et al in a multicentric study done in eight European countries, who reported that PWE were 1.5 times more at risk of injury and soft tissue injuries was the most common cause of injury.<sup>9</sup> This observation is also in keeping with many other studies all over the world like in Turkey,<sup>10</sup> Canada,<sup>11</sup> Iran,<sup>12</sup> India,<sup>13</sup> and Ethiopia.<sup>14</sup>

Another important finding is that injuries in PWE occurred mostly at home, compared to patients without epilepsy, where injuries occurred on the streets. This finding is similar to that of van den Broek et al. However, this is in contrast with other reports where injuries in PWE occurred in equal proportions indoors, on the streets, and at the workplace. We believe that the reason for this discrepancy may be due to the fact that isolation due to stigma might cause the PWE to spend less time on the street and prefer to stay indoors.

Despite many reports in favor of a higher risk of injury in PWE, Téllez-Zenteno et al in 2008 in Canada found no significant difference in the rate of injury in PWE and the general population.<sup>15</sup> It is possible that a difference in the methodology could explain the varying findings.

First, we carried out a hospital-based study while theirs was a population-based study where institutionalized patients, who could be at a substantial risk of injury, were excluded. Second, only injuries that interfere with normal daily activities were considered in their study whereas all injuries including those that did not need medical attention were included in ours.

We found that PWE were less likely to sustain a burn. This observation is in keeping with Josty et al who reported that there is a reduction in the incidence of burns due to epilepsy.<sup>16</sup> However, the only cause of burn in our study was due to flames which is in contrast to Josty et al's report. In our setting, people use mostly fire for cooking. So if a seizure occurs while cooking there will be more chances that the patient sustains a burn either directly from the fire or boiling liquids from the pot. On the contrary, Josty et al's report was conducted in a developed country where technology is advanced and people mostly use gas stoves and plates at a considerable height that would less likely cause a burn in case the patient loses consciousness or fall because of a seizure.

We found that there was no case of drowning over the study period. It is possible that because of stigmatization, and isolation, PWE are not involved in social activities like swimming, and also very few people use bathtubs in our context.

Previous studies have reported that PWE had more hospitalization than those without epilepsy.<sup>9,15</sup> This observation is in contrast to our findings, as we observed no increased rate of hospitalization or medical attention in PWE compared to those without epilepsy. The higher rate of hospitalizations in previous reports could be explained by the differences in methodologies, the other authors included PWE with injuries requiring medical attention or injuries causing disability, whereas we included all patients with injuries irrespective of whether they seek medical attention or not.

In a hospital-based retrospective controlled study conducted in Iran by Asadi-Pooya et al in 2012,<sup>12</sup> the authors reported that having seizures with falls was a significant risk factor of injury in PWE. This observation is similar to our findings, where a significant proportion of seizures with falls were associated with physical injuries.

We also observed that the use of more than one antiseizure medication was associated with the occurrence of physical injuries. Lawn et al, in 2004, conducted a study on 247 Rochester residents and found that a greater number of antiseizure medications used was a significant risk factor of injury in epileptic patients.<sup>17</sup> This result also correlates with our finding.

We found that the frequency of seizures and the type of seizure did not impact the incidence of physical injuries. This observation is in contrast to previous reports. This might be because the majority of our patients had less than one seizure per month, and though generalized seizures were more common, it occurred mostly indoors, and mostly in the night during sleep. The retrospective design of our study implies that there could be recall bias and some information might be incomplete. Some major physical injuries might be missed because of the design. The fact that this study was done in a tertiary hospital in an urban setting means the results might not be applicable to all the epilepsy population in our context; however, the center receives patients from all over the country and the subregion. The small sample size could also be a limitation to our study. We could extrapolate that our hospital is dealing with moderate to high epileptogenic cases and many low epileptogenic cases never reach the medical facility, as is seen in many developing countries.

## Conclusion

In conclusion, here we have shown that the incidence of physical injuries in PWE at the Douala General Hospital is 25.5%, and is significantly higher than in patients without epilepsy. Soft tissue injuries and mild head injuries like abrasions and lacerations are significantly higher in PWE, while burns and road traffic accidents were less common in PWE. The risk of physical injury is increased in patients having seizures with falls and in those taking more than one antiseizure medication. Our results suggest the need that PWE, especially those on more than one medication and those having seizures with frequent falls should be educated on preventive measures on physical injuries. Despite its limitations in design, this is the first study on physical injuries in PWE in Cameroon and will serve as a baseline for further studies.

## Conflict of Interest

C.-M. reported grants or contracts from NIH and Fogarty International; Leadership or fiduciary role in IATSI and ASAP. G.M.D. reported support for attending meetings and/or travel from World Federation of Neurology (World Congress of Neurology 2019 travel grant) and International Brain Research Organization (Dakar Teaching Tools Workshop 2018 travel and accommodation); Leadership or fiduciary role in African Academy of Neurology (Secretary General term 2019 - 2021) and Epilepsy Alliance Africa (Vice President for West African Region). All other authors reported no conflict of interest.

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