ORIGINAL ARTICLE

Prevalence and risk factors/predictors of seizure-related injuries among children with Epilepsy at the University of Benin Teaching Hospital, Benin City.

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ABSTRACT

Background: Children with epilepsy are considered to be at an amplified risk for injuries as compared to the general population. The increased risk may occur directly as a result of the seizure or due to other comorbid conditions that predispose to injuries. **Objectives**: This study aimed to determine the frequency and the pattern of seizure-related injuries in children aged 0-17 years with epilepsy seen at the University of Benin Teaching Hospital, (UBTH), Benin City, Nigeria. **Methods**: Consecutive cases of children with epilepsy seen at the Paediatric Neurology Clinic of UBTH, Benin-City over a period of 6 months were evaluated for injuries in the preceding 12 months using a structured questionnaire. **Results**: A total of 119 respondents were involved in the study, 50 (42.02%) sustained an injury at some point in the preceding 12 months. Participants in the middle socio-economic class had more seizure-associated injuries (n = 25, 59.5%), compared to those in the low socio-economic class (n = 20, 42.0%) and high socio-economic class (n = 5, 18.5%); P = 0.003. Seizure-related injuries were associated most with generalized seizure (50.5%) when compared with focal seizures (14.3%) P = 0.001. Among the subjects, a tonic-clonic seizure was the most common subtype of generalised seizure (p =22.306, p = < 0.001). The commonest seizure-related injuries are skin bruises (35.1%), followed by soft tissue lacerations (22.8%). Strong association between epilepsy-related injuries and compliance to anti-epileptic drugs (AEDs) were noted. **Conclusion**: Children with epilepsy are at higher risk of injury and this risk is modified by some factors like socioeconomic status, seizure type, and compliance with medication

Key words: Seizure, Children, Injuries, Epilepsy

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Introduction

Epilepsy is a chronic neurological disease of the brain that affects around 50 million people worldwide.[1] It is a clinical phenomenon diagnosed by the occurrence of two or more unprovoked seizures occurring greater than 24 hours apart.[2] This recurrent seizure is characterized by brief episodes of involuntary movement which may be focal or generalised and is sometimes accompanied by loss of consciousness and control of bowel or bladder function. Majority of children with epilepsy are found in low and middle-income countries (LMICs), this could be due to the high level of poverty, ignorance, and lack/poor state of medical facilities that characterize such counties.[1]

Seizure episodes are a result of excessive discharges in a group of brain cells, which can vary from brief lapses of attention or muscle jerks to severe and prolonged convulsions.[2] Children with epilepsy are considered to be at an amplified risk for injuries as compared to the general population and it is reported that people with epilepsy also have higher incidences of home,

street and school accidents even without an obvious seizure.[2] The increased risk may occur directly as the result of a seizure or due to other comorbid conditions that predispose to injuries. Common seizure-related injuries include soft tissue injury, dental trauma, head trauma, submersion injury, burn, fracture etc. Seizures may lead to abrupt falls or a sudden loss of awareness that occur without warning and the child is unable to utilize his/her protective reflexes to brace their fall and may consequently suffer head, orthopaedic, or soft tissue injury. In addition, they may fall onto a hot surface or into water, and sustain burns or submersion injury.

Absence or complex partial seizures lead to loss of awareness, preventing the patient from realizing and responding to dangerous situations at that moment of seizure. Absence seizures occurring during sports or chores or while crossing the highway may lead to injuries. Even in the absence of obvious clinical seizure activity, paroxysmal electroencephalogram (EEG) discharge has been shown to affect alertness and mental speed.[3]

Anticonvulsant drugs and co-morbidities like attention deficit disorder are associated with cognitive and motor impairments predisposing these children to an amplified risk of injuries.[4] Some factors like high seizure frequency, types of seizures (e.g. generalized tonic-clonic or atonic seizures), use of AEDs and compliance with AEDs also determine the risk of seizure-related injuries.[5,6] The risk of injuries may be further increased in children living in poor socioeconomic conditions in the LMICs where awareness of epilepsy, general safety measures and enforcement of child safety laws are likely to be insufficient.[7] The purpose of this study is to guide clinical practice in reducing seizure-related injuries by drawing attention to its burden and encouraging more preventive measures through the education of caregivers and health workers alike.

Methods

This study was conducted in Paediatric Neurology Clinic of UBTH, Benin. Benin City is the capital of Edo State. Edo State is in the South-South geopolitical zone of Nigeria. It is a cosmopolitan city, largely inhabited by the Edo (Bini) people. Other dominant ethnic groups in Benin City include Etsako, Esan and Owan. The main language used in the state is Bini and Pidgin. UBTH has 700 bed capacity and provides tertiary health care services to the entire Edo State and neighbouring states of Delta, Ondo and Kogi States. The paediatric neurology clinic runs twice a week, children who were discharged from the ward are seen on Monday for follow up while Friday clinics are for cerebral palsy and other neurological disorders like epilepsy.

Ethical approval was obtained from the ethics committee of UBTH. Written consent was obtained from parents/caregivers and assent was obtained from children above 8 years.

This study was carried out over seven months (September 2020 - March 2021). Consecutive cases of children with epilepsy, aged between 0-17 years seen in the clinic over the stated period were evaluated for injuries in the preceding 12 months using a structured questionnaire that has been pretested. Children with severe cognitive dysfunction, motor disability and whose parents did not give consent were excluded from the study.

The parents of children and older children with epilepsy were interviewed with a semi-structured questionnaire and open-ended questions. Details regarding age and sex were documented, the socioeconomic status was determined using the method described by Olusanya *et al*.[8] The seizure types, type of injury sustained, drug compliance were documented (Excellent compliance = misses a maximum of a day medication in 4 weeks; Good = misses a maximum of 3 days medication in 4 weeks; Fair = misses a maximum of 5 days duration in 4 weeks; poor = miss up to 6 days medication or more in 4 weeks) and its effect on the quality of life. In this study, quality of life was defined by how epilepsy-associated injuries affected the education and/or recreation of the subjects. Seizure-related injuries were defined as injuries occurring as a direct result of a seizure.

Data analysis

Data was collected and analysed using the statistical software, IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp. Data were presented using tables and charts. Frequencies and percentages were used to present categorical data, while continuous data were expressed as means and standard deviation. Frequencies were compared using the Pearson Chi-square test, Fischer's Exact test and Chi-square Goodness of Fit test. A $P<0.05$ was considered significant for all statistical comparisons.

Results

Tables 1 and 2 show the socio-demographic and anthropometric distribution of the participants. A group 0 – 5 years. Most respondents were within the low socio-economic class followed by middle and then high socio-economic class at 42.02%, 35.29% and total of 119 respondents were involved in the study with more males (55.46%) than females (44.54%). Most of the study participants (45.38%) were within the age 22.69%, respectively. The mean (SD) of OFC, weight and height of study participants were 51.27 (±4.59), 26.77 (±14.40), and 115.47 (25.86), respectively.

Table 1: Socio-demographic distribution of study participants

Variables; N = 119		n (%)
Sex of participants	Female	53 (44.54)
	Male	66 (55.46)
Age group (in years)	0 - 5 years	54 (45.38)
	6 - 11 years	30 (25.21)
	12 - 17 years	35 (29.42)
Socio-economic class	Lower class	50 (42.02)
	Middle class	42 (35.29)
	High class	27 (22.69)

N = Total number; n = frequency; % = per cent.

Prevalence of epilepsy-related injuries

Of the 119 study participants with seizures, 50 (42.02%) sustained an injury at some point in the preceding 12 months (Fig 1). Table 2 below shows no significant difference between the sex and age groups of those who had seizure-related injuries; however, participants in the middle socio-economic class had more seizure-related injuries (n = 25, 59.5%), compared to those in the low socio-economic class (n = 20, 42.0%) and high socio-economic class (n = 5, 18.5%); P = 0.003.

Figure 1: Study participants with seizure-related injuries.

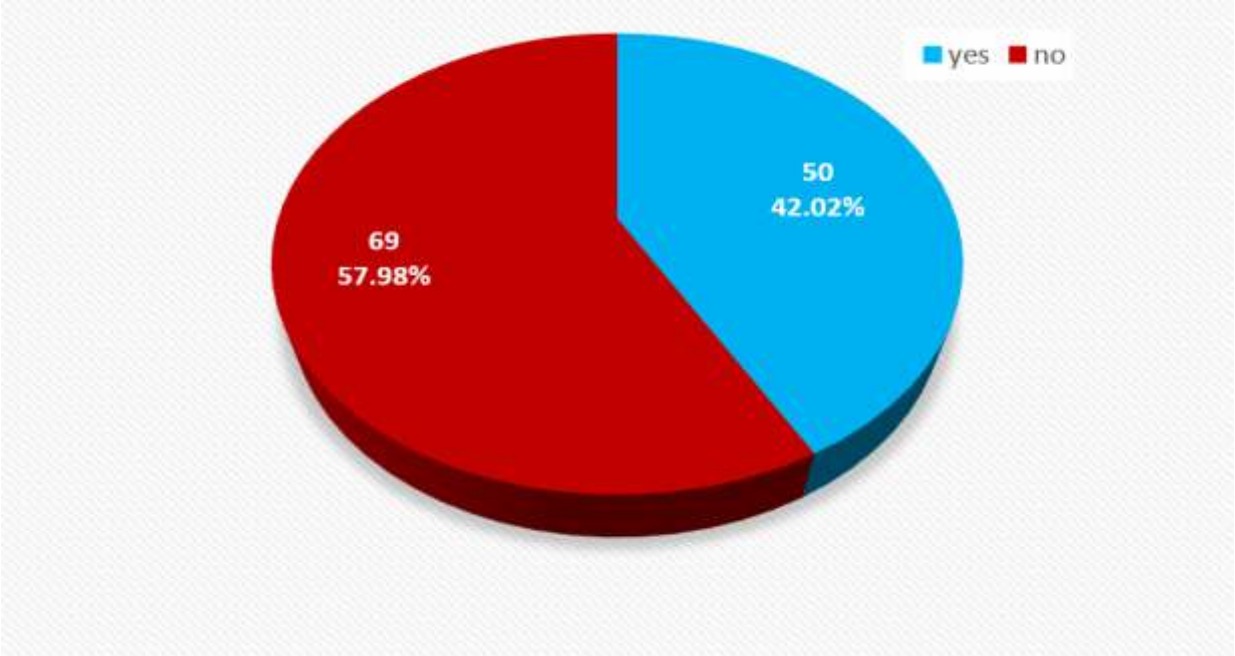

Table 2: Distribution of seizure-related injury by sex, age and socio-economic status.

Variables (N = 119)		Seizure related injury			
		Yes n (%)	No n (%)	X^2	P-value
Sex of participants	Female	26 (49.1)	27 (50.9)		
	Male	24 (36.4)	42 (66.6)	1.944	0.163
Age group (in years)	0 - 5 years	18 (33.3)	36 (66.7)		
	6 - 11 years	17 (56.7)	13 (43.3)		
	12 - 17 years	15 (42.9)	20 (57.1)	4.324	0.115
Socio-economic class	High class	5 (18.5)	22 (81.5)		
	Middle class	25 (59.5)	17 (40.5)		
	Lower class	20 (42.0)	30 (58.0)	11.487	0.003

N = total number; n = frequency; % = per cent; X^2 = Chi-square test statistics.

As seen in Table 3 below, subjects with generalized seizures had more injuries (50.5%), compared with subjects who had focal seizures (14.3%), $x^2 = 11.55$, p = 0.001. Among the seizure subtypes as seen in Table 4 below, tonic-clonic seizure was the commonest subtype of generalised seizure. However, the only child with absence seizure had epilepsy-related injury.

Table 3: Types of seizures and seizure-related injury.

Types of seizures (N=119)	Seizure related injury		X^2	P- value
	Yes n (%)	No n (%)		
Generalized (n = 91)	46 (50.5)	45 (49.5)	11.558	0.001
Focal (n = 28)	4 (14.3)	24 (85.7)		

N = total number; n = frequency; % = per cent; X^2 = Chi-square test statistics.

Table 4: Association of seizure subtypes with injury types

	Seizure subtypes						
Injury types	**Tonic-clonic n (%)**	**Clonic n (%)**	**Myoclonic n (%)**	**Atonic n (%)**	**Absence n (%)**	**X^2**	**P-value**
Soft tissue laceration	7 (21.9)	0 (0.0)	1 (50.0)	1 (20.0)	0 (0.0)	109.16	<0.001
Skin bruises	16 (50.0)	0 (0.0)	1 (50.0)	3 (60.0)	0 (0.0)		
Submersion injury	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)		
Tongue bite/oral injury	4 (12.5)	4 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)		
Dental injuries	5 (15.6)	0 (0.0)	0 (0.0)	3 (60.0)	0 (0.0)		
Head trauma	4 (12.50)	0 (0.0)	0 (0.0)	1 (0.0)	0 (0.0)		

n = frequency; % = percent; X^2 = Chi-square Goodness of Fit test statistics.

From Table 5 below, the commonest seizure-related injuries are skin bruises (n = 20, 35.1%), followed by soft tissue laceration (n = 13, 22.8%), then tongue bite/oral injury, dental injuries and head trauma, at 15.8%, 14.0% and 10.5%, respectively, p = 0.001.

Table 5: Association of seizure types with injury types

Injury types	Seizure types		X^2	P-value
	Generalized n (%)	Focal n (%)		
Soft tissue laceration	9 (20.0)	4 (100.0)	17.56	0.007
Skin bruises	20 (44.4)	0 (0.0)		
Submersion injury	2 (4.4)	0 (0.0)		
Tongue bite/oral injury	8 (17.8)	0 (0.0)		
Dental injuries	8 (17.8)	0 (0.0)		
Head trauma	6 (13.3)	0 (0.0)		

n = frequency; % = percent; X^2 = Chi-square Goodness of Fit test statistics.

Table 6 below, shows a strong association between seizure-related injuries and compliance to medication. Those with good (n = 6, 28.6%) and excellent (n = 12, 23.5%) compliance with medication had fewer injuries compared to those with no medication (n = 23. 79.3%) and poor (n = 9, 100%) compliance to medications P<0.001.

Table 6: Relationship between medication compliance and seizure-related injuries.

Compliance to medications (N = 119)	Seizure related injuries		p	P-value
	Yes n (%)	No n (%)		
Not on medication (n = 29)	23 (79.3)	6 (20.7)	44.210	<0.001
Poor (n = 9)	9 (100)	0 (0.0)		
Fair (n = 9)	0 (0.0)	9 (100.0)		
Good (n = 21)	6 (28.6)	15 (71.4)		
Excellent (n = 51)	12 (23.5)	39 (76.5)		

N = total number; n = frequency; % = per cent; p = Fischer's exact test.

Table 7 shows that 22% of respondents with injuries were affected (education, recreation or both) by the injury while 78.0% of respondents with epilepsy-related injuries had no affectation from the injury.

Table 7: Effect of epilepsy-associated injuries and quality of life (education and/or recreation)

Any effect of injury (N = 50)	n (%)	X^2	P-value
Yes	11 (22.0)	15.580	<0.001
No	39 (78.0)		

N = total number; n = frequency; % = per cent; X^2 = Chi-square Goodness of Fit test statistics.

Discussion

Epilepsy is the world's most common neurological disorder, with more affected people living in resource-constrained countries like Nigeria. Globally, most studies focus on the psychosocial impact of epilepsy, with little attention given to seizure-related injury, especially in the LMICs.[9]

In this study, the frequency of seizure-associated injury among children with epilepsy is similar to the finding by Lagunju *et al*[9], who reported a frequency of 45.6%. However, Bajaj *et al*[10] in India reported a much higher frequency of 70.4%. This could be due to differences in the study population. This study sought injuries that occurred retrospectively among Nigerian children while the study by Bajaj *et al*[10] was a prospective study conducted among Indians. This shows that injuries occur more frequently in children with epilepsy and this can be attributed to the associated factors seen among these children. Such factors include characteristics of the seizure such as the episodic nature of impairment of consciousness and motor control, psychomotor comorbidity, duration and frequency of the seizure and drug compliance. In the extant study, the majority of subjects with seizure-related injuries belong to the middle- and low socioeconomic class, this shows a possible link between poverty and the risk of injury among children with epilepsy. Thus, general awareness, general safety measures and enforcement of child safety laws are likely to be inadequate among these groups.

In the extant study, tonic-clonic seizure was the commonest seizure type that caused most injuries. This could be explained by the sudden falls caused by this seizure type. Similar findings were also reported by Lagunju *et al*[9], Appleton *et al*[11], and Ting *et al*[12].

Skin bruises and soft tissue lacerations were the most common injuries following seizure in our study. Similar findings were reported by some researchers [7,9,11] This implies that majority of injury types noted in this study following seizure were minor accidents that may or may not require hospitalization. However, major accidents such as head trauma and submersion injury are possible occurrences as noted in this study, hence adequate child monitoring and care should be stressed during parental counselling. Children with poorly controlled epilepsy should be prohibited from going to high-risk areas like near water bodies, this should also be emphasized during the counselling session with the caregivers.[10]

Our study showed a strong association between seizure-related injuries and compliance with medication. Children with good and excellent compliance to medication had fewer injuries compared to those who were not on medication or on medication but were poorly compliant with anti-epileptic. Hence, the need to advocate for early commencement of anti-epilepsy medication and also to encourage strict adherence to medication use among this group. It is pertinent to state that the data on poor drug compliance may be underrepresented due to the fear of the caregivers being blamed for the poor drug compliance.

Conclusion

Children with epilepsy are at higher risk of injury and this risk is modified by some factors like socioeconomic status, seizure type, and compliance with medication

Limitation of the study

Though, structured interview was used to obtain the data used for this study, the data was prone to recall bias.

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