RESEARCH PAPER

Injuries in Children With Epilepsy: A Hospital-based Study

SUSHMA SAJJAN, #PUNEET JAIN , SUVASINI SHARMA, ANJU SETH AND SATINDER ANEJA

*From Departments of *Pediatrics, Lady Hardinge Medical College and associated Kalawati Saran Children Hospital and #Pediatric Neurology, Department of Neonatal, Pediatric and Adolescent Medicine, BL Kapur Super Speciality Hospital; New Delhi, India.*

Correspondence to:
Dr Suvasini Sharma,
Division of Pediatric Neurology,
Department of Pediatrics,
Lady Hardinge Medical College and associated Kalawati Saran Children Hospital, New Delhi 110001, India.
sharma.suvasini@gmail.com
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Objectives: To study the magnitude and pattern of injuries in children with epilepsy.

Methods: This prospective cohort study enrolled children with epilepsy (CWE) aged 2-16 years on treatment with anti-epileptics for a minimum duration of one-month and compared them with their own siblings (controls). A semi-structured questionnaire was used to enquire about epilepsy and type and frequency of injuries sustained at monthly follow-up visits. Participants were followed up for 12-months for occurrence of injuries.

Results: 208 cases and 212 controls were analyzed. 21 cases (10.1%) and 10 controls (4.7%) had sustained injuries (*P*=0.03) (RR 2.1; 95% CI, 1.0 - 4.4). Seizure-related injuries were present in 4.3% of cases.

Conclusion: Children with epilepsy are at an increased risk of injuries and hence need supervision.

Keywords: *Accidents, Seizures, Wounds and Injuries*.

Children with epilepsy (CWE) are considered to be at an increased risk for injuries as compared to the general population. Seizures related falls and accidental burns, and effects of anti-convulsant drugs on cognition and co-morbidities (attention deficit disorder, cognitive and motor impairments) may increase the risk of injuries in these children [1]. There are conflicting reports in literature regarding the magnitude of this risk [2-5]. Factors associated with an increased risk of injuries are high seizure frequency, certain types of seizures (*e.g.* generalized tonic clonic and atonic seizures) and associated use of antiepileptic drugs [6,7]. The risk of injuries may be further increased in children living in poor socioeconomic conditions in developing countries where awareness, general safety measures and enforcement of child safety laws are likely to be inadequate.

This study was conducted to compare the risk of injuries in children with epilepsy as compared to the controls. The secondary objectives were to study the magnitude and pattern of injuries in children with epilepsy, and to assess the factors related to increased incidence of injuries in children with epilepsy.

METHODS

This was a prospective cohort study conducted in a Government teaching hospital. We recruited children aged 2-16 years with a diagnosis of epilepsy [8] and on treatment with antiepileptic drugs for a minimum duration of one month, who presented to us from November 2010 to March 2012. Children who had motor disability and who were not willing for follow up were excluded from the study. The controls included siblings (unmatched) of children with epilepsy aged 2-16 years, who were chosen as they shared the similar socio-familial-cultural milieu as the cases.

Written informed consent was taken from the parent/ caretaker prior to the study. Ethical approval for the study was taken from our institutional ethics committee.

Parents of children with epilepsy were interviewed with a semi-structured questionnaire and open-ended questions. Details regarding age, sex, seizure types, duration, frequencies, and treatment were noted. Approximately equal number of siblings of cases who did not have epilepsy were enrolled in the control group to study the prevalence of injury in normal population. The cases and controls were followed up prospectively for a period of 12 months through monthly follow-up visits and diary analysis, and telephonic conversation. At each follow-up visit, both the child and the parents were enquired about the occurrence of any injuries associated with or without seizures, type, number, mechanism and place of injury and also the need for hospitalization or

medical aid received. Seizure-related injuries were defined as injuries occurring as a direct result of a seizure event. Physical examination was done when possible to confirm and examine the injuries reported.

RESULTS

A total of 272 children with epilepsy were screened, out of which 238 children met the inclusion criteria and were enrolled in the study. 243 siblings of cases were screened for inclusion. 30 cases and 31 controls were lost to follow up. A total of 420 children including 208 cases (62.5% males) and 212 controls (51% males) were finally analyzed.

The mean (SD) age of cases was 9.4 (3.8) y and of controls was 9.0 (3.8) y. Among the cases, the most common seizure semiology was generalized (49%). Other seizure characteristics are tabulated in ***Table* I**. A past history of seizure-related injury was present in 3.3% of cases. 21 children with epilepsy (10%) had injuries during the 12-month follow-up period. Among these 21 children, one child had 4 injuries, two had 2 injuries and the rest had a single injury (total 26 injuries). Nine (9/21, 42.9%) of them had seizure related injuries and 14 out of 26 injuries were seizure-related. There were no compliance issues in the study population.

Ten (4.7%) children in the control group suffered injuries (all had a single injury) in the study period. Children with epilepsy had significantly higher injury rate (RR 2.1; 95% CI 1.0 to 4.4) as compared to the controls (P=0.03). However, if we excluded the seizure-related injuries in the cases, then the injury rates were similar in the two groups (Cases 12/208, 5.8%; Controls 10/202, 4.7%; P= 0.63).

Home was the most common place of injury in both the groups with majority of the injuries occurring during activities of personal care (***Table* II**). Head and face was the most frequently affected site in cases (18/26; 69.2%) as well as controls (5/10; 50%). 34.6% (9/26) of cases and 50% (5/10) of controls with an injury sought medical attention.

***Web Table* I** depicts the distribution of various variables among children with epilepsy who had an injury and who did not have an injury. Type of epilepsy, past history of seizure-related injury, and use of ≥2 anti-epileptic drugs were associated with increased risk of injury (P<0.05).

TABLE I SEIZURE CHARACTERISTICS IN CHILDREN WITH EPILEPSY (N=208)

Characteristic	*N (%)*
Duration of epilepsy (y), median (IQR)	2 (1-5)
Seizure semiology, n (%)	
Generalized	102 (49)
Tonic-clonic	98
Absence	2
Myoclonic	2
Focal	104 (50)
with impaired consciouness	71
without impaired consciousness	24
Evolving to a bilateral convulsive seizure	9
Unclassified	2 (1)
Seizure frequency, n (%)	
<1 per year	104 (50)
Daily	6 (2.9)
Presence of aura, *n* (%)	5 (2.4)
Children on ≥2 anticonvulsant drugs, *n* (%)	20 (9.6)
Seizures while sleeping, *n* (%)	75 (36.1)
EEG abnormalities, *n* (%)	100 (48.1)
Neuroimaging abnormalities, *n* (%)	135 (65)

TABLE II TYPE AND MECHANISM OF INJURIES IN THE STUDY POPULATION

	Cases (26 injuries)		*Controls (10 injuries)*
	Total injuries	*Seizure-related*	
Soft tissue injuries	13	10	3
Abrasion/laceration/cut	9	3	4
Fractures	3	1	1
Others	1*	0	2[#]
Fall	15	9	4
Transportation accident	3	0	1
Bumped/crushed by objects	6	5	3
Others	2[@]	0	2[$]
Home	14	11	4
School	3	0	2
Street	5	1	4
Others	4	2	0
Personal care	12	11	1
Sports/exercise	8	1	8
Others	6	2	1

**Injury due to bites; [#]2 children had burns and scalds; [@]One due to over-exertion and 1 due to bite; [$]two due to contact with sharp/hot objects.*

WHAT THIS STUDY ADDS?

- Children with epilepsy had significantly higher risk for developing injuries, with seizure-related injuries the major reason for this increased risk.

DISCUSSION

In this hospital-based cohort study over one year, children with epilepsy had a significantly higher risk for developing injuries (10%) as compared to household controls (4.7%),

Few prospective studies in children have shown injury rates of 9 to 44% (follow-up period of 1-2 years) [9-11] and 11-21% in studies with longer follow up periods [2,12]. However, Kirsch, *et al*. [13] demonstrated that cognitively normal children with epilepsy did not have higher injury rates as compared to their non-epileptic peers. In our study too, the injury rates were similar in the two groups if seizure related events were removed. Data from India in this regard is absent.

The limitations of our study included use of parental reporting for ascertainment of injuries, lack of matching (although age and sex were comparable in the two groups as a whole), short follow-up period and tertiary-care hospital based study. The pre-existing or treatment emergent co-morbidities which may influence the rates of injuries were also not studied.

Previous studies have shown that most of the injuries in these children happen at home [2,9,10]. Majority of injuries in this study also occurred during activities of personal care. Hence, excessive restriction in an outdoor setting for these children may not be warranted. This would augment their social development and feeling of independence. There is; however, a need to undertake measures to modify the home environment and reduce the risk of injuries.

Contributors: SSJ**,** SS, SA: were involved in the concept and planning the design of the study; SSJ: collected the data; PJ: performed the analysis and interpretation of the data. SSJ and PJ wrote the first draft which was revised critically for important intellectual content by SA, SS and AS. All the authors approved the final version, and agree to be accountable for all aspects of the work. SA: will act as guarantor for the manuscript.
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WEB TABLE I DISTRIBUTION OF VARIOUS VARIABLES AMONG CHILDREN WITH EPILEPSY WHO HAD INJURIES AND NO INJURIES

	Injury (n=21)	*No injury (n=187)*	*P value*
Male gender	14	116	0.67
Age, y	10.2 (4.0)	9.3 (3.7)	0.30
Age at onset of epilepsy*, y	6.5 (4.3)	6.0 (3.7)	0.56
Type of epilepsy			0.002
Generalized	17	85	
focal	4	100	
Seizures during sleep	5	70	0.21
Presence of aura	4	1	0.44
History of seizure-related injury	4	3	0.002
Use of ≥2 AED	6	14	0.002

*AED: Anti-epileptic drugs. *Values in mean (SD).*