

## Original Article

### Magnitude and factors associated with seizure-related injury among patients with epilepsy at Amanuel Specialized Mental Hospital, Addis Ababa, Ethiopia

Samson Yarega Misiker<sup>1</sup>, Sefonias Getachew<sup>3</sup>, Adamu Addissie<sup>3</sup>, Yared Mamushet Yifru<sup>2\*</sup>

<sup>1</sup>School of Medicine, University of Gondar, Ethiopia

<sup>2</sup>Department of Neurology, School of Medicine, Addis Ababa University

<sup>3</sup>Department of Preventive Medicine, School of Public Health, Addis Ababa University

Corresponding authors\*: yared\_mty@yahoo.com

#### Abstract

**Background:** Seizure-related injuries (SRI) constitute one of the major areas of concern in managing people with epilepsy. Of those, the ones with generalized tonic-clonic seizures and drop attacks, are prone to sustain motor vehicle accidents, falls, burns, drowning, fractures, soft tissue and head injuries. Hence, this study aimed to assess the magnitude and associated factors of SRI among patients seen at Amanuel Specialized Mental Hospital, Ethiopia.

**Methods:** A cross-sectional study was conducted at a regular seizure follow up clinic. A total of 298 patients above 15 years of age were included in this study. Patients' socio-demographic and clinical data were collected based on interview and record review. Descriptive statistics were done and multivariable logistic regression was used to determine independent predictors of SRI with adjusted odds ratio and corresponding confidence interval. A  $p$ -value  $< 0.05$  was considered as statistically significant.

**Results:** A total of 298 patients were included in this study. Of these, 34.9% were reported to have SRI. Lacerations (54.2%), burn (19.8%) and dental-loss (15.8%) were the most common type of injuries. There was a 2.2-fold increase in the odds of SRI among those in grades 1-6 educational levels (AOR=2.19, 95% CI (1.04-4.54)), and a lower risk of SRI was found among those who could read and write (AOR=0.11, 95% CI (0.13-0.86)).

**Conclusions:** The study documented significant level of SRI among the study population with varied levels of severity. To minimize SRI, it is essential to target the above predictors through proper surveillance system in the follow-up clinics with continuous advocacy work to the family and working environment.

**Keywords:** Seizure-related injuries, Epilepsy, Trauma

**Citation :** Misiker SY, Getachew S, Addissie A, Yifru YM. Magnitude and factors associated with seizure-related injury among patients with epilepsy at Amanuel Specialized Mental Hospital, Addis Ababa, Ethiopia. *Ethiop Med J* 61 (2) 143-150

**Submission date :** 15 February 2018 **Accepted:** 14 March 2023 **Published:** 31 March 2023

#### Introduction

Epilepsy is one of the most common acquired chronic neurologic disorders with a prevalence of approximately 0.8% [1]. Epileptic patients often have seizures with impairment of consciousness and abnormal uncontrolled movements [2]. In addition, they may have antiepileptic drug related side effects such as drowsiness, ataxia, blurred vision, and diplopia [3]. It seems intuitive that any condition involving a fall or impairment of consciousness has the potential to cause injuries and that curtailment of certain physical activities may reduce the risk of injury [4]. Even in the absence of obvious clinical seizure activity, paroxysmal (EEG) discharges have been shown to affect alertness and mental speed [4].

Epilepsy is also known to be associated with a number of co-morbid conditions which may also play an additional role in increasing the risk of injury. Attention deficit disorder is much more common in children with epilepsy (37% compared to 5% in healthy controls) [5], and has clearly been associated with an increased risk of accidental injury [6, 7]. Additionally, about a third of epileptic patients are shown to have some degree of cognitive impairment which may interfere with the awareness and alertness towards sensing and reacting to potentially dangerous situation. Some also suffer from co-morbid conditions like cerebral palsy that can interfere with motor response.

Several epilepsy-specific variables have been cor-

related with higher risks of injury. Seizure type has been a factor in most studies [8]. In a study done to assess the clinical risk factors for Seizure related injury (SRI) in adult People With Epilepsy (PWE) and analyzed to develop a predictive model done by Somsak Tiampakao and colleagues showed that Generalized Tonic-clonic Seizure (GTC) seizure type, having history of seizure attacks at least 12 times per year, and day time seizure were significant risk factors of having SRI. Based on this they developed the predictive model for having SRI in PWE and it gave 90.3% sensitivity and 46.7% specificity on the occurrence of SRI. They concluded that the significant predictive factors for SRI in PWE were the occurrence of GTCs, seizures at least 12 times per year or day time seizures [9].

An aspect of seizures most concerning to persons with epilepsy and to those who care for them is the potential for seizure-related injuries. Driving accidents, falls, drowning, suffocation, and other injuries are frequent concerns. Indeed, laws and rules concerning epilepsy are generally intended to protect the person with seizures from injuries as well as the public from the consequences of that person's seizures, especially with respect to driving a vehicle, piloting a plane, and operating other types of machinery [10]. Although taking preventive measures is to be encouraged, at times this concern may lead to unnecessary interventions that can potentially limit the privacy of patients and their right to participate in certain activities and will become an additional cause of stigma. Hence, identifying potential predicting factors and applying individualized preventive measures is an invaluable means to improve the quality of the health of patients. This will subsequently be a relief to the care takers, the public and the country as a whole. Patients with epilepsy can sustain any type of injury related to the seizure. A study conducted in Ethiopia showed that generalized seizures occurred in 69% of the cases, partial seizures in 20% and unclassifiable seizures in 11% [11].

To the best of our knowledge, there was no study done in Ethiopia which assessed SRI'S and associated factors so far. Hence, this study is aimed to assess the magnitude and associated factors for SRI among patients with epilepsy in Amanuel Specialized Mental Hospital. This study may benefit the health system to tailor necessary measures to mitigate the occurrence of the injuries and their complications thereby improving the health-related quality of life among patients with epilepsy and contributes its part in minimizing the loss of productivity and expenses that significantly compromise the country's economy. Importantly, the study may provide insight into the magnitude and types of SRI, and socio demographic factors associated with SRI. This would further enable health care programs to use the data for planning and

policy formulation like developing and implementing preventive measures to help patients with epilepsy.

## Methods

**Study design and area:** Institutional based cross sectional study was conducted from September 1-14, 2014 at Amanuel Mental Specialized Hospital (AMSH). AMSH is the oldest mental health hospital in the country established in 1930 and is situated in Addis Ababa, the capital city of Ethiopia. It currently has a total of 300 beds of which 277 are for inpatients and 23 for Emergency room, serving people from all corners of the country. There is also a large outpatient service, having more than 100,000 visiting patients each year. The hospital is known for treating PWE in a time when there were no neurologists in the country,- and that tradition is still continuing.

**Study population:** The study participants were recruited from regular seizure follow up clinic in the hospital during the study period. All patients with epilepsy, aged of above or equal to 15 years old diagnosed by unequivocal clinical and/or EEG diagnosis of epilepsy ( $\geq 2$ unprovoked seizures) were enrolled.

**Sample size and sampling technique:** A total of 298 patients who had a follow up at the clinics were enrolled in order of their arrival to the AMSH regular seizure clinic during the study period.

**Study tool and data collection:** Data was collected on patients socio demographic (Age, gender, race, occupation), seizure related information (nature, circumstance, severity, and consequence), Epilepsy (aura, prodromal, ictal and post-ictal phenomena description), were assessed using pre-tested structured questioner and a check list on review of information from the patient's record. Specific clinical data was gathered & organized using the diagnostic scheme for the classification of seizures and epilepsy by ILAE, 1981 (to determine the epileptic seizure type), & Seizure Frequency Scoring Scale as modified from *E.L. So et al.*1997(12). Data was collected by two medical professionals based on interview, physical examination and review of the patient's record. And SRI history is collected as long as they remember.

**Data analysis:** The data was entered and analyzed using the statistical package for social sciences (SPSS) version 16 statistical Software. The descriptive information was determined using the frequency, proportion, mean, and standard deviations. Odds ratios (OR) and their 95% confidence intervals (CI) were estimated using bivariate and multivariable logistic regression analysis to identify possible explanatory variables associated with seizure related injury. P-value of less than 0.05 was used to chose variables which have association in the bivariate model to mul-

tivariable model analysis. The result at p-value <0.05 was considered statistically significant in the final model.

### Operational definitions

Epilepsy; two or more unprovoked seizures

SRI; any physical trauma or injury that resulted as a direct consequence of the seizure

Status epilepticus; a single seizure episode lasting for at least 30 minutes, or two or more episodes occurring one after the other before the patient regains full consciousness in between the attacks.

### Results

#### Socio-demographic characteristics of study participants.

A total of 298 patients were included in the study with a response rate of 100%. The majority of patients included in the study were younger 192(64.4%), males 174(58.4%), Christians 239 (80.2%), single 189(63.4%), Right-handed 288(96.6%), educated 222(74.5%), unemployed 133 (44.4%), and 216(72.5%) were living with their parents or siblings (Table 1).

#### Type of seizure related injuries

A total of 114 (34.9%) patients reported to have SRI due to active seizure (Figure 1). Out of these 10 (8.8%) reported multiple types of injuries while the rest had single type of injury. Most common types of injuries sustained were lacerations (54.2%), burn (19.8%) and dental-loss (15.8%). Additional reported injuries included fractures, joint dislocation, contusion and head injury (Table 2).

#### Clinical characteristics of epileptic patients during presentation

Of those patients included in the study 162 (54.4%) had seizure for more than 10 years. All the rest reported to have their seizure onset within the last 10 years. Among these participants 120 (40.3%) had seizure attacks usually during the nighttime while 83 (27.9%) had seizure during the day time. Seizure related injury happened mostly at home 61 (53.5%) followed by work place 21 (18.4%), in the street 19 (16.7%) and school 11 (9.6%) (Figure 1).

**Table 1.** The socio demographic characteristics of study population seen at regular seizure follow up clinics of Amanuel Specialized Mental Hospital, 2015. (n=298)

Characteristics	Frequency	Percentage
Age groups		
15-30	192	64.4
31-65	106	35.6
Mean age(+SD)	30.6(12.5)	
Gender		
Male	174	58.4
Female	124	41.6
Marital status		
Single	189	63.4
Married	87	29.2
Divorced/Separated	8	2.6
Widowed	14	4.7
Handedness		
Right-handed	288	96.6
Left-handed	10	3.4
Educational level		
Unable to read and write	76	25.5
Able to read and write only	21	7.0
Grade 1-6	61	20.5
Grade 7-12	92	30.9
Grade 12+	48	16.1
Living situations		
Alone	18	6.0
With parents and /or siblings	216	72.5
With spouse	52	17.4
Other	12	4.0
Occupational status		
Self	101	34.0
Government	57	19.2
NGO	7	2.4
Unemployed	133	44.4

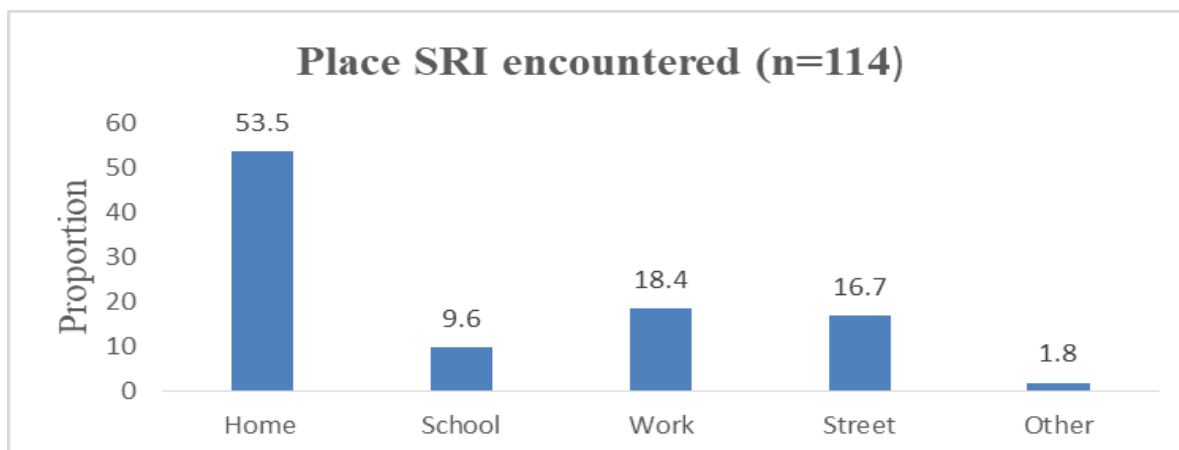


Figure 1. The place where SRI encountered among epileptic patients at regular seizure follow-up clinics of Amanuel Specialized Mental Hospital, 2015.

Table 2. The magnitude, type and severity of active seizure related injuries among Epileptic Patients seen at regular seizure follow up clinics of Amanuel Specialized Mental Hospital, Addis Ababa, 2015.

Type of injury	Number (%)	Degree of Severity		
		Mild No(%)	Moderate No(%)	Severe No(%)
Fracture	6 (6.3)	6 (100)	--	--
Joint dislocation	6 (6.3)	2 (33.3)	2(33.3)	2(33.3)
Laceration	52 (54.2)	45 (92.7)	6 (6.3)	1 (1.0)
Contusion	6 (6.3)	6 (100)	--	--
Sprain	2 (2.1)	2 (100)	--	--
Burn	19 (19.8)	10 (52.6)	6 (31.6)	3 (15.8)
Head injury	5 (5.2)	5 (100)	--	--
Dental injury	18(15.8)	--	--	--
Multiple injuries	10			
Total	114*	76	12	6

\*104 active injuries (cases) 10 were multiple injuries.

The rest 95(31.9%) had seizure attacks both during the day and the night time. The majority 283 (94.9%) of the participants reported GTC seizure during attack. Among them only three patients were ever diagnosed with status epileptics. Most reported 237(79.5%) a seizure time ranging from 5-30 minutes during attack (Table 3). A total of 87 (29.2%) participants reported to have pre-seizure symptoms or aura whereas the majority 231(77.5%) reported to have post-seizure symptoms of some kind.

The most frequently reported post-seizure symptoms were headache 70(23.5%) and deep sleep 65(21.8%). The majority of participants 255(85.1%) had delays in starting treatment after onset of seizure. Among these 111(35.1%) delayed for less than one year, 91 (31.6%) for 1 to 5 years and the rest 53(18.4%) for more than five years (Table 3).

Table 3. The clinical characteristics of epileptic patients during presentation at regular seizure follow up clinics of Amanuel Specialized Mental Hospital, Addis Ababa 2015.

Clinical characteristics (n=298)	Frequency	Percentage
Onset of epilepsy symptoms		
Last 1 year	10	3.4
Last 1-5 years	62	20.8
Last 5-10 years	64	21.5
Before 10 years	162	54.4
Signs and symptoms that come before the actual seizure		
Headache	12	13.8
Blurring of vision	30	34.5
Shocking sensation	8	9.2
Dizziness	10	11.5
Fearfulness	13	14.9
Palpitation	4	4.6
Other	10	11.5
People tell you about what actually happens during the seizure		
GTC	283	94.9
Focal	13	4.4
Absence	2	0.7
The duration of the actual seizure in most of the attacks		
< 5 min	58	19.5
5-30 min	237	79.5
> 30 min	3	1.0
What happens after the actual seizure stops		
Nothing	67	22.5
Headache	70	23.5
Deep sleep	65	21.8
Confusion/disorientation	17	5.7
Headache and Deep sleep	60	20.1
Headache and confusion	5	1.7
Both (headache +deep sleep +confusion)	6	2.0
	8	2.7
Ever been diagnosed with status epileptics		
Yes	3	1.0
No	295	99
The time gap between the onset of the symptoms and the start of antiepileptic drug treatment		
Immediately	43	14.9
< 1 year	111	35.1
1-5 years	91	31.6
> 5 years	53	18.4
Last time you had a seizure		
Last 24 hrs.	16	5.4
Last 1 week	36	12.1
Last 1 month	51	17.1
Last 1-6 months	65	21.8
Last 6-12 months	63	21.1
Before 2 years	67	22.5
Timing of the occurrence of most seizure attacks		
Night time when asleep	120	40.3
Day time when awake	83	27.9
Day time or night time	95	31.9

Continued....

Seizure frequency score		
Seizure free, off AED	19	6.4
Seizure free, need for AED unknown	27	9.1
Seizure free, on AED	54	18.1
Simple partial seizure only	6	2.0
Nocturnal seizure only	15	5.0
1-3/yr.	34	11.4
4-11/yr.	20	6.7
1-3/mo.	97	32.6
1-6/wk.	22	7.4
1-3/d	2	0.7
4-10/d	2	0.7

**Associated factors of SRI**

A multivariate logistic regression result depicted that; The odds of SRI increased by 2.2 times (AOR=2.19, 95% CI (1.04-4.54) among those who were in grade 1-6 education levels, and a lower risk of SRI was re-

ported among those who able to read and write (AOR=0.11, 95% CI (0.13-0.86)(Table 4).

**Discussion**

Patients with epilepsy can sustain any type of injury

**Table 4.** The Socio demographic factors associated with active seizure related injuries among epileptic patients at regular seizure follow up clinics of Amanuel Specialized Mental Hospital, 2015.

Variables	Active injury (SRI)		COR 95% CI	AOR 95% CI
	Yes	No (%)		
<b>Age groups</b>				
15-30	68(65.4)	124(63.9)	1.00	1.00
31-65	36(34.6)	70(36.1)	0.57(0.57-1.55)	1.19 (0.65 - 2.21)
<b>Gender</b>				
Male	54(51.9)	120(61.9)	1.00	1.00
Female	50(48.1)	74(38.1)	1.5(0.93-2.43)	1.49 (0.86 - 2.59)
<b>Marital status</b>				
Single	72(69.2)	117(60.3)	1.00	1.00
Married	24(23.1)	63(32.5)	0.62(0.36-1.08)	0.98 (0.42 - 2.29)
Divorced	3(2.9)	5(2.6)	0.98(0.23-4.20)	0.58 (0.12 - 2.89)
Widowed	5(4.8)	9(4.6)	0.90(0.29-2.80)	0.65 (0.16 - 2. 61)
<b>Educational level</b>				
Unable to read and write	24(23.1)	52(26.8)	1.00	1.00
Able to read and write only	1(1.0)	20(10.3)	0.11(0.01-0.85)	0.11 (0.01 - 0.86) *
Grade 1-6	28(26.9)	33(17.0)	1.84(0.92-3.70)	2.19 (1.04 - 4.58) *
Grade 7-12	31(29.8)	61(31.4)	1.10(0.58-2.11)	1.17 (0.58 - 2.33)
Above grade 12	20(19.2)	28(14.4)	1.55(0.73-3.28)	1.59 (0.70-3.65)
<b>Occupational status</b>				
Self	29(27.9)	72(37.1)	1.00	1.00
Government	20(19.2)	37(19.1)	1.34(0.67-2.69)	1.14 (0.53 - 2.42)
NGO	2(1.9)	5(2.5)	0.99(0.18-5.41)	0.98 (0.17 - 5.79)
Unemployed	53(51.0)	80(41.2)	1.65(0.95-2.86)	1.82 (0.96 - 3.46)
<b>Living situations</b>				
With parents /siblings	78(75.0)	138(71.1)	1.00	1.00
Alone	8(7.7)	10(5.2)	1.42(0.54-3.74)	2.07 (0.71 - 6.05)
With spouse	12(11.5)	40(20.6)	0.53(0.26-1.07)	0.62 (0.24 - 1.63)
Other	6(5.8)	6(2.6)	1.77(0.55-5.67)	2.66 (0.70 - 10.12)

NB\*= $p < 0.05$ , COR=Crud Odds Ratio, AOR=Adjusted Odds Ratio

related to their seizure. And this study tries to give an overall description of SRIs with their associated factors. In our study the prevalence of SRIs among PWE found to be 34.9% which is apparently more than that reported by the European cohort study (21%) [9] but less than some other reports like the one by Asadi-Pooya et al (53%) [3].

The most common types of injuries reported were lacerations (54.2%), burn (19.8%) and dental-loss (15.8%) followed by fractures, joint dislocation, contusion and head injury. There were no reports of submersion injury or injury to the eye. This is more or less consistent with other studies. There was higher prevalence of reported dental injuries (about 4.5% in other studies) [15] when we come to SRHIs (Seizure related Head Injuries) while it is common in other studies (78%), it was 5.2% in our case [13]. One possible explanation for this variation may be that most patients who sustained severe head injuries may not have survived to report it or some might have trivialized mild to moderate head injuries.

In this study the majority of patients reported to have seizure for more than 10 years (54.4%), while the rest had it in the last 10 years. Most had seizure attacks usually during the night (40.3%), while 27.9% had seizure during the day. The rest (31.9%) had seizure attacks both during the day and night. It is intuitive to assume that seizures that occur exclusively at night, in the safety of one's bed, probably also lead to less risk of injury than those occurring predominantly during the day.

Only three types of seizures were reported: Generalized tonic clonic-seizures (94.9%), focal seizures (4.4%) and absence seizures (0.7). Other types of seizures were not reported or detected probably as result of limited capacity and inadequate effort to look into the various seizure types by physicians and reporting errors on the patient's side. However our finding is consistent with other studies in a sense that most seizures are generalized in nature.

The duration of active seizure reported by the majority was 5-30 minutes. However we should keep in mind that much of the convulsive fit results in the attendants' panic there by making tracking of time somewhat unreliable. Moreover, we have noted that many of them count the post-ictal phenomenon including sleep time as part of the convulsion, and therefore we suspect the actual duration of the active convulsion might be less than 5 minutes as noted elsewhere in other studies.

A total of 29.2% reported to have pre-seizure symptoms or aura. Presence of a warning aura with every seizure is shown to be protective from accidents [14]. Most patients had delays in starting treatment after one set of seizure. In earlier studies this were highly

associated with SRI by way of more frequent &/or longer attacks [14]. The places of the seizure also have great relevance in terms of the risks for SRI. Most seizure related injury happened mostly at home followed by work place, the street and the school. Though home is relatively safe injury depends on the circumstances and these calls for precautions even at home.

Socio demographic factors such as age, sex, religion, marital status, occupation, and living situations were not found to be statistically associated with SRI in this study, while a higher prevalence of SRI during active seizure was associated with a low educational status. Patients with a lower education status were having 2.2 times more chance of SRI compared to those who are unable to read and write. And those who have no further education other than able to read and write only were found to have a lower chance of exposure to SRI (AOR=0.11, 95% CI (0.13 -0.86).

This study has its own limitation which includes its retrospective nature, difficulties in retrieving relevant information from poorly documented patient charts, difficulties in differentiating single versus multiple SRI among patients, recall bias related to the different aspects of SRIs and challenges in diagnosing comorbid disorders that may be linked to SRIs.

### Conclusion and recommendations

The study documented significant levels of SRI among the study population with varied levels of severity. Soft tissue injuries and burn were the most common types of injuries detected. The only socio-demographic factor associated with SRI was a lower educational status. However, further large scale epidemiologic studies are highly recommended. Availing awareness raising mechanism for epileptic patients, their care givers and professionals in Ethiopia on SRI is highly important to mitigate the problem to our understanding. Besides Surveillance and monitoring of SRIs, advocacy work on behalf of epileptic patients for a safer home and work environment is very essential.

### Authors contribution

SY, YM, AA: conceptualized and designed the study. SY: Wrote the research proposal, conducted the research, analyzed the data and write a draft manuscript. YM, SG, and AA: Involved in the write up of the proposal, data analysis and write up of the manuscript. All co-authors contributed to its improvement and critically reviewed the manuscript development. All authors approved the final version of manuscript.

**Ethical approval:** Ethical clearance was obtained from the Ethical review committee of the Department of Neurology reference number SM/NEURO/065/2007. Informed consent was obtained from all patients or caregivers involved in the study after explaining the nature of the study in the language they understand and those who were diagnosed with the SRI were linked to the appropriate facility, if they were in need of further evaluation or treatment.

**Funding:** Funding comes through Addis Ababa university, as part of postgraduate study research funding and .The funder has no role in the publication of this study.

**Conflict of Interest:** The authors have declared that no competing interests

#### **Acknowledgements**

We are grateful to the school of medicine at Addis Ababa University for funding the research cost of the study. Finally, we would like to extend our deep appreciation to the data collectors and persons involved in facilitating patients interviews and card review in the hospital. And all the participants.

**In Memory of :** Dr.samson Yaregal the PI of this study and our colleague ,whom we lost 2022 and saddened by his passing at a younger age.

## **References**

1. Hauser WA. Incidence and prevalence. In: Engle Jr J, Pedley TA, editors. *Epilepsy: a comprehensive textbook*. Philadelphia: Lip-pincott–Raven; 1997. p. 47–57.
2. Collaborative Group for the Study of Epilepsy. Prognosis of epilepsy in newly diagnosed patients: a multicenter prospective study of the effects of monotherapy on the long-term course of epilepsy. *Epilepsia* 1992; 33:45–51.
3. Asadi-Pooya AA, Nikseresht A, Yaghoubi E, Nei M. Physical injuries in patients with epilepsy and their associated risk factors. *Seizure*. 2012 Apr;21(3):165-8.
4. Aldenkamp A, Arends J. The relative influence of epileptic EEG discharges, short nonconvulsive seizures, and type of epilepsy on cognitive function. *Epilepsia* 2004;45:54–63
5. Dunn DW, Austin JK, Harezlak J, et al. ADHD and epilepsy in childhood. *Dev Med Child Neurol* 2003; 45:50–4.
6. Leibson CL, Katusic SK, Barbaresi WJ, et al. Use and costs of medical care for children and adolescents with and without attention-deficit/hyperactivity disorder. *JAMA* 2001;285:60–6.
7. Swensen A, Birnbaum HG, Ben HR, et al. Incidence and costs of accidents among attention deficit/hyperactivity disorder patients. *J Adolesc Health* 2004; 35:346–9.
8. Van den Broek M, Beghi E. Accidents in patients with epilepsy: types, circumstances, and complications: a European cohort study. *RESt-1 Group. Epilepsia*. 2004 Jun;45(6):667-72
9. Tiamkao S, Sawanyawisuth K, Asawavichienjinda T, Yaudnopakao P, Arunpongpaisal S, Phuttharak W, Auevitchayapat N, Vannaprasaht S, Tiamkao S, Phunikhom K, Chaiyakum A, Saengsuwan J, Jitpimolmard S. Predictive risk factors of seizure-related injury in persons with epilepsy. *J Neurol Sci*. 2009 Oct 15;285(1-2):59-61
10. Sirven JI. Adding injury to insult: Seizure-related injuries. *Epilepsy Behav*. 2010 Nov; 19(3):195-6. doi: 10.1016/j.yebeh.2010.08.009.
11. Teklehaimanot R., The incidence of epilepsy in rural central Ethiopia, *epilepsia* 1997 May;38(5): 541-6
12. *E.L. So et al.* Assessing changes over time in temporal lobectomy: Outcome by scoring seizure frequency : *Epilepsy Research* 27 (1997) 119–125
13. Friedman DE, Tobias RS, Akman CI, Smith EO, Levin H S. Recurrent seizure-related injuries in people with epilepsy at a tertiary epilepsy centre: a 2-year longitudinal study. *Epilepsy Behav*. 2010 Nov ;19(3):400-4
14. Wirrell, E.C. (2006), Epilepsy-related Injuries. *Epilepsia*, 47: 79-86. <https://doi.org/10.1111/j.1528-1167.2006.00666.x>