

The Incidence, severity, outcome and preventive measures of burn injuries in epileptic patients: An experience of burn unit in Govt. Medical College Srinagar.

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Abstract

Background: Burn injury among epileptic patients is very common and results in significant morbidity and mortality. Epileptics constitute a group of people who are vulnerable to injuries during seizures. The aim of this study was to evaluate, the incidence, severity, outcome and preventive measures of burn injuries in epileptic patients.

Methods: This study was conducted in burn unit of Post Graduate Department of surgery, Government Medical College Srinagar between May 2010 and April 2017. A total of 107 patients were enrolled in the study. All patients, irrespective of severity of their burn injuries with a diagnosis of epilepsy and/or history of epilepsy that admitted to our hospital were included in the study. Patients excluded from the study were those for whom there were insufficient data regarding the diagnosis or incorrect diagnosis of epilepsy. Patients characteristic, the mechanism of burn injury, the activity in which patient was engaged at the time of burn, and the energy source used was noted. Type, total body surface area (TBSA), severity and morbidities of burn injuries, operative procedures performed and their outcomes were evaluated from the patient's treatment files and annual admission register. All patients were taken to physician for consultation on the treatment of epilepsy. Statistical

Software SPSS (Version 20.0) and Microsoft Excel were used to carry out the statistical analysis of data.

Results: A total of 107 Epileptic patients were included in the study over a period of 7 years, with mean age of 35 years, and female and male ratio (F:M) of 4:1. 64(59.81%) were illiterate and 43(40.18% were literate. Generalized tonic clonic seizure was most common type of seizure disorder 78(72.89%) followed by absence seizures, complex partial seizures and simple seizures. Flame was the most common cause of burn injuries in epileptic patients 45(42.05%).The most common organ involved upper limb 31(28.97%). Most of the patients 81 (75.70%) had a TBSA involvement of < 20% and majority of injuries were second degree deep burns 37(34.57%). The most common complication was post burn ulcer 26(24.29%) followed by post burn contracture and gangrene. 53 (49.53%) patients required surgical intervention and rest of the patients were managed conservatively. Mortality in our study was 6 (5.60 %).

Conclusion: Epileptic patients were identified as a vulnerable group for burn injuries. Females are at greater risk than males of sustaining such an injury, as they are most frequently performing domestic work like cooking. The open flames as an energy source in rural areas increases the risk. The epileptic patients should be categorized as a high risk group in view of sudden and

unpredictable attack of epileptic seizures, which leads to loss of consciousness and accidental burn injuries. Had these patients been identified as belonging to a high risk group, the majority of them could have been saved. These injuries are morbid, and may impact on long-term functionality. Although superficial burn injuries can be managed by conservative means, deeper burn injuries require surgical interventions. The best outcomes are achieved through early surgical intervention in selected groups of patients, as well as through targeting all epileptic patients for education and instituting specific preventive measures.

Keywords: Epilepsy-Burn Injuries-Outcome-Preventive Measures

Background: Epilepsy is a neurological disorder characterized by repeated unprovoked seizures in the absence of a toxic metabolic or febrile condition. Epileptic seizures are due to abnormal excessive transitory electrical discharges by nerve cells¹. Patients with epilepsy have an increased risk of accidents and injuries when compared to the general population^{2, 3}. Some authors agree that the majority of people with epilepsy suffer accidents related to seizures^{4, 5}. Other studies suggest that the number of accidents not related to seizures in epileptic patients is lower than in non-epileptic individuals^{6, 7}. Patients with epilepsy should be encouraged to live normal lives, but there are certain seizure-related risks associated with epilepsy, including death, direct physical injury, or injury involving others. Because of these inherent risks, to prevent seizure-related morbidity or mortality, persons with epilepsy must take special precautions that may necessitate changes in lifestyle. The association between epileptic seizures and burn injury is quite clear. The attack of epilepsy comes without any warning signs, leading to loss of consciousness and convulsions. The relationship between

epilepsy and burn trauma is quite obvious, especially in circumstances where epileptic seizures are started in the surrounding area of burn accident⁸. It is important to identify this high risk group of patients and provide them with specific treatment, alongside the institution of targeted preventive measures. Such burn patients must be treated in collaboration with a neurologist to provide targeted antiepileptic treatment and prevention strategies. SMHS is a tertiary care hospital located at centre of Srinagar city, and serves a large indigent rural and peri-urban population. The aim of this study was to evaluate the incidence, types and of burn injury, site involved, and severity of burn injury, morbidities, operative procedures conducted, overall outcomes and measures to prevent or reduce the incidence, morbidity of burn injuries among epileptics during a period of seven years.

Methods: This study was conducted in burn unit of Department of surgery, Govt. Medical College Srinagar between May 2010 and April 2017. This study included 107 patients who had burn injury due to epileptic seizures, accounting for 2.9% of total number of burn patients admitting during this period. It was prospective observation study. All patients, irrespective of severity of their burn injuries with a diagnosis of epilepsy and/or history of epilepsy that admitted to our hospital were included in the study. Patients excluded from the study were those for whom there were insufficient data regarding the diagnosis or incorrect diagnosis of epilepsy. Patients characteristic, the mechanism of burn injury, the activity in which patient was engaged at the time of burn, and the energy source used was noted. Type, total body surface area (TBSA), severity and morbidities of burn injuries, operative procedures performed and their outcomes were evaluated from the patient's treatment files and annual admission register. Early surgical intervention was considered in all operative cases. All patients were

taken to physician for consultation on the treatment of epilepsy. Categorical variables were presented in number and percentage (%), and continuous variables were presented as mean ± SD or median. Statistical Software SPSS (Version 20.0) and Microsoft Excel were used to carry out the statistical analysis of data.

Results: A total of 107 epileptic patients were included in this study over a period of seven years. Majority of patients were females 86(80.37%) and males were 21(19.62%). 64(59.81%) of patients in our study were illiterate and 43(40.18%) were literate. Most common age group involved 30 to 40 years with mean age of 35 years (range 15 to 50 years) and majority of patients 81 (75.70%) belongs to rural area and 26 (24.29%) patients belongs to urban area, ratio of 3:1 (rural: urban) [Table 1].

Table 1 :Demographic Profile of Epileptic Burn Patients

Epileptic Patient with Burn	
No of Patients	107
Sex Ratio(Female : Male)	86:21(4:1)
Mean Age of the Patients (in Years)	35 (Range of 15-50 Years)
Rural and Urban ratio	81:26 (3:1)
Education	
Illiterate	64(59.81%)
Literate	43(40.18%)

All patients were taken to a physician for consultation on the treatment of epilepsy. About 78(72.89%) patients were diagnosed as a case of generalized tonic-Clonic seizures, this is followed by absence seizures, complex partial seizures and simple seizures and duration of epilepsy ranges from 1 to 15 years [Table 2].

Table 2 :Types of Epilepsy in epileptic burn patients

Types of Epilepsy	Number of Patients	Percentage
a. Generalized Tonic Clonic Seizures	78	72.89
b. Absence Seizures	12	11.21
c. Complex Partial Seizures	11	10.28
d. Simple Seizures	6	5.60

a. Duration of Epilepsy Ranging From 1 to 15 years

Most of patients 81 (75.70%) sustained a total body surface area (TBSA) <20% and 26(24.29%) patients

sustained burns of more than 20% .Burns that were more than 20 % of TBSA were predominantly due to open flame 45(42.05%) and scald burn 30 (28.97%)[Table 3]. 89.71% (96 patients) of injuries took place at home while cooking and bathing and 10.28% (11 patients) of injuries at work. In 53 patients (49.53%) injuries occurs between 5 am to 10 am and in 21 patients (19.62%) injuries occurs between 6 pm to 11 pm. In 46(42.99%) patients burn injuries occurred in winter season followed by autumn 32(29.90%), spring 21(19.62%) and summer 8(7.47%). Flame burn occurs mostly in female patients while they are cooking in the kitchen on open chula (fire wood), kerosene stoves, and due to liquefied petroleum gas cylinder, while scald burn occurs in the kitchen due to hot liquids from cooking and in the bathroom due to tap water. They had seizure attack and fell on fire and were scalded by boiled water. About 18(16.82%) patients had non-compliance with treatment, 20(18.69%) patients stop medicine once the seizures disappeared for sometime, 15(14.01%) patients reported first episode of seizure at the time injury, 5(4.67%) patients miss the dose on the day of injury, 30(28.03%) patients were under treatment, 14(13.08%) patients were under treatment of local quack or any spiritual icon, because they believe that this disease is caused by evil forces and hence it is not possible to get cured through modern medicine, 5(4.67%) patients reduces doses himself without consulting physician because of unable to afford the medicine and these patients are uneducated and have poor socioeconomic status. All patients of our study were treated by department of neurology. About 5 (4.67%) patients develop second attack of seizure in the same admission.

Table 3 :Causes of Burn Injuries In Epileptic Patients

Causes Of Burn	Number of Patients	Percentage
Flame Burn	45	42.05
Scald Burn	31	28.97
Contact With Hot Surface	20	18.69
Electrical Burn	10	9.34
Chemical Burn	1	0.93

There was a wide variation in the site of burns, but the majority patients involved the upper limb 31 (28.97%). Table 4 showed site of burn involved along with percentage.

Table 4:Site Involved During Burn In Epileptic Patients

Site Involved	Number	Percentage
Upper Limb	31	28.97
Trunk	27	25.23
Both Upper Limb and Trunk	8	7.47
Head, Neck and Face	12	11.21
Thigh and Buttock	7	6.54
Lower Limbs	10	9.34
Multiple	12	11.21

In this study, majority of patients have second degree deep burn, followed by mixed burn, third degree burn, first degree burn and second degree superficial burn [Table5]. First degree burn affects only outer layer of skin, known as epidermis, while as second degree superficial burn affects epidermis and part of dermis (partial thickness burn). The second degree deep burn affects epidermis and also destroys whole of dermis (full thickness burn). Third degree burn causes severe damage to nerve endings and permanent tissue damage and scarring. In Fourth degree burn all layers of skin are completely destroyed and muscle, fat, bone and tendon are often affected.

Table 5:Severity of bum injury and total body surface area (TBSA) involved in Epileptic patients

Variable	Number	Percentage
Severity		
First Degree Burn	13	12.14
Second Degree Superficial Burn	11	10.28
Second Degree Deep Burn	37	34.57
Third Degree Burn	17	15.88
Mixed Burn	29	27.10
TBSA		
<20%	81	75.70
>20%	26	24.29

All the first degree burn healed within 1 week, second degree superficial burns healed within 2 weeks, the second degree deep burns required 3 weeks to heal, with exception of the 5 patients which required split thickness skin grafting. 53 (49.53%) patients required surgical intervention. Most of these patients underwent more than one surgical procedure, i.e. either debridement, split skin grafting or both, 26(24.29%) patients were managed with escharectomy and STGS. 5 (4.67%) patients were managed by flap cover, 2(1.86%) were reverse sural flap for coverage of a distal leg defect and 3(2.80%) was distally pedicled anteromedial thigh flap for the infrapatellar region. 6 (5.60%) patients with contracture of elbow, 4 (3.73%)were managed by release of contracture with STSG and 2 (1.86%)by 5 flap Z-plasty.2 (1.86%) patients has gangrene right foot and were managed by below knee amputation. 1 (0.93%) patient had amputation of right hand fingers due gangrene. 1 (0.93%) patient has gangrene of the right arm and were managed by above elbow amputation, 6 (5.60%) patients with neck contracture were managed by release of contracture and STSG. 3(2.80%) patients with axillary contracture were managed by release of contracture with opposite running YV-Plasty and M-V Plasty , and 3 (2.80%) patients with both upper and lower lid ectropion were managed by release of contracture and defect was covered with full thickness graft [Table 6]. Most common complication in our study was septicemia which was managed by antibiotics, followed by contracture and gangrene. Mortality in our study was 6 (5.60 %). 4(3.73%) patients died with body surface area greater than 80% and 2 (1.86%) patients due to delay in presentation.

Table 6: Morbidities, Operative Procedures and Complications in Epileptic burn patients

Morbidities	Operative procedures	Number	Percentage
Post Burn Ulcer	Escharectomy and STSG(Split Thickness Skin Grafting)	26	24.29
Post Burn Lower Leg Defect	Reverse Sural Flap , and Distally Based Antero-Medial Thigh Flap	5	4.67
Post Burn Contracture Elbow	Release of Contracture and STSG,5-Flap Z-Plasty	6	5.60
Gangrene Right Foot	Below Knee Amputation	2	1.86
Gangrene Right Hand Digits	Amputation of Digits	1	0.93
Gangrene Right Forearm	Above Elbow Amputation	1	0.93
Post Burn Contracture Neck	Release of Contracture and STSG	6	5.60
Post Burn Contracture Axilla	Release of Contracture with Opposite Running YV -Plasty and M-V Plasty	3	2.80
Eye lid Ectropion	Release of Ectropion and Full Thickness Skin Grafting	3	2.80

Discussion: Patients with epilepsy have an increased risk of accidents and injuries when compared to the general population^{2,3}. Some authors agree that the majority of people with epilepsy suffer accidents related to seizures^{4,5}. It is important to identify this high risk group of patients and provide them with specific treatment, alongside the institution of targeted preventive measures, sustain dramatic burn injuries during the acute episodes. Burn injuries received during acute seizures have been reported by various authors in association with cerebral cysticercosis⁴ and in subjects wearing grass skirts⁹. It is estimated that less than one third of epileptic patients in the region receive appropriate antiepileptic treatment, and the subsequent poor control of seizures exacerbates the risk of accidental injury in these patients¹⁰. ‘In our study, the constituent ratio of epilepsy related burn injuries is 2.9%’. Which is lower than the study conduct by Bull et al. (5%)¹¹ and Meirelles et al. (10 %)¹². Lower incidence can be due to increase of awareness, literacy and health education about the disease.

In our study majority of patients 86 (80.37%) were females, with mean age of 35 years and most common age group involved 30 to 40 years (range 15 to 50 years) and most of people belongs to rural area 81 (75.70%), 64(59.81%) patients of our study were illiterate and 43(40.18%) were literate [Table 1]. The Burn occurs in home while they are cooking in kitchen. This coincides

with the findings of Meirelles et al¹², who noticed that a large number of patients had visual contact with the flame prior to the accident, suggesting that fire could be a photostimulator for the onset of seizure attack. We also noticed in our study that most of the patients were female and sustained injury while cooking in the kitchen. The greatest risk factors for the increased incidence of burns in epileptic patients are the frequency of seizure attack, the duration of the epileptic episode^{13, 14}, and a lack of awareness and education about the risk of burns among epileptic patients¹². In our study, majority of patients (81) belongs to rural area, because of large rural catchment area.

Our study reveals that the commonest type of seizure that occurred was General tonic colonic seizures 78(72.89%) followed by absence seizures 12(11.21%) [Table2]. Interruption of medication by patients was reported as the cause of burn injury in epileptic patients¹⁵. In Our study majority of patients either stop medication at all 20(18.69%) or non-compliant 18(16.82%) or owing to poverty and/or ignorance or taken medication from local quake or spiritual icons. This is similar to Manktelow’s series from Liberia¹⁶. Our study reveals that most of patients 81(75.70%) sustained a TBSA <20% and 26(24.29%) patients >20%. This is similar to international literature^{15,17, 18}. Most injuries about 49.5% occurs during morning time followed by evening time (19.6%). In 46(42.99%) patients burn injuries occurred in winter season followed by Autumn 32(29.90%), Spring 21(19.62%) and Summer 8(7.47%). Open flame was most common cause of burn injury in epileptic patients 45(42.05%), this is followed by scaled burn 31(28.97%)[Table3]. This can be explained on the basis that there is large dependence of rural population on open chula (fire wood), kerosene stoves. Also in winter most of people of valley use fire pots for warming. This is contrast

to the other studies while scaled burn is the most common cause^{15, 17,18}. The most common organ involved in our study was upper limbs 31[28.97%] followed by trunk 27[25.23%] [Table 4].

In our study, majority of patients 37 (34.57%) have second degree deep burn followed by mixed burn 29 (27.10%) and third degree burn 17(15.88%)[Table5],because of inability of epileptic patients to with draw from heat source during a seizure. Operative interventions are required in deep dermal and full-thickness burns to accelerate healing and reduce scarring. This can be achieved by burn excision and split-thickness skin grafting in most of cases¹⁸.In our study, majority of patients develops post burn ulcers 26 (24.29%) followed by contractures. All patients with deep burn required operative interventions in the farm of escharectomy and STSG, local flaps and amputation of gangrenous parts (foot, digits, and arm), release of contracture and STSG and Ectropion release and FTSG [Table 6]. In the study of Adigun et al.¹⁹A total of 250 patients were managed during the 5 year study period. Two patients (0.8%) fulfilled the criteria for inclusion and the extent of injury was quite severe: one patient required disarticulation of a gangrenous left hand at the wrist joint and disarticulation of gangrene of the right 3rd, 4th and 5th toes at the metatarsophalangeal joint, the other patient required disarticulation of the gangrenous fingers of the left hand at the metacarpophalangeal joints. We performed below knee amputation in 2(1.86%) patients who sustained electric burns over the right foot and presented late leading to gangrene of the foot. Mortality in our study was 6(5.60%) which is lower than international literatures, 4 (3.73%) patients have > 80% BSA and died because of sepsis and 2(1.86%) patients died because of delayed presentation. About 5 patients (4.6%) develop second attack of seizure in the same admission, which

were managed by adjusting dose of antiepileptic medication after consultation of neurologist. All patients after discharging from burn unit were advised to follow up in neurology unit. Although not all injuries are preventable, Burn injuries in epileptic can be prevented by taking simple measures including, treat epilepsy aggressively, one of the major problems in epileptic patients is their noncompliance, and patient's medication should be regularly monitored as per the advice of the physicians. Patients of higher risk should avoid unsupervised bathing. Most of burn injuries are caused by Flame and scald burn which can be minimized by using fire and radiator guards^{11,20,21}, flame-retardant clothing^{11,21} and installing thermostats to control the water temperature in showers. In the kitchen, the incidence of burn injuries can be prevented by use of microwave ovens²⁰, self-sealing deep-fat fryers, insulated plastic kettles, and cooker guards²⁰. The utilization of Mass Media approach is vital importance. A television or radio program in the vernacular language of the community will be most useful. It is critical that these programs adhere to the socio-cultural values of the community. A campaign that demonstrates burn prevention and safety skills such as isolation of all cooking sites with open flames, supervision and ready access to first aid, is likely to be more effective compared with one against total' use of open flames^{22,23}. The patient and his family should be educated about the disease and its complications and preventable measures.

Conclusion: Epileptic patients were identified as a vulnerable and high risk group for burn injuries. In our study females are at greater risk than males of sustaining such an injury, as they are most frequently performing domestic work like cooking. Open flam as an energy source in rural areas increases the risk. The epileptic patients should be categorized as a high risk group in view

of sudden and unpredictable attack of epileptic seizures, which leads to loss of consciousness and accidental burn injuries. Had these patients been identified as belonging to a high risk group, the majority of them could have been saved. Burn in epileptic patients is deep burns. These injuries are morbid, and may impact on long-term functionality. Although superficial burn injuries can be managed by conservative means, deeper burn injuries require surgical interventions. The best outcomes are achieved through early surgical intervention in selected groups of patients, as well as through targeting all epileptic patients for education and instituting specific preventive measures. Lack of proper understanding and education regarding epilepsy is the most set back that causes difficulties in treatment of epileptic burn patients. Epileptic patients and their families should be educated and counseled. This will improve compliance with the taking of medication and guarantee that epileptics do not cook while alone.

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