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Burn Injuries in Epileptic Patients: Prevalence, Causes, and Outcomes - A Cross Sectional Study at Pak Italian Burn Center Nishter Hospital Multan

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ABSTRACT

Objective: To evaluate the patterns of burn injuries, identifying the prevalence, causative factors and outcomes of burn injuries among patients of epilepsy admitted to the Pak-Italian Burn Center, Nishtar Hospital Multan.

Methodology: A descriptive cross-sectional study was conducted at the Pak-Italian Modern Burn Center, Nishtar Medical University and Hospital, Multan from January 2018 to June 2023. Patients with epilepsy and burn injuries caused directly by seizures, covering all age groups and both genders were included. Patients were received in the emergency department where the fluid resuscitation was done and every effort was made to eliminate shock and were admitted to the burn unit. On the stable condition all the patients or their care taker were interviewed to assess the causes of burn injuries. A structured proforma was used to collect data including demographic characteristics, causes of injuries and outcomes. Data was analyzed using SPSS version 26.

Results: Out of 3482 patients with burn injuries, 264 (7.5%) were epileptic. Average age of patients was 30.10±11.23 years. About 52.7% burn accidents occurred at homes, 28.4% at workplace and 18.9% at some outdoor locations. Based on causes flame burn was the most common with 48.5% followed by scald, electric burns and other miscellaneous causes with 42.4%, 4.9% and 4.2% incidence rate respectively. Post-burn contracture was the most common complications in 37.9% patients, followed by wound infections 19.3% cases, while 12.1% patients experienced loss of body parts. Overall mortality rate was 11.4%.

Conclusion: Burn injuries among epileptic patients were observed 7.5%, with the most common causes being flame burns, scalds, and electrical burns and overall mortality rate of 11.4%.

Key words: Epilepsy, Burn injuries, Prevalence, Etiology, Complications.

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Introduction

The global burden of epilepsy affects approximately 5 million people annually.[1] Each year, epilepsy is estimated to impact 49 out of every 100,000 individuals in industrialized nations. In contrast, this figure rises significantly in low- and middle-income countries, reaching up to 139 per 100,000 individuals.[2] Epilepsy, a disorder that manifests as recurrent seizures, has significant neurological, psychological, cognitive and social consequences for individuals. Most seizures last from 30 seconds to a couple of minutes relying upon the type of epilepsy. During this short interval patients can withstand some kind of dramatic injuries that require immediate medical assistance. People with epilepsy are more likely to die as a result of an accident than non-epileptic patients. Man or woman with epilepsy has a 5% chance per year of visiting an emergency department due

to seizure-associated damage. They suffer from fractures, burns and other serious deformities.[3,4]

Burn accidents are common in epileptic patients with worldwide reported incidence of approximately 1.6-10% of total hospital admitted burn patients.[5] Epilepsy attacks occur suddenly and without any prior warning, resulting in unconsciousness and convulsions. Therefore, the connection between epilepsy and burn damage is clear, particularly if the attack occurs close to burn agents. Prolong contact with heat might occur during the first minutes of unconsciousness as the preface of epileptic assault, and results in excessive and serious burns. People with epilepsy mostly undergo such burn injuries while performing their routine activities i.e., cooking, ironing, bathing, using heaters.[6,7] Risk factors for sustaining a burn harm include frequency and type of seizure, female gender and non-compliance to medication. The more frequently seizures occur, the more are possibilities of getting burn injuries. Burns in epileptics tend to share common characteristics. The duration of epilepsy, sex, and frequency of seizures, previously identified as key predictors, frequently are compounded by non-compliance with anticonvulsant therapy, and there is a limited awareness among epileptics of the risks of injury and burns.[8-10]

According to a study from Southwest China reported a burn injury prevalence of 0.78% among 184 epileptic patients.[11] Another international study, conducted over one year, reported a prevalence of 26.5% among epileptic patients over 20 years.[12] Additionally, a recent global study indicated that 9.8 per 1,000 individuals experienced seizure-related injuries.[13] Given these conflicting findings on the prevalence of burn injuries in epileptic patients worldwide, along with the scarcity of local data, this retrospective study aimed to determine the prevalence, causes, and outcomes of burns resulting from seizures in epileptic patients at the Pak-Italian Modern Burn Center, Nishtar Medical University and Hospital, Multan, Pakistan.

Methodology

This descriptive cross-sectional study was conducted at the Pak-Italian Modern Burn Center, Nishtar Medical University and Hospital, Multan, Pakistan. Data was collected from January 2018 to June 2023. After obtaining approval from the Institutional Ethical Committee, a total of 3,482 patients with burn injuries were reviewed. Among these, only 264 patients with burns specifically attributed to epileptic seizures met the inclusion criteria and were enrolled in the study. Inclusion criteria encompassed patients with documented epilepsy and burn injuries caused directly by seizures, covering all age groups and both genders. All the patients with burn injuries that were unrelated to seizures, patients incomplete medical records or missing data on epilepsy diagnosis and the chronically burn cases were excluded. Patients were received in the emergency department of Nishtar Hospital Multan where the fluid resuscitation was done and every effort was made to eliminate shock. After those patients were admitted to the burn unit, wounds were cleaned with pyodine scrub and normal saline and the topical agent was applied to the wound. Empirically, 3rd generation cephalosporins were started in all patients. Wound swab cultures from three different sites from all patients were taken, at the time of admission and then at every seventh day and then antibiotics were initiated according to the results of bacteriological examination.

During their stay in the ward, strict monitoring of intake/output was done. Where indicated, patients were supported with blood products. In all the patients, great care was given to nutrition. Almost all the patients were on oral feed with occasional intravenous support in the form of amino acid infusion in a few patients. On the stable condition all the patients or their care taker were interviewed to assess the causes of burn injuries. A structured proforma was used to collect data including demographic characteristics, causes of injuries and outcomes. Furthermore, data was analyzed using SPSS version 26.

Results

Out of 3482 patients with burn injuries, 264 (7.5%) were epileptic. Average age of patients was 30.10±11.23 years. Literacy rate among such patients was only 23.1% while others were illiterate. Only 70 (26.5%) epileptics were on regular anti-epileptic medication, 75% patients with burn injuries had previous history of fits and 25% are those who never experienced fits before. GTCS were commonest with 38.6% incidence rate, complex partial seizures with 24.2% and 37.1% cases were not specified. Epilepsy related inquiry. 82 (31.1%) patients suffered from burn injuries involving face and neck, 34 (12.9%) involving upper limb, 20 (7.6%) involving trunk, 90 (34.1%) patients had involvement of both upper limb and trunk, 19 (7.2%) patients involving trunk and lower limb and 19 (7.2%) patients involving only lower limb. Furthermore, the SES, residential status and educational status are presented in table I.

Table I: Demographic and clinical variables of the patients. (n= 264)

Burn related factors		No. of cases	(%)
Previous history of fits	Yes	198	75
	No	66	25
Type of epilepsy	GTCS	102	38.6
	CPS	64	24.2
	Not specified	98	37.1
Anti-epileptic treatment	Yes	70	26.5
	No	86	32.6
	Occasionally	108	40.9
Age of patient	<11 years	11	4.2
	12-20 years	42	15.9
	21-30 years	130	49.2
	31-40 years	58	22
	41-50 years	12	4.5
	51- 60 years	6	2.3
	>60 years	5	1.9
Socioeconomic status	Low class	249	94.3
	Middle class	11	4.2
	Upper class	4	1.5
Residential area	Urban	156	59.1
	Rural	108	40.9
Literacy rate	Literate	61	23.1
	Illiterate	203	76.9
Previous history of fits	Yes	198	75
	No	66	25
Type of epilepsy	GTCS	102	38.6
	CPS	64	24.2
	Not specified	98	37.1
Anti-epileptic treatment	Yes	70	26.5
	No	86	32.6
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About 52.7% burn accidents occurred at homes, 28.4% at workplace and 18.9% at some outdoor locations. Based on causes flame burn was the most common with 48.5% followed by scald, electric burns and other miscellaneous causes with 42.4%, 4.9% and 4.2% incidence rate respectively. <20% TBSA was involved of 52 patients (19.7%). 167 patients had 21-40% TBSA involvement and 45 patients had >40% TBSA involvement. STSG is the commonest surgical procedure, performed on 86 (32.6%) patients followed by FTSG on 75 (28.4%). 71 (26.9%) patients were treated with debridement and 32 (12.1%) with amputation. Post burn contracture is the amongst complication of burn occurred in 100 (37.9%) patients, wound infection was observed in 51 (19.3%) cases and loss of body part in 32 (12.1%) epileptic patients with burns. Out of 264 epileptic patients (11.4%) died as a consequence of such a drastic accident and 234 (88.6%) were discharged after appropriate treatment. Table II.

Table II: Causes of burn injuries and outcomes of the patients. (n= 264)

Burn related		No. of cases	(%)
Location	Home	139	52.7
	Workplace	75	28.4
	Outdoor	50	18.9
Type of Burn	Flame	128	48.5
	Scald	112	42.4
	Electric burn	13	4.9
	Falls Resulting in Burns	11	4.2
TBSA	<20%	52	19.7
	21-40%	167	63.3
	>40%	45	17
Degree of burn	1st degree	55	20.8
	2nd degree	65	24.6
	3rd degree	129	48.9
	Mixed	15	5.7
Treatment	STSG	86	32.6
	FTSG	75	28.4
	Debridement	71	26.9
	Amputation	32	12.1
Post burn complications	Contracture	100	37.9
	Infection	51	19.3
	Loss of body part	32	12.1
	None	81	30.7

TBSA= total body surface area, STSG= split-thickness skin graft, FTSG= full thickness skin graft

Discussion

Epilepsy is considered as one the most serious non-communicable chronic neurological conditions in the world. People with this neurological ailment are high risk individuals for enduring any kind of minor and major injuries. Various authors found burn injuries as leading cause of morbidity and mortality among epileptics. Hampton et al. reported that 38% of epileptics had burnt during seizures in the period of 5 years.[10] Epilepsy 3 times more correlated to burns than any other disorder. In this study, out of 3,482 patients with burn injuries, 264 (7.5%) were identified as epileptic patients who were admitted to the department for burn treatment and among the causes of burn injuries, flame burns were the most common, 48.5%, followed by scalds 42.4%, electric burns 4.9%, and other miscellaneous causes were 4.2%.

Although inconsistently reported, Lam NN et al[15] noted a lower prevalence, with epileptic patients comprising 1.38% of total burn admissions. However, they consistently observed a significantly higher proportion of adults (81.75%) and flame burns (58.39%) in the epilepsy group compared to non-epileptic individuals.[15] Additionally, Jiburum et al[16] identified flame burns as the leading etiology among epileptic burn patients, and Johari MG et al[17] reported that flame burns accounted for 66.6%

of injuries in their study population. Scald injuries, including those caused by hot showers, are increasingly being recognized as a notable cause of burns, especially in developed countries. All the findings collectively underscore the need for targeted safety interventions to reduce the risk of burn injuries among epileptic individuals, both in domestic and occupational environments.

Like this study Faurie et al[18] highlighted two-thirds of burn accidents among epileptic patients occurred at home, establishing the home as the most vulnerable site for such incidents. Our finding underscores the risk faced by women engaged in domestic activities when a seizure occurs, often resulting in burn injuries. Similarly, Nguyen R et al[6] reported that women are twice as likely as men to sustain epilepsy-related burns, further emphasizing gender-specific vulnerabilities. In aligns with these studies, our findings reveal that young adults, particularly those aged 30 ± 11 years, constitute the majority of burn victims, often women engaged in domestic activities during seizure episodes, while the low incidence in children and older individuals highlights the protective measures and caution exercised by their families, which may reduce their exposure to such accidents.

Like this series, studies have consistently highlighted the anatomical distribution and socioeconomic factors influencing burn injuries in epileptic patients. Botan et al[19] reported that facial burns and upper limb injuries were the most common, with significant cases of deep facial burns leading to eye loss in 66.6% of patients. These findings align with Faurie et al[18] who also emphasized the vulnerability of the upper half of the body during seizures. Furthermore, an African study underscored the rising incidence of post-burn facial deformities, highlighting a critical area of concern. Socioeconomic and educational disparities exacerbate the risks associated with burn injuries. In low-income settings, reliance on open fires and wood stoves for cooking often due to energy crises heightens exposure to burn hazards, especially for epileptics. This pattern is evident in rural and urban populations in developing countries, where lack of awareness and resources perpetuate these preventable injuries. Additionally, Lam NN et al[15] reported a larger percentage of epileptic patients resided in rural areas (79.56% vs. 67.66%; $p < 0.01$). According to a study two-third of the epileptics were on medication and one-fourth were on no treatment.[21] Findings of this study corroborate these observations, demonstrating a need for targeted interventions to improve safety measures and awareness in high-risk groups.

In this study, 60% of patients experienced third-degree or deep second-degree burns, a finding comparable to Akhtar et al, where third-degree burns accounted for 17% and deep second-degree burns for 33%.[22] These injuries often result from prolonged contact with heat sources during seizures, exacerbated when patients are alone. GTCS were the most frequent cause, consistent with studies by Asadi Pooya et al[23] and Akhtar et al[22] emphasizing the need for patient supervision and education about seizure management.

In this study mortality and recovery rates observed significant, with an 11.4% mortality rate among epileptic burn patients. In the comparison of this study Johari MG et al[17] reported that a total of 38 patients were successfully discharged, with a recorded mortality rate of 2.6%. in aligns to this study Tavousi SH et al[24] upper limb was the most frequently affected burn site, accounting for 61.4% of cases. Flame burns were the leading cause, reported in 59.1% of incidents, followed by burns from hot liquids at 26.7% and the mortality rate was observed at 4%, corresponding to three cases.[24] These results highlight the pressing need for timely interventions, comprehensive burn management, and enhanced education for both patients and caregivers. By addressing these areas, the burden of burn injuries in epileptic patients can be significantly reduced, improving both survival and quality of life outcomes.

Conclusion

Burn injuries in epileptic patients were observed in 7.5% of cases, with the most common causes being flame burns, scalds, and electrical burns. Mostly patients experienced complications such as contractures, wound infections, and loss of body parts. Overall mortality rate was 11.4%. Findings underscore the need for effective prevention strategies, early intervention, and better management of burn injuries in epileptic patients to improve their outcomes. Further large scale studies also recommended to validate the findings.

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