



## STUDY OF ELECTRIC BURNS IN BUNDELKHAND REGION

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**ABSTRACT**

**Introduction:** An electrical burn is a skin burn that happens when electricity comes in contact with your body. When electricity comes in contact with your body, it can travel through your body. When this happens, the electricity can damage tissues and organs. This damage can be mild or severe – and it can even cause death. **Aim and Objectives:** To analyze the effect of various factors on the extent and severity of electric injury. **Material and methods:** All the patients presenting themselves to O.P.D. and emergency of Maharani Laxmi Bai Medical College, Jhansi between a period of June 2014 to December 2016 with complaints of electric burn injuries are considered in this study. This study includes all type of electric burn, Minimum number of 98 patients were selected for the study. **Result:** Our study it is observed that majority of cases were in age group between 21 to 30 years. Total male patients are 77 (78.57%) while female patients are only 21 (21.42%). Rural population 67 (68.36%) was most commonly involved then urban 31 (31.63%). Electric burns is more common in illiterate person 59 out of 98 (60.20%) than educated persons 39 (39.79%). Rural population specially farmers 30 out of 98 (30.61%) are mostly involved in electric current injury which is more of work related injury. Mostly people of low socioeconomic group 83 out of 98 (84.69%) involved in electric burn injury. Electric burn patients have 2 to 25 percent of total burn surface area (TBSA) 86 out of 98 (87.75%). Patients involved had house hold burn 91 (92.85%) and industrial burn 7 (7.14%). Limbs are involved commonly in electric burn injury. Upper limb is the most involved part 70 (71.42%) followed by lower limb 38 (38.77%) followed by chest 40 (40.81%). Right hand is most common contact point 44 (44.89%) followed by right lower limb. 10 patients have high voltage electric burns which is 10.20% of total, rest 88 patients out of 98 have low voltage electric burn which is 89.79% of total. Hindu population 86 (87.75%) was more involved than Muslim population which is 12 (12.25%). Married population is more involved in electric burn injury 55 (56.12%) than unmarried population 43 (43.87%). Joint family members are more involved in electric burn injury than nuclear family member 40 (40.81%). **Conclusion:** In our study we also concluded that the effect of current on internal organs including cardiac, renal and the electrolyte changes are more with the increased burn surface area and the increased depth of wound denoting that probability of involvement of internal organs can be depicted by the severity of external surface involved

**KEYWORDS :-** Electric injury, TBSA, low-voltage, high-voltage.**INTRODUCTION**

Electrical injury is damage caused by electric current passing through body. Electric burn injury may be domestic or commercial. According to statistical data all over world electrical injuries are second most important cause for admission to burn unit. Electric current are of two types- alternating current (AC) and direct current (DC). Alternating current is most common cause of electric burn injury. In house hold electricity is provided at the frequency of 50-60Hz and this is more dangerous than DC. DC current is provided by batteries. Effect of alternating current mainly depends on frequency. Low frequency AC at 50-60Hz cause extended muscle contraction which freeze hand to current source. Severity of electric burn injury depends on following factors-

1. Type of current (DC or AC)
2. Voltage and ampere range
3. Duration of exposure
4. Body resistance
5. Pathway of current in body which determine tissue damage.

For both alternating current and direct current higher the voltage and ampere greater will be the injury. Tissue damage due to electrical exposure is primarily by conversion of electric energy to heat resulting in thermal injury. The body tissue with highest resistance tend to suffer more damage. Maximum resistance is provided by skin and all internal tissue has negligible resistance. Dry well keratinized intact skin has average resistance of 20000 to 30000 ohm/cm<sup>2</sup>. So large amount of heat is dissipated in skin leading to wide burns. Current pathway through the body also determine which

structure will be injured. Hand is most common source point followed by head while foot is most common ground point.

**Pathology:**

Passing of high electric field cause thermal or electric chemical damage to internal tissue. Damage include hemolysis, protein coagulation, coagulation necrosis of muscle and other tissue, thrombosis, dehydration and muscle and tendon avulsion. High electric field strength injuries result in massive edema leading to compartment syndrome. Muscle destruction can result in rhabdomyolysis and myoglobinuria and electrolyte disturbances.

**AIM AND OBJECTIVES**

1. Epidemiological study of electric burn in Bundelkhand.
2. To analyze the effect of various factors on the extent and severity of electric injury.
3. To analyse the outcome of electric burn injuries in our unit.

**MATERIAL AND METHODS**

All the patients presenting themselves to O.P.D. and emergency of Maharani Laxmi Bai Medical College, Jhansi between a period of June 2014 to December 2016 with complaints of electric burn injuries are considered in this study. This study includes all type of electric burn, Minimum number of 98 patients were selected for the study.

**Inclusion criteria:**

- All patient with electric burn

**Exclusion Criteria:**

- Patient with other associated severe injuries (like head injury and other serious injury)
- Patient who were dead on arrival.

**RESUT**

Parameters		Number of patients (N=98)	Percentage (%)
Sex	Male	77	78.57%
	Female	21	21.42%
Age group (yrs) [Male]	0-10	07	07.14%
	11-20	19	19.38%
	21-30	24	24.48%
	31-40	16	16.32%
	41-50	07	07.14%
	51-60	04	10.52%
Age group (yrs) [Female]	0-10	08	08.16%
	11-20	02	02.04%
	21-30	02	02.04%
	31-40	06	06.12%
	41-50	02	02.04%
	51-60	01	01.02%
Religion	Hindu	86	87.75%
	Muslim	12	12.24%
Education	Educated	39	39.79%
	Illiterate	59	60.20%
Occupation	Child	06	06.12%
	Electrician	08	08.16%
	Farmer	30	30.61%
	House wife	11	11.22%
	Labour	13	13.26%
	Shop Keeper	05	05.10%
	Student	25	25.51%
Habitat of Enrolled	Rural	67	68.36%
	Urban	31	31.63%
Marital Status	Married	55	56.12%
	Unmarried	43	43.87%
Family Type	Joint	58	59.18%
	Nuclear	40	40.81%
Socioeconomic status type	Low	83	84.69%
	Middle	15	15.30%
Electric burn [Male]	High Voltage	06	6.12%
	Low Voltage	71	72.44%
Electric burn [Female]	High Voltage	01	1.02%
	Low Voltage	20	20.40%
Type of Electric Burn	Industrial	07	07.14%
	Household	91	92.85%
Type of Wound	Superficial	93	80.61%
	Deep	05	05.10%
Percentage of TBSA involving	2-25	86	87.75%
	26-50	12	12.24%
	51-above	00	00.00%
Outcome	Face	08	08.16%
	Chest	40	40.81%
	Abdomen	13	13.26%
	Back	01	01.02%
	Upper Limb	70	71.42%
	Lower Limb	38	38.77%

Contact Point	Back	02	02.04%
	Chest	09	09.18%
	Left Foot	01	01.02%
	Right Foot	00	00.00%
	Left Hand	28	28.57%
	Right Hand	44	44.89%
	Left Thigh	04	04.08%
	Right Thigh	00	00.00%
	Left Arm	00	00.00%
	Right Arm	01	01.02%
	Left Elbow	00	00.00%
	Right Elbow	01	01.02%
	Head	08	08.16%
Outcome	Survivor with no deformity	20	25.97%
	Survivor with deformity without amputation	44	44.89%
	Survivor with amputation	09	11.68%
	Death	04	05.19%
Number of days stay in hospital	1-10	83	84.69%
	11-20	12	12.24%
	21-30	02	02.04%
	31-40	01	01.02%
	41-on wards	00	00.00%
Days stay in the hospital according to burn percent	1-10%	4-5	
	11-20%	6-7	
	21-30%	8-9	
	31-40%	9-10	
	41-on wards	>10	
	Cardiac Effect (ECG Change)	Electrolyte balance	Kidney
Burn Percent	0-10%	-	No
	11-20%	-	No
	21-30%	2	-
	31-40%	2	-
	41-50%	2	2
	50%-on wards	-	-

**DISCUSSION**

In our study it is observed that majority of cases were in age group between 21 to 30 years. Our observations are consistent with studies conducted by Mellen PF et al (1992) & Reyaz Ahmad Kasana et al (2013) in which peak incidence of age group between 21 to 30 years. The reason can be attributed to the fact that it is most active group but our study does not match with Smith S Segu et al (2014) in which peak incidence rate image in between 15 to 14 years.

In our study total male patients are 77 (78.57%) while female patients are only 21 (21.42%). Our study matches with the study of Smith S. Segu et al (2014), Ulus Trabmi Acil Cerehiderg (2016) and Reyaz Ahmad Kasana et al (2013). In all these studies males patients were most commonly involved than females showing that in Indian population the males who go out of the house to work are more prone to electric burn injuries.

In our study rural population 67 (68.36%) was most commonly involved then urban 31 (31.63%). So our study is in concordance with Sameer Jain et al (2014) and Ryaz Ahmad Kasana et al (2013) studies who too concluded that incidence

of electric burn is more in rural areas. The reasons behind this being unawareness of the rural people and lack of proper transmission line ,forcing of local people in maintenance (local unskilled population) who resort to repairing work due to lack of adequate staff. Lines are laid over trees in rural areas exposing farmer and children to risk.

In our study electric burns is more common in illiterate person 59 out of 98(60.20%) than educated persons 39 (39.79%). Our study observations are consistent with study of Buja Z et al (2010) who found out that illiterate people were more prone for electric burn injuries than the literate crowd due to insufficient knowledge about the proper electric distribution system and their hazards .Further illiteracy corresponds to population of low socio economic level who in turn also have more complication rates due to they being managed in inefficient burn centres. (lack of affordability).

In our study rural population specially farmers 30 out of 98 (30.61%) are mostly involved in electric current injury which is more of work related injury. Our study is consistent with Umar Farooq et al(2010), Gang RK et al (1992) and Smith S Segu et al (2014) who also found that most of electric burn injuries are work place related and mostly due to direct contact with electrical wire. Such injuries can be reduced by proper awareness and efficient electrical transmission system. Our study is inconsistent with study of Ulnas Travma SL Serrhi Derg et al (2016) who found that most of electric burn injury are due to industrial accident which is a high voltage electric injury.

In our study mostly people of low socioeconomic group 83 out of 98(84.69%) involved in electric burn injury. Our study is in concordance with Sameer Jain et al (2014), Reyaz Ahmad Kasana et al (2013) who found out that low socioeconomic population are mostly involved in electric burn injury due to unawareness and mishandling of electric current wires.

In our study most of the electric burn patients have 2 to 25 percent of total burn surface area (TBSA) 86 out of 98 (87.75%). Our study is consistent with the studies of Ajay Lunawat et al (2013), Gang RK et al (1992), Smith S Segu et al (2014) and Hadded SY (2008). Ajay Lunawat et al (2013) studied that majority of patients who had disability ranging from 72 to 100 percent had total burn surface area (TBSA) from 8 to 20 percent. Rest studies also showed that most patient have TBSA from 2 to 25%.

In our study most patients involved had house hold burn 91 (92.85%) and industrial burn 7 (7.14%). Our study is consistent with study of Martinez JA et al (2000) studies that out of total electric burns 95.16% are due to domestic supply of current and 4.84% were due to industrial supply of current. Cases of the household electric burn are increasing due to increased utility of household electrical appliances without proper precaution and unawareness of the hazards.

In our study, both limbs are involved commonly in electric burn injury. Upper limb is the most involved part 70 (71.42%) followed by lower limb 38 (38.77%) followed by chest 40 (40.81%). Our study is consistent with study of Hadded SY et al (2008) who concluded that upper limb and hand 70 (71.42%) and lower limb 38 (38.77%) are most commonly involved parts in electric burns.

In our study right hand is most common contact point 44 (44.89%) followed by right lower limb. Our study correlates with the study of Ryaz Ahmad Kasan et al (2013) in which scalp is most common contact entry point followed by neck and forehead while exit point is located in lower limb is 66.67% and 22.23% in upper limb.

In our study 10 patients have high voltage electric burns which

is 10.20% of total , rest 88 patients out of 98 have low voltage electric burn which is 89.79% of total. Our study is consistent with study of Shih JG et al (2017) in which 44% patients had low voltage injury and 38.3% had high voltage injury. Mortality is 40% in high voltage injury in our study while in low voltage injury it is nil. It is higher than in the study of Shih JG et al (2017) in which mortality is 2.6% from low voltage injury (LVI) and 5.2% in high voltage injury. Our study is consistent with Buja Z. et al (2010) in which 35.72% burn were due to high voltage and 64.28% burn was due to low voltage. Among patients with contact burn the amputation rate was 28.58% and 4 (7.14%) patients died. These results suggest that the aggravation of the use of the electric system appliances leads to increase in number of patients with electric injury.

In our study Hindu population 86 (87.75%) was more involved than Muslim population which is 12 (12.25%).

In our Study Married population is more involved in electric burn injury 55 (56.12%) than unmarried population 43 (43.87%).

In our study joint family members are more involved in electric burn injury than nuclear family member 40 (40.81%).

In our study the average number of hospital day increases with the percentage of burn surface area as increasing deformity and the depth and extent of wound leads to delayed healing which demands increased hospital stay.

In our study we also concluded that the effect of current on internal organs including cardiac, renal and the electrolyte changes are more with the increased burn surface area and the increased depth of wound denoting that probability of involvement of internal organs can be depicted by the severity of external surface involved.

## CONCLUSIONS

1. Most patients involved had house hold burns and industrial burn
2. Aggravation of the use of the electric system appliances leads to increase in number of patients with electric injury.
3. Rural population was most commonly involved than urban.
4. Hindu population is more involved than Muslim population.
5. Married population is more involved in electric burn injury than unmarried population.
6. Joint family members are more involved in electric burn injury than nuclear family member.
7. Males patients were most commonly involved than females showing that in Indian population the males who go out of the house to work are more prone to electric burn injuries.
8. It was observed that majority of cases were in age group between 21 to 30 years.
9. Electric burns are more common in illiterate person than educated persons.
10. Mostly people of low socioeconomic group are involved in the electric burn injury.
11. Right hand is most common contact point followed by right lower limb.
12. The duration of hospital stay increased with the depth and extent of burn surface area.

13. The probability of involvement of internal organs can be predicted by the extent of external involvement. The probability of cardiac, renal and electrolyte involvement increases with the extent of burn surface area.

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