A study of clinico etiological profile and outcome of electrical burn patients in Vindhya region M.P.

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ABSTRACT:

Background- Electric burnout is a unique form of trauma, in which death and illness are much higher compared to heat stroke. The incidence of electrical accidents has increased, due to use of electricity in the house hold, institutions and industries. Electrical injuries can cause extensive disfigurement to that of significant functional disability and sometimes can be fatal due to cardiac events and therefore the patients need to be closely monitored in an ICU set up. Management of electrical burns patient requires a team work of surgeons and physicians

Materials and Methods: This retrospective study was carried out on patients admitted in Burn Unit of Surgical wards of Sanjay Gandhi Memorial Hospital associated with Shyam Shah Medical College, Rewa (M.P.) during of 1st June 2020 to 31st May 2021. The objective was to analyse the demographic characteristics and outcomes and patterns of electrical injuries, to assess the demography, degree of disability and loss of life due to electrical burn..

Results:: We had 56 patients (41 male and 15 female) of electric burns admitted in our centre. Most of the accidents leading to the electrical burn injuries could have been prevented.

Conclusion:: Prevention is possible by increasing public awareness through primary education among the rural people and by taking adequate precautions such as the use of personal protective equipment's (insulated gloves and footwear.) and following national electrical codes.

Keywords: Atrial fibrillation, electric burn, electric injury, medical management

Introduction

Electric burnout is a unique form of trauma, in which death and illness are much higher compared to heat stroke. The effects of electrical energy depend on the type of current, voltage, tissue resistance, method and duration.[1]

Injuries caused by exposure to 1000 volts or greater are considered high tension electrical burns. High tension electrical current may cause 'flash' burns, 'True' electrical burns or secondary thermal burns.[2]

Burnout is a major health problem worldwide. Worldwide, about 2,65,000 people die each year as a result of burnout. Most burn injuries occur in people living in low and middle socio-economic countries.

Electrical burns are one of most devastating burn injury a patient has to bare. Electrical burns are one of the leading causes of DALYs (Disability Adjusted Life Years) lost in low and middle income countries like India. Upper limb involvement is present in majority of the electrical burn injuries. Upper limbs may have entry point, exit point or both. Injury may range from simple flash burns or low voltage contact burns to devastating gangrene of the limbs.

All the efforts are taken to salvage the skin (limb) with adequate debridement and early flap cover using various distant flaps. Local flaps are avoided because of the unreliable vascularity due to extent of the electrical injury to the adjacent areas. In case of lightning, the commonest cause of death is respiratory arrest. So, if only artificial respiration is started immediately, patient can be revived. Since this should be done at the site of accident, which is more often remote, the mortality rate remains high. Aim of the study to evaluate various clinic-etiological profile and outcome and management of electric burn patients. Detect early and late complication and their management. Correlate post burn complication between low and high voltage electric burn.

1. Materials and methods

The prospective study was carried out on patients admitted in Burn Unit of Surgical wards of Sanjay Gandhi Memorial Hospital associated with Shyam Shah Medical College, Rewa (M.P.) during of 1st June 2020 to 31st May 2021. The objective was to analyse the demographic characteristics and outcomes and patterns of electrical injuries.

Inclusion Criteria:

All patients (total 56 patients) admitted under the Department of Surgery, with a diagnosis of electrical burn injury.

All age groups and both sexes were included in this study.

Exclusion Criteria:

Patients who presented to the accident and Emergency department with alleged history of sustaining electric injury without any obvious skin involvement were not included in this study

2. Results

TABLE NO 1- Demographic characteristics of patients

Age group	Total number	Percentage
1-15	22	39.29
16-30	20	35.71
31-45	9	16.07
>45	5	8.929

Gender		
Male	41	73.21
Female	15	26.79
Residence		
Rural	43	76.79
Urban	13	23.21
Socioeconomic Status		
Low	39	69.64
Middle	17	30.36
High	--	--

Among 56 patients admitted in burn unit, the age group range from 9 months day to 65 yr. The male predominance was present in age group. The majority of patients belonged to (1-15) groups, which were 39.29 % and lowest percentage (8.92%) were recorded in >45 age group. Total 56 patients of electric burn 41 were male and 15 were females and male to female ratio was. (M: F, 2.73:1). 76.79% of the patients affected with electrical burns injuries were rural area and 23.21% came from urban areas. 39 patients (69.64) patients belonged to lower socioeconomic status, whereas 17 patients (30.36%) were from middle class. (**Table-1**)

TABLE NO 2- Clinical characteristics of patients

Mode of injury		**Total number**	**Percentage**
Accidental		56	100%
Homicidal		0	0%
Depth of burn			
Superficial		29	51.79
Superficial+ deep		23	41.07
Deep		4	7.14
Anatomical site			
Head and neck		17	30.36
Chest and Abdomen		38	65.52
Upper limbs	Right	46	82.14
	Left	22	39.29
Lower limbs	Right	16	28.57
	Left	9	16.07
Perinium		5	8.77

All patients of electrical injuries are accidental. Majority of patients had superficial (51.79%), 2nd most superficial+ deep (41.07%) burn and least are deep burn which was 7.14%. 56 patients with the electrical burns was involved of different anatomical sites of injury. Upper limbs (hands and forearm) injury was the most common, which account 68 patients. 2nd most common is chest and abdomen which has 38 patients and least number of patients are involved in perinium region 5. (**Table-2**)

TABLE NO 3- DISTRIBUTION OF CASES ACCORDING TO DURATION OF HOSPITAL STAY IN RELATION TO PERCENTAGE OF BURN

S.N.	Percentage of burn	Total no. of patients	0-2 days	3-7 days	8-14 days	15-30 days	>30 days
1	0-10%	26	4	13	7	2	-
2	11-20%	12	1	3	4	4	-
3	21-30%	3	-	-	1	2	-
4	31-40%	1	-	-	-	1	-
5	41-50%	9	-	3	1	5	-
6	>50%	5	-	2	2	1	-
	Total	**56**	**5**	**21**	**15**	**15**	**-**

Table 3 shows that the percentage of burn increase from 0 to 40%, the hospital stays also increase as they take more time for healing whereas percentage of burn highly increases, the duration of time decrease as such patients die within very less time after hospitalization. (**Table 3 and Graph 1**)

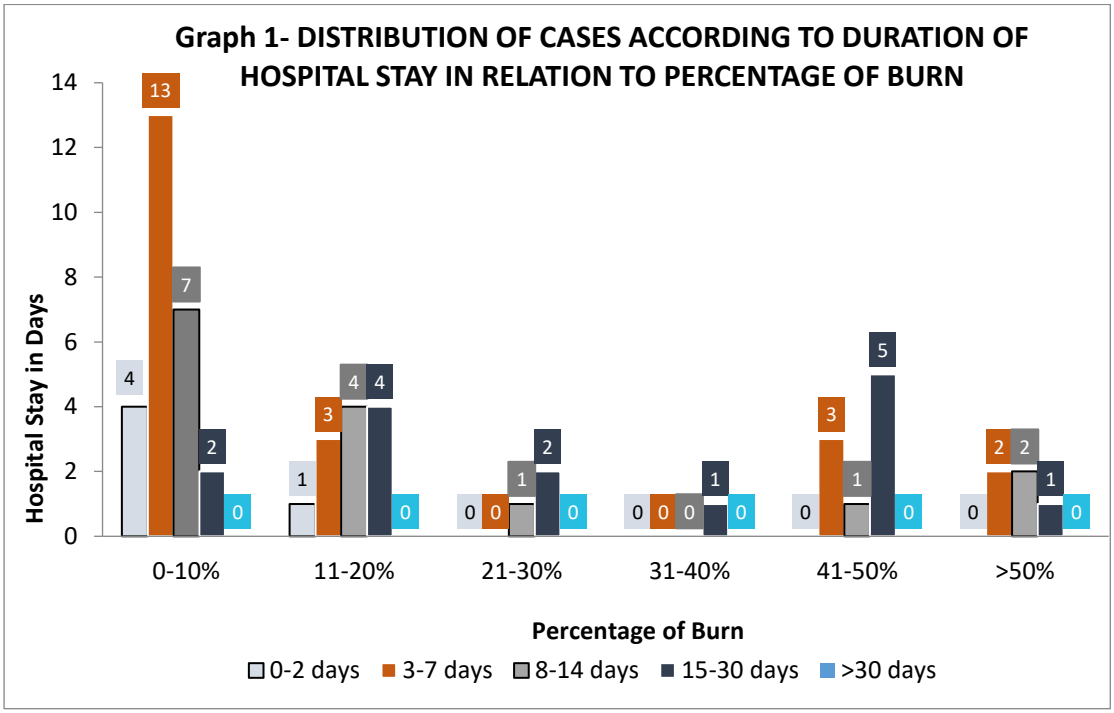

TABLE NO 4- DISTRIBUTION OF CASES ACCORDING TO DEVELOPMENT OF COMPLICATION

S.N.	COMPLICATIONS	Total number of patients	percentage
1.	Contracture	14	25.00
2.	Hyper granulation	4	7.14
3.	Infection	1	1.79
4.	Gangrene	11	19.64

5.	Death	5	8.92
6.	No complication	21	37.50
Total patients		**56**	**100.0**

TABLE NO 5 –MORTALITY CASES IN RELATION TO BURN % OF BSA

S.N.	Percentage of burn	Total cases	Mortality	Mortality percentage
1.	0-10%	26	0	0
2.	11-20%	12	0	0
3.	21-30%	3	0	0
4.	31-40%	1	0	0
5.	41-50%	9	0	0
6.	>50%	5	5	100.0
	Total	**56**	**5**	**8.93%**

TABLE NO 6- DISTRIBUTION ON THE BASIS OF OUTCOME OF THE PATIENTS UNDER STUDY

S.N.	OUTCOME		Total no. of patients	Percentage
1.	Recovered with morbidity n=43	No any complication	14	76.79
		Amputation	8	
		Disarticulation	3	
		Contracture	14	
		Hyper granulation	4	
2.	Discharge on request		08	14.29
3.	Expired		5	8.92
Total patients			**56**	**100.0**

Out of 56 patients, 62.49% patients developed various types of complications and 37.51% patients had no complications. Overall mortality was 8.93%. There was no mortality below 50% TSBA burns. 100% mortality reported in >50% TSBA burns. The majority of patients were recovered (76.79%) and a significant no. of cases were died i.e. 8.92%. (**Table- 4, 5 & 6**)

4. Discussion

Electric burn wound on protective covering of the body produced by excessive heat, damaging the beneath tissues causing circulatory disturbances and mild to severe constitutional disturbances. If untreated burn injuries result in intense suffering and protected course of illness, possible disfigurement with physiological and psychological trauma to patients, huge cost and suffering to the patient's family.

Burn wound pose a great burden on health care infrastructure and burn unit of surgical wards, although morbidity and mortality has been decreased with better understanding of the physiology and better available option for treatment of electrical burn patients. Timely correction of fluids and electrolyte imbalance, better resuscitation decrease mortality and morbidity in electrical burn patients

INCIDENCE OF CASES WITH RESPECT TO AGE AND SEX

In our study of 56 patients, range 1 - >45years. Maximum patients (22) were belonging to between 1 to 15 years accounting to 39.29%. Out of 56 patients in the study, 20 patients were among the age range of 16-30 years, accounting to 35.71%. Thus, it shows that most of electrical injuries occurred between the ages of 1 years to 30 years in almost all studies reviewed. This age group included the main earning member of the families.

In the studies by **Piotrowski et. al**. and **Ayton Saracogluetal**.[3,4], 99% patients were males. **Ducietel**.[5], reported that 93.9% patients were males. In the study by **Chao-Feng Sunetal**.[33], 90.3% were males while in the study by **Shagun Aggarwal et. al**.[6], 90.0% were males. In the study by I. **Ferreiroetal**.[7], 80.0% were males. In our study also, 95% patients were males (96/98). Thus, it is consistently shown that males are predominantly affected by electric burn injuries and the most common etiology is work-related injuries.

Incidence of electrical burn according to religion

In the present study, all electrical burn injuries patients are Hindu.

Time and place of burn

In the present study it was noted that majority (18 patients)of electrical burn incidence between 06am to 10 am (32.14%). Most of electrical burn occurred during his working. In the study of **Lal and Bhatti[8]**, most of the burn occurred in home. Most of electrical burns injuries were occurred between 7am to 10 am and 4pm to 8 pm, which correlate with the time of routine work.

Similar study by **Sharma RK et al[9]** approximately 90% of the burns are caused by household accidents**.** Another study **by Drago DA**and **Natterer J, et al[10-11]**, in comparison to home environment, most of burns occur in kitchen involving food preparation and meal times**[39,40].** Similar study by **Mehta MA et al** majority of burn occurred at home.**[12]**

Residential distribution

In present study that the patients from rural area carry higher percentage 76.79% (43 patients) and in urban areas 23.21% only (13 patients).

Mode of injury

In the present study all patient of electrical burns 100.0% were accidental type.

Body surface area of burn

In our study, we found that 46.43% patients electrical burn injuries involving less than 10% total body surface area (TBSA), in which 0-5% are 18 patients and 5-10% electrical burn are 8 patients . 21.43% patients (12 patients) electrical burn injuries involving less than 11-20% total body surface area (TBSA). Thus, in most of the studies the mean percentage of TBSA involved was found to be less than 20%.

The percentage of total body surface burnt was found to 1 – 10% of the TBSA (Total Body Surface Area) for most of the patients (46.43%) in the study done by **A. Pittrowski et. al.**[3]. The average percentage of total body surface area burnt was found to be 42.5% among the patients who expired and 26.5% among the survivors in the report by **AytenSaracoglu et. al.**[4]. In the study done by **Chao-Feng Sun et. al.**[13], the percentage of total body surface area involved ranged from 1 to 30%. **Shagun Aggarwal et. al.**[6]; found a mean percentage of total body surface area burnt was 8.76% (range2–30%) in their study. **Kingsly et. al.**[14], in this report had all

patients with involvement of less than 20% of the total body surface area. I. **Ferreiro et. al.**[7] in their study found that in patients with contact burns, the average percentage of total body surface area burnt was 9%.

In the study done by **A. Pittrowski et. al**.[3], majority of the patients sustained high tension injuries. In contrast to that, **S.B. Duci et. al.**[5] recorded majority patients with low tension injuries as compared to high tension injuries (180 v/s 66). Similar findings were noted by **Shagun Aggarwal et. al.**[6] with most of the patients sustaining low voltage injuries (99) versus high voltage injuries (20). In a study by **Arrowsmith et. al.**[15], majority patients had low tension burns (128) and remaining were high voltage burns (17). Our results were contrast, with the low voltage injuries (7.1%) being less as compared to high voltage injuries (92.9%).

Depth and degree of burn:

In our study, that the majority of patients (51.79%) had superficial electrical burn, while 41.07% had superficial + deep electrical burn and 7.14% had deep electrical burn alone.

In similar study **PeddiM et al[16]** most of patient's sustained partial thickness (50.5%). while 16.5% children had deep burn**.**

Complication:

In our study we found that out of 56 patients, 57.0% patients had developed various types of complications. Most commonly contracture was developed in 25.0% of cases (14 patients), hyper-granulation was observed on 7.14% of cases (4 patients) and 1.79% electrical burn patients get infection, 19.64% electrical burn patients are gangrene (11 patients) and 8.92% electrical burn patients (5) are expired.

Outcomes:

In our study 76.79% patients were recovered from electrical burn injury. In similar study by **Peddi et al[16]**79.6% survived **[42].** Recovery of patients depends on many factors like age, sex, cause and mode of injury, percentage and depth of burn and the part affected.

A time laps between the time of burn and hospitalization to the center where patients can stay for long time till they recovered also affects the recovery period first aid received at home, health center or PHC with or without fluid and antibiotic therapy also affects wound healing. During the course of treatment patient's faith on the treating team and moral, economic and physical support from the family also affects the wound healing process.

Above factors further morbidity the effect of treatment depending upon the facilities available at the treatment center and the enthusiasm and sympathetic attitude of member of the treating team.

It was also observed that physiotherapy is better in exposure method along with the involvement of attendants for caring patients. A sense of responsibility and moral support for self-mobilization cleaning and performing their daily routine work develop earlier with this type of method.

Conclusion

Since ours is a rural area where most of the occupation is agriculture, the electric burns by accidents are common. Hence creating awareness, education and following of safety measures like use of insulated gloves and footwear play a key role in prevention. Electrical burn patients need to be monitored and treated for cardiac events

in the first 48 h. As disability from electrical injury is a possibility, efforts for rehabilitation and counselling should be a part of our treatment protocol.

Electric burn is serious kind of injuries, leading to permanent disabilities make the people physically dependent to others, increase poverty. Upper limb was most affected part of body and amputation were most common surgery perform .Early and adequately done fasciotomy has a significant role in electric burn injuries to lower the incidence and level of amputation in extremities with good rehabilitation by best ,low economic, well balanced prosthetics. Proper education, communications and rehabilitation may reduce the social burden caused by occupational hazards. To prevent this life-threatening event, measures should be taken by health-care officials, electric department officers and social networks to help educate the people about application of safety equipment, proper communication in between electrical department workers and improvement medical facility regarding burn cases or early refer of complicated burn to higher center, through every available means of communication.

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