

Original Article

Electric burn injuries

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ABSTRACT

Objective

To highlight the pattern of electrical injuries seen in our environment and the management problems faced in our set up.

Methods

This retrospective observational study was carried out at Burns unit Fauji Foundation Hospital, Rawalpindi from June 1999 to April 2008. All patients seen in causality or admitted in burns unit were evaluated regarding the cause of injury, place of injury, extent of involvement of burnt area and mortality of victims. All findings were recorded on a separate Performa and evaluated statistically at the end of the study.

Results

A total of 248 patients were included in the study. Flame injuries were the commonest (43.96%) with mean age of victims of 22.81 years. Most of the electrical injuries were sustained at home (40.63%, n=13), followed by occupational (37.50%, n=12) and 21.87% (n=07) in streets or outside. Majority of the patients (59.37%, n=19) sustained less than 10% burns. More than 20% burns were noticed in 15.63% (n=05) patients. No death was observed in patients with low voltage burns and 9.37% (n=03) mortality were noted among patients having high voltage burns.

Conclusions

Children at home and young persons at workplace are more prone to have electrical injuries. Use of good quality electric wires, home appliances/machinery, enforcement of safety rules at home and workplace and upgradation of our health facilities are required to decrease the menace of severe electrical injuries. (Rawal Med J 2010;35).

Key words

Electrical injuries, burns, electric shock.

INTRODUCTION

Burns by electrical injury is a relatively infrequent but potentially devastating form of multisystem injury with high morbidity and mortality. Electrical trauma can be caused by low-voltage current (less than 1000 V), high-voltage current (more than 1000 V), lightning and voltaic arc.¹ In adults, most electrical injuries occur in the work-place, whereas children are exposed mostly at home.²⁻⁴ In nature, electrical injury occurs due to lightning especially in hilly areas.⁵ It causes serious injuries in 1000-1500 individuals every year worldwide with mortality rate of 20-30%, with as many as 74% of survivors experiencing permanent injury and sequel.^{1,6}

Electrical injuries clinical manifestations can vary and range from mild complaints not demanding serious medical help to life-threatening conditions.¹ Immediate death is rare and mostly associated with lightning. It may occur from current-induced ventricular fibrillation or a systole or from respiratory arrest secondary to paralysis of the central respiratory control system or due to paralysis of the respiratory muscles.^{5,7} The severity of the injury depends on the intensity of the electrical current (determined by the voltage of the source and the resistance of the victim), the pathway it follows through the victim's body, and the duration of the contact with the source of the current.⁵ There is no specific therapy for electrical injury and the management is symptomatic. Although advances in the intensive care unit, and especially in burn care, have improved the outcome, prevention remains the best way to minimize the prevalence and severity of electrical injury. The objectives of this study were to highlight the patterns of severe electrical injuries seen in our environment and the management problems faced in our set up.

SUBJECTS AND METHOD

This retrospective observational study was carried out at Burns unit Fauji Foundation Hospital, Rawalpindi from June 1999 to April 2008. Fauji Foundation Hospital is a tertiary care 660 bed teaching hospital having independent 16 bed Burns unit equipped with all necessary facilities for the treatment of burns. All patients reporting to causality or admitted in burns unit were evaluated regarding the cause of

injury, place of injury, extent of involvement of area burnt and mortality of burns victims. All findings were recorded on a separate Performa and evaluated statistically at the end of the study.

RESULTS

A total of 248 patients were included during the study period. Flame injuries were the commonest (43.96% n=109), followed by hot liquid (35.89%, n=89).

Table 1. Etiology of burns (N=248).

Age	Hot liquid	Flame	Chemical		Electric	Explosive	TOTAL
			Acid	Alkali			
0-10	28	24	-	4	12	2	70
11-20	26	22	2	5	10	3	68
21-30	14	18	-	2	4	-	38
31-40	9	15	-	-	2	-	26
41-50	8	17	-	-	3	-	28
51-60	2	7	-	-	1	-	10
61-70	2	4	-	-	-	-	06
> 70	-	2	-	-	-	-	02
Total	89 (35.89%)	109 (43.96%)	2 (0.80%)	11 (4.43%)	32 (12.90%)	5 (2.02%)	248
95% Confidence limits	31.32 To 39.56	38.92 To 47.12	0.62 To 0.97	2.12 To 6.22	9.02 To 14.23	1.67 To 3.09	

All these patients presented within 24 hours of the incidents. Majority of patients were between age of 0-20 year. Thirteen percent (n=32) patients with electrical injuries had mean age of 22.81 years (Table 1).

Total	19	8	2		1	2		32
	(59.37%)	(25%)	(6.25%)		(3.13%)	(6.25%)		
95% Confidence limits	55.01 To 63.89	22.45 To 24.92	5.67 To 7.37		2.42 To 4.04	5.10 To 7.31		

More than 20% burns were only noticed in (15.63%, n=05) patients. No mortality was observed in patients having low voltage burns and (9.37%, n=03) mortality was noted among patients having high voltage burns (Table 3).

DISCUSSION

Presence of severe burns (common in high-voltage electrical injury), myocardial necrosis, the level of central nervous system injury, and the secondary multiple system organ failure determine the morbidity and long-term prognosis.^{1,5} Low voltage electrical injuries are more common in developing countries.^{5,8} Common causes are unsafe electrical poles in the streets, passing of uninsulated electric wires very close to the roof, improper drainage of water after the rain, substandard electric wiring in the houses, low quality electric appliances, lack of knowledge about safety measures to prevent electrical injuries.^{2,9}

Maghsoudi⁶ from Iran reported 4% incidence of electrical burn injuries with mean age of 27.5 years (range, 3-71 years). In our study, 12.91% patients had electrical injuries with mean age of 22.81 years. Males are commonly affected as reported worldwide and young persons and children are more prone to sustain electrical injuries.^{3,4,6,7} Similarly, 68.75% patients in our study were up to the age of 20 years.

Extent of burns area involved depends upon type of burn and duration of contact. In our study, 68.75%, patients had low voltage burns. They had total body surface area burns of less than 20% and most commonly involved areas were around the point of entry and exit, armpits and around genitalia. Mortality was seen only in high voltage electrical injuries and death occurred in 9.37% patients in our series. Many victims die before reaching the

hospital or even not reported to the hospital. It might be because of sudden death due to cardiopulmonary arrest and lack of first aid facilities in the rural areas where farmers work in the fields under the electric poles (having more than 500 KVA).

Frequency of high voltage and low voltage burns also varies in different setups. In industrialized countries frequency of high voltage injuries are common.^{1,10} In Iran, it is 54% by high-voltage, 42% by low-voltage and 4% by lightning.⁶ In United States, it is 37.51% high voltage and 39.57% low voltage respectively.⁸ In developing countries, low voltage injuries are more common. In Nigeria, 67% low voltage burns were seen as compared to 29% of high voltage burns.⁷ In our study, 68.75% patients had low voltage burns while 31.25% patients had high voltage burns.

Frequency of lightening injuries is less common and very rare in some countries where thunderstorms are less common.⁸ It was 4% in Nigeria and Iran^{6,7} Lightening injures had high mortality as compared to other electric injuries.⁸ Arnoldo reported mortality was highest in the lightning strikes (17.6%) as compared with the high voltage (5.3%) and low voltage (2.8%) injuries.⁸ In our study, it is observed only in high voltage burns.

CONCLUSION

Children at home and young people at workplace are more prone to have electrical injuries. High voltage injuries were fatal more often. Use of good quality electric wires, home appliances, enforcement of safety rules in the home and workplace and upgradation of our health facilities are required to decrease the menace of severe electrical injuries.

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