

## Original Research Paper

# Profile of Deaths due to Electrocutation: A Retrospective Study

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### Abstract

We carried out a retrospective analysis of deaths due to electrocution from the medico-legal deaths reported to our institution. Majority of the victims were males belonging to the age group of 11-50 years. Almost all deaths were accidental and most of them were concentrated in the period of monsoon implicating the important role of wetness in causing these deaths. In contrast to the studies done in the West, bathtubs, heaters or hair dryers were not involved in any of the deaths. The mortality rate due to electrocution was significantly higher at 4.4 per one lakhs (100000) population in the present study as against the figures of 0.94 and 0.14 from Bulgaria and Canada respectively. Most of the deaths were either instantaneous or immediate and most of the deaths were preventable by electrocution. It signifies that people living at home did not have elementary knowledge of risks of electrocution; therefore awareness about use of good quality electric appliances and cables is the need of the hour.

**Key Words:** Electrocutation, Gujarat, India, Accidental Deaths, Burns

### Introduction:

Electricity is such an integral part of life, that it's hard to imagine life without it. But, with the advantages and convenience of electricity come the hazards as well. Sometimes, the use of electricity may result in cases of morbidity or mortality and most of these are accidental in nature, [1-5] Although, on rare occasions, electricity has also been put to use for suicidal [6-11] and homicidal purposes. [2]

A distinct pattern is seen in deaths due to electrocution all over the world. In the Western world, accidental deaths caused by electrocution are not common owing to the good safety measures and high level of awareness. However, many cases of suicides are reported. As against this, in developing countries like India, accidental deaths caused by electrocution are for more common than suicidal deaths.

### Materials and Methods:

The present study comprises of an analysis of the Medico-Legal autopsies that we conducted during the period of 2004-2008 (five years). During this period, we received 5028 cases for autopsies and of these 102 cases were of electrocution. We collected the general information about these cases from the history, the police papers and post mortem reports.

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This information was then entered in a proforma made for this purpose and there after analysed.

### Results:

Most of the victims were male 75 and the remaining were female 27(26.47%). (Table 1) On an average we received 20 cases per year. This was 2.02% of the cases we autopsied and 4.4 per 100000 populations per year. Most of these cases, 52(50.99%), were concentrated in the months of June, July and August. (Table 2) The age of the victims was spread over the range of 1 year to 70 years, though most of them fell in the age group of 11-50 years. (Table 3) Most of the victims suffered electrocution while they were working in their homes. (Table 4) The common voltage used in India is 220-240v and therefore they suffered the same. (Table 5) In 48 cases (47.06 %), only entry marks were seen, while 34 cases (33.34 %) showed both the entry and exit marks. In 9 cases (8.82 %), no marks were seen. In 19 cases (18.62 %), there were additional marks (non electrocution injuries) over and above the entry and or exit marks of electrocution. 13 cases (12.74 %) showed burns on the body and clothes as per the sites involved. (Table 6) Upper limbs were the most common sites to show the electrocution marks, 91 cases (89.21 %). This was followed by lower limbs 29 cases (28.43 %). (Table 7)

In 68 cases, the surrounding area, at the site of incident, was found to be damp or wet, while it was dry in 34 cases (33.33%). (Table 8) 98 (96.07%) victims died on the spot or we can

say that declared dead when brought to our hospital. 3 cases (2.94%) cases survived the initial shock, though died within 24 hours of the incident. One victim died after 24 hours. (Table 9) All cases except one were accidental and the exception was suicidal. We did not find any case of homicidal electrocution.

### **Discussion:**

Males accounted for a major number of fatalities (73.53%). This is in consistency with the work of other researchers. [1, 2, 12, 13] Most of our cases fell in the age group of 11-50 years (84.29%). This finding is also in consistency with the work of others, though Rautji et al [12] narrowed down the range to 21-40 years and Dokov [13] classified age group as 25-44 years. Surprisingly, the age group of 0-10 years was also not spared. In our study there were 7.84 per cent cases in this group while in another study from India [12] the figure was 11.8 per cent and from the one in Turkey it was 31.7%. [1]

In the present study, electrocution deaths accounted for 2.02% of total, while Rautji [12] reported the figure of 1.98 per cent and Tirasci et al [1] reported 3.3%. In terms of deaths due to electrocution per one lakhs population the figure turns out to be 4.4. This is significantly higher when compared to studies done by Dokov et al in Bulgaria [13] and Laupland et al [15] in Canada who reported the figures of 0.94 and 0.14 respectively. The average number of fatalities reported by Dokov was 35 in the span of 22 years, while in our study it was about 20 per year. Obviously many factors like illiteracy amongst the general public, lack of awareness about the hazards of electricity, poor maintenance of equipments and wire linings etc. must have been responsible for this difference. As per the site of the body involved, findings in our study were in consistency with the work of Rautji et al [12] and Dokov et al [13] in most of the cases it was the upper extremity followed by lower extremities.

In our study, in 48(47.06 %) cases, only entry marks were seen and both entry and exit marks were seen in 34(33.34 %) cases. in contrast to the findings of the other worker from India [12] who had figures as high as 86.27 % for cases with only entry marks and 13.73 % for both entry and exit wounds. Surprisingly, in their study there was not a single case of electrocution without any mark. In our study there were 9 (8.82%) cases lacking a mark of electrocution. Such cases were seen in the rainy season, first being the easy passing of current in damp material and second, and the lowered resistance of skin of the victims due to wetness

or dampness. These cases certainly became cases of negative autopsies. In such cases the cause of death was ascertained by inference after full legal and medical investigations.

Tirasci et al [1] and Karger [14] reported "wet" cases of electrocution using bathtubs, heaters and hair dryers. We did not find any such case and there was no such case reported by other workers from India. [2, 12] This difference can be explained on the basis of the fact that the prevalence of bathtubs and hair dryers is almost negligible in India. However, we did get cases of electrocution due to involvement of water by way of the effects discussed earlier. In fact, the wet surrounding was responsible for 68 (66.67 %) cases in the present study. Almost half of our total cases, 52 (50.99%), were concentrated in three months of the year, namely June, July and August. These are the months of monsoon in this part of the world. These findings are consistent with the findings of other worker [12] from Delhi, India.

Tirasci et al also report maximum number of cases in the months of June, July and August but the season during this period in Turkey is summer rather than monsoon. Most of our victims (73.63 %) suffered electrocution in the surroundings of home.

Even in cases of deaths due to electrocutions; some other injuries may be seen. In our study we found non electrocution injuries in 19 (18.63%) cases. In all, except two cases, these injuries were trivial and consistent with fall on ground after getting electrocuted. Injuries found in the remaining two cases are worth mentioning. In one of the cases, the victim was travelling in an auto-rickshaw when a live wire fell on the auto-rickshaw and the victim was thrown out of the rickshaw due to electrocution.

In the second case, the victim got electrocuted on the first floor and fell on ground floor suffering serious injuries. In both of these cases, injuries sustained were consistent with the history available. These victims died late due to effects of injuries. Surprisingly, other authors were silent on this aspect of non electrocution injuries in their studies. [2, 12, 13, 15]

In our study, in addition to the injuries we also found flame burns in 13 (12.75%) cases. Four of such cases were due to high voltage and two of them actually died due to burn. Over all, four of our victims died late (24 to 48 hours) due to either effects of injuries or burns, after surviving the initial shock of electrocution. In this region, cases of electrocution fall in a category in which some compensation from various agencies as well as some civil laws is awarded. Therefore these

cases of delayed deaths were attributed to electrocution and termed accidental.

All deaths, except one in our study were accidental, the exception was suicidal. The suicide knew the technicalities of electricity being electrician; other victims were not trained in any way to deal with electricity.

**Conclusion:**

- Most of the deaths were accidental, only one case was suicidal. It is in contrast to studies done in West where suicidal cases were as high as 2/3rd. [14]
- Males were the predominant victims.
- In the rainy season, more than 50 per cent deaths occurred.
- Most of the deaths were either instantaneous or immediate.
- Rate of fatality is significantly higher in India as compared to Bulgaria<sup>13</sup> and Canada<sup>15</sup> other parts of world.
- We did not find any cases of deaths involving bathtubs, heaters and hair dryers.
- More than 73.54 per cent deaths occurred in domestic surroundings. It signifies that people living at home did not have elementary knowledge of risks of electrocution.
- Most of the deaths were preventable.

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**Table-1: Cases according to Sex**

Sex	No.	%
Male	75	73.53
Female	27	26.47
Total	102	100

**Table- 2: Cases according to Months/ Year**

Month	2004	2005	2006	2007	2008	No.	%
Jan	1	1	1	0	0	3	2.94
Feb	2	0	0	1	1	4	3.92
Mar	0	2	1	0	0	3	2.94
April	2	3	0	1	2	8	7.84
May	1	1	1	1	2	6	5.88
Jun	7	3	5	6	1	22	21.57
July	2	1	2	3	5	13	12.75
Aug	3	4	7	1	2	17	16.67
Sep	0	2	3	0	3	8	7.84
Oct	0	2	1	2	2	7	6.86
Nov	0	3	1	0	1	5	4.90
Dec	2	1	0	1	2	6	5.88
Total	20	23	21	16	21	102	100

**Table 3: Cases according to Age**

Age (Yr.)	No.	%
<1	0	0
1-10	8	7.84
11-20	19	18.62
21-30	31	30.39
31-40	20	19.60
41-50	16	15.68
51-60	7	6.86
61-70	1	0.98
71-80	0	0
81-90	0	0
>90	0	0
Total	102	100

**Table 4: Cases according to Place of Incident**

Place	No.	%
House	75	73.54
Industrial	7	6.86
On road	12	11.76
Others	8	7.84
Total	102	100

**Table- 5: Cases according to Types of Mark Present over the Body**

Type of marks	No.	%
Only entry mark	48	39.02
Entry and exit	34	27.64
No marks	9	7.32
Additional marks	19	15.45
Burns	13	10.57
Total	123	100

**Table- 6: Cases according to Site of Mark**

Site of marks	Entry	Exit	Others	No	%
Upper limb	70	13	8	91	55.82
Lower limb	7	14	8	29	17.79
Head & neck	4	1	8	13	7.98
Chest	6	2	9	17	10.43
Abdomen	3	2	8	13	7.98
Total	90	32	41	163	100

**Table- 7: Cases according to Surrounding of the Place of Incident**

Surrounding	No	%
Wet	68	66.67
Dry	34	33.33