Original Research Article

Dark side of Electricity: Hospital based Retrospective Observation Study of Deaths Due to Electrocution

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Abstract

Electricity is the set of physical phenomena associated with the presence and flow of electric charge. Electrical injuries are a relatively common type of mechanical trauma that can be caused by lightning, low-voltage trauma, or high-voltage trauma. They frequently have high morbidity and mortality rates. A hospital based descriptive observational study that was conducted at the SMS Medical College, in the department of forensic medicine in Jaipur, Rajasthan from 20th June 2021 to 19th June 2022. There were 75 death cases from electrocution that were included in the sample. Males made up 92% of cases, while females made up only 8% of cases, for a male to female ratio of 11.5 to 1. The majority of the subjects (34.67%) are between the ages of 21 and 30. Age group 31–40 (26.67%) came next. There are 54 (72% of the total) rural residents in the area where the subject resides. The majority of the subjects, or 39 (52%), fell into the lower middle class according to the Modified Kuppuswamy scale. Mortality rate in fatal electrocution cases can be reduced by providing immediate and adequate resuscitation. Although accidental electrocution accounts for the majority of fatalities, suicidal and homicidal electrocution should also be taken into account. In each of these situations, the incident's history, along with a thorough investigation of the crime scene and an autopsy report may enable us to determine the death's cause and manner, allowing us to use the information to plan and put into action preventive measures to lower the likelihood of future occurrences.

Key Words: Compensation, Electrocution, Modified kuppuswamy scale, Prevention, Resuscitation

Introduction

Electrocution is the term used to describe any death brought on by an electrical shock to the body. If not instantly fatal, the damage associated with electrical injuries can result in the dysfunction of multiple tissues or organs[2,8]. The Greek word "Electron" is the origin of the word "electric." Electricity presented in various forms such as lightning, static electricity, electromagnetic induction and electrical current. With the development and modernization of both industry and agriculture, electricity became more common. The proportion of deaths and accidents related to electricity increased at the same time. According to national data on suicides and accidents in India for the year 2020, 13446 electrocution deaths occurred, accounting for 2.4% of all accidental deaths (National Crime Reports Bureau)[1]. The forensic pathologist faces a

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significant challenge when dealing with electrical fatalities, which are not uncommon. The main goal is to ascertain the facts, the reason for the death, the manner of death in cases of electrocution, and whether the death was brought on by carelessness, an accident, or defective electrical equipment. Electric fatalities are commonly found both at the workplace and the house. The presence of contact injury and exit injury are the most typical signs in electric fatalities. The amount and type of electric current also affect the severity of electric injuries and the variety of their appearance. Deaths due to electrocution are emerging into a public health problem especially in the low income countries because of lack of awareness and poor safety issues. This study demonstrates the severity of the accidental electrocution problem in Jaipur at home and at work and offers suggestions for creating efficient safety programme to lower the risk of electrocution.

Aims & Objective: To observe the pattern of electrocution deaths at SMS medical college, Jaipur during 2021-2022.

1. To observe the socio- demographic and medico legal profile of electrocution fatalities.

2. To study the pattern of electrical injuries and other associated injuries in electrocution deaths.

Material and Methods

Medico-legal Autopsies of Electrocution deaths at the mortuary of the SMS Medical College in Jaipur from 20th June 2021 to 19th June 2022 included in this hospital-based observational study. 72 cases are required as sample size, which is further enhanced to 75 for the purpose of present study. Inclusion criteria was fatalities resulting from electrical injuries autopsied at mortuary, SMS Hospital, Jaipur and written informed consent for participation in study. Exclusion criteria was suspected / alleged electrocution deaths not verified on autopsy and decomposed / mutilated bodies of electrocution deaths. Means and standard deviation were used to express qualitative data, and percentages and proportions were used to express quantitative data. The significance of the derived results was assessed using the chi square test, the analysis of the mean difference using the unpaired t test, and other suitable statistical tests. P values under 0.05 and below 0.001 were deemed statistically significant and highly significant, respectively.

Result and Discussion

75 (1.79%) of the 4186 medico-legal autopsies performed at the study site during the study period involved electrocution. The majority of the subjects in the current study (34.4%) were from the active working class and were between the ages of 21 and 30.which was comparable to the Gupta BD et al. 2004[5] (30.39%), Raguis S et al. 2013[10](40%), Balasubramniam S, 2016[3] (32.14%), Khan MK et al. 2019[7] (29.03%), Giri S et al. 2019[6] (38.6%), and Choudhary UK et al. 2019[4] (48.6%) estimates. However, the majority of participants in the Marak F et al. 2017[9] study (26.1%) were between the ages of 41 and 50.

In our study (92%) there were more men than women, which is comparable to the study by Raguis S et al. 2013[10] (96%). However, there was complete male dominance in the study by Balasubramniam S, 2016[3] and only slightly less in the studies by Gupta BD et al. 2012[5] (75.27%), Khan MK et al. 2019[7] (69.5%), Marak F et al. 2017[9] (73.91%), Giri S et al. 2019[6] (86.3%), and Choudhary UK et al. 2019[4] (83%).

Due to the predominance of Hindus in the study area, the majority of cases were of Hindu descent and originated from rural backgrounds. 49.33 percent of the subjects had finished middle school. The majority of participants (53%) are socioeconomically categorized as lower middle class and earn between $10357 and $15335 per year.

Most incidents (41.33%) took place at home, which is comparable to studies by Gupta BD et al. 2012[5] (73.54%), Khan MK et al. 2019[7] (69.35%), Marak F et al. 2017[9] (43.5%), Giri S et al. 2019[6] (47.7%), and Choudhary UK et al. 2019[4] (51.35%). However, the study conducted in 2013 by Raguis S et al. 2013[10] revealed that the outside place dominated (68%).

Only entry wounds were found in 44% of the participants in the current study, which was similar to the results of studies by Gupta BD et al. 2012[5] (39.00%), Khan MK et al. 2019[7] (38.7%), and Choudhary UK et al. 2019[4] (43.33%). However, lower number only entry wounds were reported in the study by Marak F et al. 2017[9] (26%) while more in the study by Giri

S et al. 2019[6] (56.8%). In our study, the prevalence of both entry and exit wounds was 44%, which was higher than that found in studies by Gupta BD et al. 2012[5] (27.64%), Khan MK et al. 2019[7] (29.03%), Giri S et al. 2019[6] (10.2%), and Choudhary UK et al. 2019[4] (30%). A higher percentage of entry and exit wounds, however, were found in the Marak F et al. 2017[9] (73.9%). The majority of entry and exit wounds on subjects were on their extremities (82.67%), which was comparable to studies by Gupta BD et al. 2012[5] (72.6%), Giri S et al. 2019[6], Balasubramniam S, 2016[3], Marak F et al. 2017[9], and Choudhary UK et al. 2019[4] (79%).

Low voltage caused the majority of subjects to die from electric injuries (65.33%). This can be justified by the fact that household electrical appliances are more frequently the cause of accidental electrocution deaths in day-to-day life due to poor handling, malfunction, or electrical line faults. which was comparable to the research conducted by Marak F et al. 2017[9] (65.2%) and Choudhary UK et al. 2019[4] (75.68%). In contrast, Raguis S et al. 2013[10] found that only 40% of burns were caused by low voltage and 60% by high voltage.

Table 1 distribution of subjects in domestic places according to source of burn/electrocution

Source Of Burn	No. Of Subjects	Percentage
Appliances – AC, Fridge, Geyser,Blower	2	6.45%
Cooler	11	35.48%
Heater	2	6.45%
Iron	1	3.225%
Live wire	9	29.03%
Switch board	3	9.67%
Water motors	3	9.67%
Total	31	100%

Similar to the study by Marak F et al. 2017[9] (23. 73% brought dead), the majority of the subjects in the current study died in hospitals (66.66%), while 18 subjects died immediately (24%). However, there were significantly more brought dead cases in the studies by Raguis S et al. 2013[10] (80%) and Giri S et al. 2019[6] (76.01%). In our study, all cases were unintentional, and Balasubramniam S, 2016[3] found similar findings.

Most electrocution deaths occurred in the rainy season (29.33%), primarily in July and August.

Image 1: Entry wound of electrocution

Image 2: Exit wound of electrocution

Image 3: Entry wound of electrocution

Image 4: Entry wound of electrocution over hidden area

Conclusion

Electric current passing through the human body can have a variety of effects, from a localized muscle spasm to the person's sudden death. Since all of the deaths were unintentional, a thorough investigation should be done in every case of electrocution death in order to determine compensation and potential safety precautions. The autopsy surgeon faces a difficult task when a person dies from electrocution because there can be minimal or severe tissue damage throughout the body. Because the victim may frequently be in a state of suspended animation, the mortality rate in fatal electrocution cases can be reduced by providing immediate and adequate resuscitation. In each of these instances, the history of the incident, along with a thorough investigation of the crime scene and an autopsy report, may enable us to determine the manner in which the death occurred as well as its cause, allowing us to use the information to further plan and put into place preventive measures aimed at lowering such occurrences. The pattern of fatal electrocution injuries in this study is more or less consistent with the majority of other studies conducted by different authors. When using damaged appliances, faulty machinery, or non-insulated wiring, caution should be advised. Electrical devices or gadgets that children cannot handle should not be used by them. People residing near high-tension wires are at particularly high risk of getting electrocuted. With the installation of underground cables, the electric supply system in Jaipur was updated in the previous year, and positive changes can be anticipated soon. The fatality rate from electrical injuries could be significantly reduced by performing routine maintenance on electrical wires and implementing safety measures by raising public awareness. I finally put it to rest by saying, "Electrocution is an avoidable catastrophe."

Ethical clearance: Taken from institutional ethics committee of SMS Medical College Jaipur.

Source of funding: Self

Conflict of Interest: Electrical workers are most at risk of dying from electric current. they put their lives in danger so we can use electricity. This research article as my modest tribute to them.

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