Section: Anaesthesiology

Original Research Article

STUDY OF DEATHS DUE TO ELECTROCUTION IN JHARKHAND POPULATION - RETROSPECTIVE STUDY

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ABSTRACT

Background: Electricity is an ambiguous energy; hence, no one can predict the voltage or flow of electric energy. Hence, careless touch may also lead to fatality in many cases. Death or partial damage of any limb or organ depends on the voltage or exposure of the person to electricity. **Materials and Methods:** 52 electrocuted autopsies were carried out in the mortuary of Phulo Jhano Medical College Hospital adult patients of both sexes. Voltage, place, parts of the body involved, and types of injury were also studied. **Result:** Place of electrocution was 27 (51.9%) at house, 11 (21.1%) at the workplace, 5 (9.6%) on the road, and 8 (15.3%) others; 13 (25%) were high voltage, and 39 (75%) had low voltage. Major exposure or involvement was 19 (36.4%) right, 18 (34.6%) upper limb, 9 (17.3%) right, 9 (17.3%) lower limbs, followed by 9 (17.3%) head and neck, and least was 5 (9.6%) chest. **Conclusion:** The present pragmatic electrocution death study will certainly help the medico-legal expert to rule out if the death is due to carelessness, suicide, or conspiracy to kill by electrocution.

INTRODUCTION

Electrocution is the term used to describe any death brought about 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. In 2020 about 2.4% of deaths occurred due to electrocution.[1] The forensic pathologist faces many challenges when dealing with electrical fatalities, which are uncommon. The main purpose of this study is to know the facts and reason for death due to electricity, whether death occurred due to defective electric equipment.[2]

Electric fatalities are commonly found at home and in the workplace. The presence of contact signs and exit injury is the most typical features in electric fatalities.[3] The amount or capacity and type of electric current also vary in sudden death, delayed death, and survival with physical abnormality because electricity is an ambiguous energy agent to which many workers in different occupations and industries are exposed daily in the performance of their duties to earn their daily bread and butter.[4] Hence, an attempt is made to evaluate the place, voltage, and involvement of body organs in electrocuted cases.

MATERIALS AND METHODS

52 adults electrocuted to death autopsy were studied in the Forensic and Toxicology Department (Mortuary) of Phulo Jhano Medical College and Hospital, Dumka, Jharkhand-814101.

Age, sex, type of voltage (high or low), type of electric mark, body region distribution, and types of injuries were studied. Histopathological examination of damaged tissues and the presence of Lichtenberg figures and fern-like patterns on the skin were noted. The duration of the study was from January 2024 to December 2024.

Statistical Analysis: Distribution of cases according to place of voltage, according to various regions of the body marks, and types of injuries were classified with percentages. The statistical analysis was carried out using SPSS software. The ratio of male and female was 2:1.

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RESULTS

[Table 1] Place of incident condition and voltage

- Place: 27 (51.9%) at house, 11 (21.1%) at workplace, 1 (1.92%) Industrial, 5 (9.6%) on road, 8 (15.3%) other
- Condition: 41 (78.8%) dry and 11 (21.1%) wet
- Voltage: 13 (25%) high, 39 (75%) low voltage

[Table 2] Distribution cases according to site of electrocution mark

- 9 (17.3%) Head and neck, 5 (9.61%) chest, 8 (15.3%) abdomen, 9 (17.3%) back.
- In upper limb: 19 (36.4%) right, 18 (34.6%) left
- In lower limb: 9 (17.3%) right side, 9 (17.3%) left side, 4 (7.69%) Genital

[Table 3] Distribution of cases according to type of injuries over all body

- 1 (1.92%) No injury, 23 (44.2%) Entry wound, 5 (9.61%) Flash burns, 7 (13.4%) charring

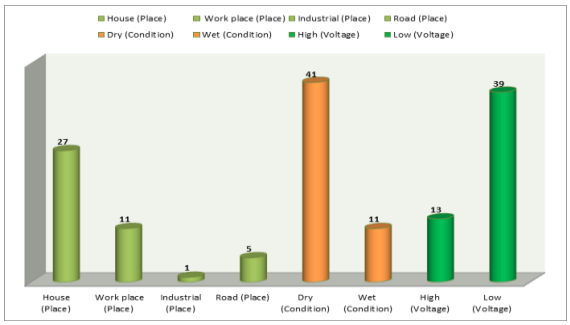

Figure 1: Place of incident, condition and voltage

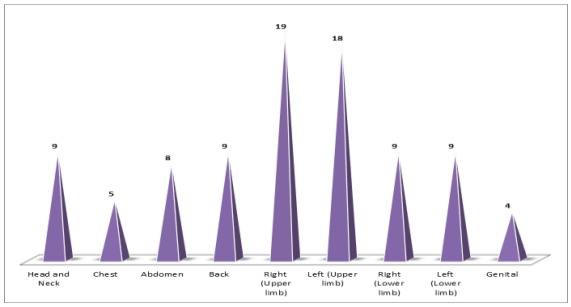

Figure 2: Distribution of cases according to site of electrocution mark

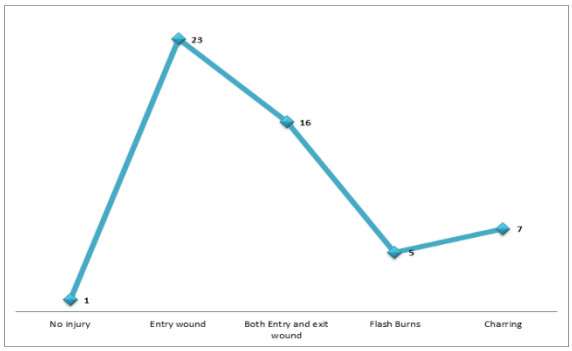

Figure 3: Distribution of cases according to type of injuries all over the body.

Table 1: Place of incident, condition and voltage (N-52)

Details	No of patients	Percentage %
Place		
House	27	51.9
Workplace	11	21.1
Industrial	1	1.92
Road	5	9.6
Condition		
Dry	41	78.8
Wet	11	21.1
Voltage		
High	13	25
Low	39	75

Table 2: Distribution of cases according to site of electrocution mark

Site of Electrocution		No. of Subject	Percentage %
Head and Neck		9	17.3
Chest		5	9.61
Abdomen		8	15.3
Back		9	17.3
Upper limb	Right	19	36.4
	Left	18	34.6
Lower limb	Right	9	17.3
	Left	9	17.3
Genital		4	7.69

Table 3: Distribution of cases according to type of injuries all over the body

Types of Injury	No. of Patients (52)	Percentage %
No injury	1	1.92
Entry wound	23	44.2
Both Entry and exit wound	16	30
Flash Burns	5	9.61
Charring	7	13.4

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DISCUSSION

In the present study of death due to electrocution in the Jharkhand population, 27 (59%) were in the home, 11 (21.1%) in the workplace, 5 (9.6%) on the road, and 8 (15.1%) in other places. High voltage death 13 (25%), low voltage 39 (75%), 41 (78.8%) in dry condition or climate, and 11 (21.1%) in dry climate [Table 1]. In the study of the site of electrocution, limbs are mainly involved: 19 (36.4%) right upper limb, 18 (34.6%) left upper limb, 9 (17.3%) right lower limb, and 9 (17.3%) left lower limb, followed by 9 (17.3%) in the head and neck and least in 4 (7.69%) in the genital area [Table 2]. The types of injuries were highest: 23 (44.2%) entry wounds, 16 (30%) both entry and exit wounds, 7 (13.4%) charring, and 5 (9.60%) flash burns [Table 3]. These findings are more or less in agreement with previous studies.[5-7]

Forensic pathology plays a vital role in the investigation of electric deaths. Autopsies reveal specific patterns of injury that can differentiate electrocution from other causes of death, e.g., traumatic injury differs from injuries caused by electrocution deaths. The presence of Lichtenberg figures, a firn-like pattern on the skin, is a unique marker of lightning strikes.[8] Histopathological examination elucidated the extent of tissue damage and confirmed the diagnosis of electrical injury.[9]

In addition to physical examination, assessment of circumstances of death. It includes sources of electricity, the environment, and any safety violations. The forensic expert must collaborate with electrical engineers to reconstruct the event, ensuring a comprehensive understanding of the incident.

Males are mainly affected, often due to occupational hazards in industries such as construction and maintenance.[10] Seasonal variations also increase the death rate due to electrocution. During summer season likely to increase outdoor activities and the usage of electric devices.

The persons who survived the electric injury need immediate, extensive medical intervention, because the long-term sequelae of electric injury might be more subtle, pervasive, and less well defined. The patient may develop neurological, psychological, and physical symptoms and may cause hindrance to leading a normal social life.[11]

CONCLUSION

Death due to electrocution is an ambiguous incident and challenge to medico-legal experts to rule out that death is casual, suicidal, or planned murder. Hence, apart from histopathological and physical examination, the family physician of the dead patients has to be consulted to know the patient's psychological status. To confirm suicide, police must rule out if it is a conspiracy. However, physical marks and histopathology express only the death due to electrocution.

Limitation of study: Owing to remote location of research Centre, small number of cadavers and lack of latest techniques. We have limited findings and results.

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