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ORIGINAL ARTICLE

Electrocution Deaths in Northwest Delhi, India: A Five-Year Retrospective Analysis (2018–2022)

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ABSTRACT

Introduction: Electricity is an essential resource in modern society. However, its ubiquitous presence also presents inherent risks to human life. Although electrocution deaths account for a small proportion of overall fatalities, which can be preventable, which represents a significant public health concern due to accidental exposure, equipment malfunction, and failure to use proper safety precautions.

Objective: To analyze the demographic profile, seasonal variation, occupation, and forensic characteristics of electrocution deaths in Northwest Delhi, India, over five years.

Methods: A retrospective review was conducted on 105 autopsy-confirmed electrocution death cases from the Department of Forensic Medicine at Dr. Babasaheb Ambedkar Medical College, Rohini, Delhi (2018–2022).

Results: Electrocution fatalities accounted for approximately 1.2% of all autopsy cases. Males predominated (95 cases, 90.5%), with the most affected age group being 21–30 years (40 cases, 38.1%), followed by 11–20 years (26 cases, 24.8%) and 31–40 years (21 cases, 20.0%). Cases peaked during the monsoon season (June–September; 73 cases, 69.5%), with the highest incidence observed between 12:00 PM and 5:00 PM (41 cases, 39.0%). The labor class represented the most common occupational group (24 cases, 22.9%), and the most common source of electrocution was the exposed electric wires and faulty electrical boards (18 cases, 17.1%). Upper

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extremity involvement was most frequent (73 cases, 69.5%), with entry wounds identified in 92 cases (87.6%) and both entry and exit wounds observed in 7 cases (6.7%).

Conclusion: The study indicates that electrocution deaths in the Northwest region of Delhi are predominantly due to accidents and occur most often in young males, particularly during the monsoon season and afternoon hours. So, several preventative strategies including improved electrical safety education, regular maintenance of electrical installations, and heightened public awareness are essential to reduce these fatalities.

KEYWORDS

• Electrocution • Accidental Death • Electrical Hazards • Public Safety • Forensic Analysis

INTRODUCTION

Electricity is the lifeblood of modern society, powering everything from our homes to our industries and essential services. In today's world, imagining life without this invaluable resource is nearly impossible. However, while electricity brings tremendous benefits, it also poses significant risks. For instance, despite its widespread use, fatalities due to electrocution remain relatively low compared to other types of accidents, yet they are almost always accidental rather than intentional.[1,2]

In most cases, electrocution incidents occur because of carelessness, misuse, or improper maintenance of electrical systems and wiring. Such lapses can lead to dangerous exposure to live electrical currents, particularly when safety standards are not rigorously followed.[3] It is important to note that homicidal or suicidal electrocution is exceedingly rare, as the vast majority of these tragic events are unintentional.[1, 2]

Another key factor is the type of electrical current involved. Direct current (DC) is rarely used in everyday applications, which means that electrocution fatalities are predominantly associated with alternating current (AC), which is true for both low and high voltage exposures, where the risk is mainly tied to the inherent characteristics of AC electricity.[4,5]

The current study focuses on the epidemiology of electrocution deaths in Northwest Delhi over the period from 2018 to 2022, offering insights into the patterns, causes, and potential preventive measures related to these incidents.

MATERIAL AND METHODS

This study was a retrospective analysis of 105 electrocution death cases for the period of 2018 to 2022. The records are obtained from the Department of Forensic Medicine at Dr. Babasaheb Ambedkar Medical College, India. Only those cases in which death was unequivocally attributed to electrocution were included. The diagnosis was established based on autopsy findings, corroborative crime scene reports, and the exclusion of other potential causes of death. The collected records were then systematically analyzed concerning the victim's sex and age, season of occurrence, time of day, occupation, source of electrocution, affected body region, and the presence of entrance and exit wounds.

RESULTS

The majority of the victims were male (95 males, 90.47%) as compared to female (10 females, 9.50%) and the commonest age group involved was 21-30 years (40 cases, 38.09%) followed by 11-20 years (26 cases, 24.76%) and 31-40 years (21cases, 20%) (*Table* 1).

Table 1: Age distribution of cases

Age (Yrs.)	Total	Percentage
0-10	7	6.66%
11-20	26	24.76%
21-30	40	38.09%
31-40	21	20%
41-50	9	8.57%
51-60	2	1.90%

According to the season concerned, the highest number of electrocution cases was seen during June-September (73 cases, 69.52%) (*Table* 2), and the peak period for deaths was between

12 pm and 5 pm (41 cases, 39.04%) (*Table* 3). The most common occupation was labor class people (24 cases, 22.85%), followed by electricians (9 cases, 8.57%), in which death occurs due to electrocution (*Table* 4).

Table 2: Seasonal distribution of cases

Month (season)	Total	Percentage
Oct –Jan (winter)	12	11.42%
Feb-may (summer)	20	19.04%
Jun-Sept (monsoon)	73	69.52%

Table 3: Time duration of occurrence

Time	Total	Percentage
5 am to 12 pm	30	28.57%
12 pm to 5 pm	41	39.04%
5 pm to 8 pm	18	17.14%
8 pm to 6 am	16	15.23%

Table 4: Occupation wise distribution of cases

Occupation	Total	Percentage
Driver	4	3.80%
Electrician	9	8.57%
Housewife	1	0.95%
Labor	24	22.85%
Shop worker	2	1.90%
Student	2	1.90%
Unknown	63	60%

The most common source of electrocution was electric wire and electric board (18 cases, 17.14%), followed by factory machines (10 cases, 9.52%) (*Table* 5). The upper extremity was involved in 73 cases (69.52%), followed by the lower extremity in 12 cases (11.42%). (*Table* 6). Entry and exit wounds were present in only 7 cases (6.66%), while in 92cases (87.61%), only entry wounds could be seen on autopsy.

Table 5: Source of electrocution

Source	Total	Percentage
High tension wire	8	7.61%
Refrigerator	1	0.95%
Fan	3	2.85%
Marble rubbing Machine	3	2.85%
Water cooler	5	4.76%
Water motor	6	5.71%
Factory machine	10	9.52%
Electric wire and board	18	17.14%
Welding machine	2	1.90%
Electric pole	1	0.95%
Water Heating rod	3	2.85%
Fish catching hook	1	0.95%
Iron grill	4	3.80%
Unknown	40	38.09%

Table 6: Body region distribution involved during electrocution

Body region	Total	Percentage
Head and Neck	6	5.71%
Upper extremity	73	69.52%
Chest and abdomen	8	7.61%
Lower extremity	12	11.42%
No electrocution mark	6	5.71%

DISCUSSION

Electricity is integral to everyday life, powering our homes, workplaces, and industries. Nearly everyone interacts with electrical systems daily, and many employees across different sectors are routinely exposed to their hazards.[3,6] Despite the crucial role electricity plays, the vast majority of electrocution-related deaths are accidental.[2,7] In our study covering Northwest Delhi from 2018 to 2022, electrocution fatalities represented 1.2% of all autopsy cases. This rate is notably lower than the 1.98% reported in earlier research from Delhi,[8] suggesting that increased public awareness and better handling of electrical equipment may contribute to a decline in such incidents.[4]

Our findings revealed a significant gender disparity: males accounted for 90.47% of electrocution deaths (95 out of 105 cases), while females comprised only about 9.5%. This observation is consistent with previous studies that reported male involvement in electrocution fatalities ranging from 81% to 95%.[2,7,8] This trend is likely due to the higher probability of men encountering electrical hazards at work and during daily activities at home.

Age also plays a vital role in the risk of electrocution. Global surveys indicate that adults in their third and fourth decades are particularly vulnerable, and our study supports this, with individuals in these age groups accounting for 58.09% of cases.[2,3,6,7,9,10]

Seasonal trends were another critical aspect of our findings. The majority of electrocution deaths (69.52% or 73 cases) occurred during the monsoon season (June to September). High humidity and the resulting moisture on the skin significantly lower its resistance from about 1000 ohms when dry to between 200 and 300 ohms when wet thereby increasing the likelihood of a fatal electrical shock.[3,8,11] While studies by Fatovich[7] corroborate these findings, research from Coimbatore, India, noted a higher incidence during the summer months, possibly due to increased sweating, which also lowers skin resistance.[2,6,7,9,10]

Time of day is another factor: our data showed that most electrocution incidents occurred in the afternoon, followed by the morning. This pattern aligns with findings from Mukherjee *et al*.[3] although some studies have reported a higher occurrence in the morning.[4,12]

Occupational analysis revealed that the labor class was the most affected group, with 22.85% of cases, followed by electricians (8.57%). This pattern is similar to Marak *et al*.[13] findings. It may reflect lower educational levels among laborers and poor maintenance practices in construction environments, where electrical wiring is often not securely installed.

Regarding the source of electrocution, faulty electrical equipment was the most common culprit.[10,13] In our study, the leading sources were exposed electric wires and defective electric boards (17.14%), followed by factory machinery (9.52%), high-tension wires (7.61%), and, less frequently, water coolers (4.75%). In water coolers, electrocution can occur if there is a fault in the electrical supply or live wires come into contact with the metal casing.

Forensic analysis further indicated that the upper extremities were the most frequently affected body region in these accidents (69.52%), likely because individuals often use their hands to handle malfunctioning equipment.[8,12,14,15,16] Electrical burn marks were predominantly observed at the entry point of the current (87.61%), while both entry and exit wounds were present in only 6.66% of cases. This distribution may be explained by the exit point often covering a larger earthing area, making it less distinct.[17]

Importantly, our study did not identify any cases of homicidal or suicidal electrocution, reaffirming that these tragic incidents are almost exclusively accidental.

CONCLUSION

In summary, our findings reveal that the trends in electrocution deaths in Northwest Delhi closely align with global patterns. The risk is particularly high among young men working in high-exposure settings such as construction sites, factories, or environments involving electrical equipment like faulty boards and water coolers especially during the monsoon season. Ultimately, these tragedies can be preventable mainly through improved public education, stringent safety measures, and diligent maintenance of electrical systems.

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