

## Profile and Analysis of Lightning Victims Brought To RIMS, Ranchi, Jharkhand

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**Abstract:** Lightning stroke is one of the most frequent causes of death by natural phenomenon. When there is discharge of electricity between clouds lightning occurs. Deaths due to lightning occur throughout the world and the incidences are more in the rural areas compared to the cities. This study was aimed to study the profile and analysis of lightning victims. The study was conducted in the Department of Forensic Medicine and Toxicology, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand. Total 24 cases of lightning victims were brought in the period of 03 years from 2013 to 2015. Most of the victims were males (66.6%) of rural areas. 91.6% victims were farmers and 20.8% of the incident took on Saturday in the afternoon (66.6%). The incidence of lightning occurred mostly in the monsoon season (July-37.4%). The majority of the victims (83.3%) died of cardiopulmonary arrest and 41.7% of victims showed the survival period of 1 to 24 hours. Though unpredictable, such deaths are preventable with better public education, rural health care, etc.

**Keywords:** education, electricity, cardiopulmonary arrest, lightning.

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### I. Introduction

Out of all the unnatural deaths, the most unpredictable is due to lightning. Lightning chooses the easiest and the shortest path, that is, path of least electrical resistance [1]. During the thunderstorm, the lightning stroke discharges many current peaks varying from 10,000-200,000 Amp occurring in the fraction of a second affecting an area of about 30 m distance [1]. Very few detailed study are available regarding the human fatalities due to lightning strikes. In the United States on an average 100 to 600 deaths are recorded annually due to lightning [2]. In India, every one hour nearly 02 persons died due to causes attributable to forces of nature during the year of 2014 [3]. Out of 20,201 accidental deaths attributable to natural causes, 12.8% deaths are due to lightning [3]. In Jharkhand, 858 deaths were due to causes attributable to forces of nature (natural) in 2014 [3]. The injuries with or without the burns on the body associated with tearing off of the wearing apparels, may closely resemble those produced by criminal violence [fig.1].

But the history of thunderstorm in the locality, effects of lightning with characteristic burns on the body and the vicinity, fusion or magnetization of metallic objects on the body or nearby, will all suggest death due to lightning stroke. Lightning causes human injury by four distinct mechanisms: the direct effect of electric current, burning by superheated air, effects of expanded and repelled air around flash and the sledge hammer blow death by compressed air pushed before the current.

This study was taken up for the profile and analysis of the lightning victims in this region and thus, spreading awareness to reduce these deaths.

### II. Materials And Methods

The present study was carried out from 2013 to 2015 in the Department of Forensic Medicine and Toxicology, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand. Total 24 cases were brought for the autopsy during this period. Detailed data collected from the relatives of the deceased, hospital records, inquest, autopsy reports etc.

### III. Observation And Results

A total of 24 cases of lightning were reported during 03 year of period from 2013 to 2015. Most of the victims were from age group 11-20 years (33.3%) then followed by 21-30 years age group (20.8%) and 41-50 years age group (20.8%) [TABLE 1].

**Table-1: Age & Gender wise Distribution of Victims**

Age group (yrs)	Males	Females	Total (%)
0-10	0	0	0 (0%)
11-20	6	2	8 (33.3%)
21-30	2	3	5 (20.8%)
31-40	2	0	2 (8.4)
41-50	4	1	5 (20.8%)
51-60	2	1	3 (12.5%)
>60	0	1	1 (4.2%)
Total	16	8	24 (100%)

Majority of the casualties (20.8%) occurred on Saturday [TABLE 2].

**Table-2: According to Days in Week.**

Day	Cases	%
Monday	3	12.5
Tuesday	2	8.4
Wednesday	6	25
Thursday	4	16.6
Friday	1	4.2
Saturday	5	20.8
Sunday	3	12.5
Total	24	100

22 (91.6%) victims were farmers [TABLE 3].

**Table-3: Occupation wise distribution**

Occupation	Cases	%
Farmer	22	91.6
Student	02	8.4
Total	24	100

The peak time of incidence (66.6%) were at the afternoon (12 pm-6 pm) [TABLE 4].

**Table-4: time of incidence**

Time	Case	%
morning(6am-12pm)	06	25
Afternoon(12pm-6pm)	16	66.6
Night(6pm-6am)	02	8.4
Total	24	100

20 victims (83.2%) were struck by lightning while they were taking shelter under something [TABLE 5].

**Table-5: place of incidence**

Place	Cases	%
Working open	02	8.4
Shelter under	20	83.2
Playing open	02	8.4
Total	24	100

The monsoon season is the peak incidence of lightning with 37% of cases in the month of July and 25% in the month of August [TABLE 6].

**Table-6: Month-wise incidence of lightning victims**

Month	Cases	%
January	0	0
February	0	0
March	0	0
April	1	4.2
May	2	8.4
June	4	16.6
July	9	37.4
August	6	25
September	2	8.4
October	0	0

November	0	0
December	0	0
Total	24	100

The survival period is 1-24 hours in 41.7% of victims followed by <1 hour in 33.3% cases [TABLE 7].

**Table-7:** survival period

Survival period	Cases	%
Brought dead	6	25
<1 hr	8	33.3
1-24 hr	10	41.7
>24 hr	0	0
Total	24	100

The cardiopulmonary arrest is the major cause of death (83.3%) and rest due to head injury [TABLE 8].

**Table-8:** cause of death

Cause	Case	%
Cardiopulmonary arrest	20	83.3
Head injury	04	16.7
Total	24	100

#### IV. Discussion

The total 24 cases of lightning victims were reported in the period of 03 years from 2013 to 2015. The maximum number of cases (33.3%) was from 11 to 20 years age group, followed by 20.8% in 21 to 30 years age group. Only one case is reported at extremes of the age [TABLE 1]. These findings are consistent with other author's findings [3, 4]. This was due to the fact that adults are involved in outdoor activities in spite of bad weather and working class people belong to this age group.

In our study 16 cases (66.6%) were of males whereas females amounted to 08 (33.4%) [TABLE 1]. Males were involved in outdoor activities and hence more prone for lightning. Similar findings are observed by other studies [5, 6].

Our study shows that all the victims were from rural areas. These are consistent with other studies [4, 7]. Farmers were top among the occupation [TABLE 3] because most common outdoor activity in our region is farming [8, 9]. The peak incidence occurred in the monsoon season with 37.4% cases in the month of July followed by 25% in the month of September [TABLE 6]. The other studies also favored this finding [10]. This might be due to victims were working at open field even during high risk period of lightning; primary occupation is agriculture which is rain dependent.

Persons standing beneath a tree or under a shade are most vulnerable (83.3%) in our study [TABLE 5]. The tendency of lightning striking a tall object in an open space and shelter under a tree is by no means safe, particularly if they are carrying or wearing something that may attract lightning. But the other studies showed that majority of the casualties occurred while working in the open fields [9, 10].

As per day of incidents, most cases 5 (20.8%) occurred on Saturday followed by Thursday (16.6%) and Monday (12.5%) [TABLE 2]. Other studies also found the similar findings [7, 11]. The most probable reason is that people indulge in more outdoor activities on weekends and holidays. Like other studies in our study also most of the cases (66.6%) occurred in the afternoon between 12pm-6pm [TABLE 4] [8, 10, 12]. This is the time for most of the people engaged in their work more susceptible and also times for most the people to finish their daily work and go back to respective home, hence more susceptible to strike by lightning.

Maximum cases (41.7%) died from between 1 hour to 24 hours of hospitalization followed by 33.3% victims died within 1 hour and 25% of victims were brought dead [TABLE 7]. This is in contrast with the study done by S. Chattopadya who observed that majority of the victims either died on the spot or on the way to the hospital [10]. The reason is after lightning, ventricular arrhythmias are most common effect on the body and this is life threatening condition needs immediate treatment by skilled persons.

Cardio-pulmonary arrest following lightning was most common in 83.3% cases followed by head injury (16.7%) due to lightning [TABLE 8]. Similar findings were observed by other studies [13, 14].

#### V. Conclusion

The incidence of lightning is much higher in this region. Altitude of this place is comparatively higher from mean sea level. They are favorable for convective cloud to form due. This condition makes Jharkhand a lightning prone. Males of young age group, belonging to low socio-economic class encounter during rainy season. The farmers taking shelter under a tree and at the open fields are vulnerable to lightning stroke. Cardiopulmonary arrest following lightning was most common cause of death.

These cases are unpredictable but preventable with proper precaution and with better public education, arrange lightning protection devices, awareness of common people.

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**Fig.1-** 32 year male showing tearing off of the wearing apparels and contusion over the pubic area (PM No.897/14)