Original Article

LIGHTENING: A 15 YEAR STUDY OF FATAL CASES AT SVNGMC YAVATMAL

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Abstract:

Lightning kills many people despite the fact that danger from lightning strikes is well recognized. It kills more people than other natural disasters such as floods and hurricanes. A review of the Indian medical literature shows paucity of published data regarding lightning fatalities. The Central India has a largely rural population, many of whom has low socioeconomic status and poor education, housing, and other infrastructure and hence (possibly) is at greater exposure risk. Forty seven victims of lightning-related death were identified from the records of Department of Forensic Medicine, Yavatmal, for period 1996 to 2010. Lightning strikes occurred from June to September (normal monsoon rainfall period), and most strikes took place in the afternoon. This study serves to illustrate the relatively high incidence of lightning strikes in the region and calls for a more systematic and detailed investigative protocol in lightning-related deaths.

Key words: Lightening, Burns, factors.

Introduction:

Lightening is defined as a momentary, atmospheric, transient, high current electric discharge whose path length is measured in kilometers from sky to earth. In lightening, very high voltages and amperages are involved and happen when highly charged thundercloud discharges via a huge arc to the ground. Most lightning discharges are within clouds, while some cause electrical discharge from a cloud to earth. Most human deaths are caused by cloud-to-earth lightning strikes.[1]

Lightning injury can occur in five ways: direct strike, orifice entry, contact, side flash, and blunt trauma. The primary cause of death in victims of lightning strike is cardiac arrest, which may be associated with primary ventricular failure or asystole. Lightning acts as an instantaneous, massive direct current shock, simultaneously depolarizing the entire myocardium. In many cases intrinsic cardiac automaticity may spontaneously restore organized cardiac activity and a perfusing rhythm. But concomitant respiratory arrest due to thoracic muscle spasm and suppression of the respiratory center may continue after return of spontaneous circulation. Unless ventilation is supported, a secondary hypoxic (asphyxial) cardiac arrest will develop.

Aims and Objectives:

This study is aimed at various conditions responsible for deaths due to electrocution brought to our tertiary care hospital.

The objectives of the study are:

1) To study the prevalence of lightening deaths at our hospital.
2) To ascertain the various conditions associated with deaths due to lightening.

Material and Methods:

The present study was carried out from January 1996 to December 2010 in the Department of Forensic Medicine & Toxicology at a Govt. Medical College and hospital,

Yavatmal. A standardized proforma specially designed for this purpose was used and filled in each case after detailed examination of inquest, autopsy, hospital records etc. to gather information.

Results:

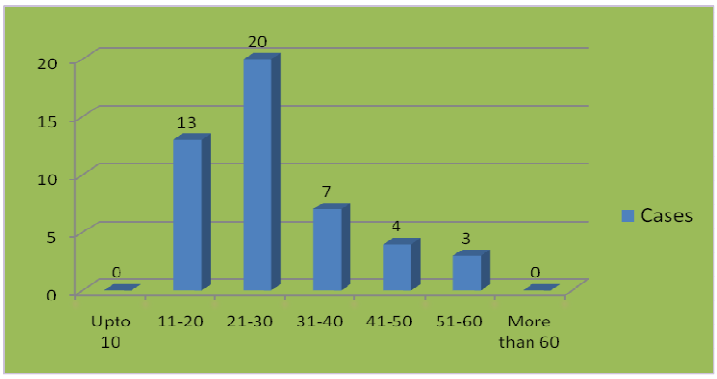

Figure no. 1: Distribution of study cases according to age of the victims

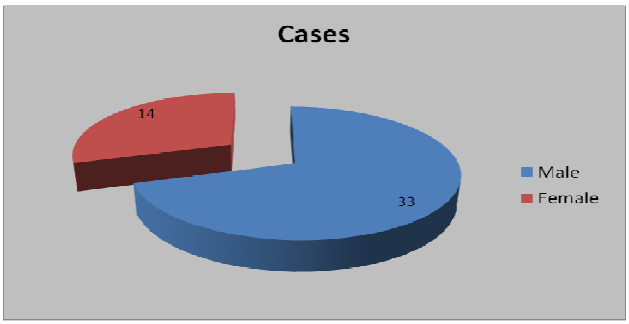

Figure no. 2: Distribution of study cases according to sex of the victims

Marital status	Cases	Percentage
Married	28	59.57
Unmarried	19	40.43
Total	47	100

Table no. 1: Distribution of study cases according to marital status of the victims

Occupation	Cases	Percentage
Farmer	23	48.94
Labourer	16	34.04
Students	7	14.89
Technician	1	2.13
Proffessional	0	0
Total	47	100

Table no. 2: Distribution of study cases according to occupation of the victims

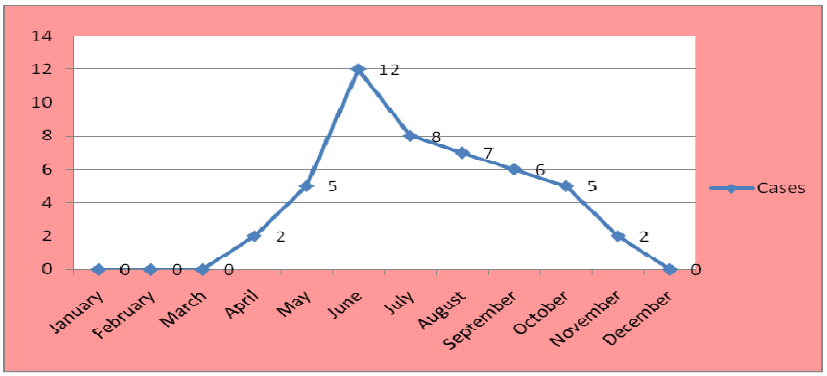

Figure no. 3: Distribution of study cases according to month of the incidence

Survival period	Cases	Percentage
Brought dead	38	80.85
Less than 1 hour	2	4.26
1 hour to 1 day	2	4.26
More than 1 day	5	10.63
Total	47	100

Table no. 3: Distribution of study cases according to survival period of the victims

Day	Cases	Percentage
Monday	06	12.77
Tuesday	05	10.64
Wednesday	08	17.02
Thursday	06	12.77
Friday	04	06.51
Saturday	10	21.27
Sunday	08	17.02

Table no. 4: Distribution of study cases according to days in week

Time of incidence	Cases	Percentage
0001 - 0600	07	14.89
0601 - 1200	06	12.77
1201 - 1800	18	38.30
1801 - 2400	16	34.04

Table no. 5: Distribution of study cases according to time of the incidence

Autopsy findings	Present	Percentage
Burns over the body	38	80.85
Magnetisation of metals	14	29.79
Singed hairs	20	42.55
Associated injuries	35	74.47

Table no. 6: Distribution of study cases according to autopsy findings

Cause of death	Cases	Percentage
Cardio-respiratory arrest	38	80.85
Burns	5	10.65
Head injury	2	4.25
Pulmonary infarction	2	4.25
Total	47	100

Table no. 7: Distribution of study cases according to cause of death

Discussion:

In present study maximum number of cases 20 (42.55%) were from 21-30 years age group, followed by 13 cases (27.66%) in 11-20 years and no cases at both the extremities. The minimum age of the victim was 13 years and the maximum was 60 years with average age 32.3 ± 17.5. Similar results were noted by Aslar AK et al (2001)[2], Dokov William (2009)[3]. This is due to the fact that children and adults are involved in outdoor activities in spite of bad weather. Findings of our study differ from Murthy OP et al (2009)[4], Bluementhal R (2005)[5], Wetli CV (1996)[6] and Philippe J Duclos and Lee M Sanderson (1990)[7].

In our study 33 cases (70.21%) were of males whereas female amounted to 14 (29.79%) and ratio of male to female was 2.33:1. Consistent findings were reported by Murthy OP et al (2009)[4], Dokov William (2009)[3], Sophie Pointer and James Harrison (2007)[8], Brian Mills et al (2006)[9], Aslar AK et al (2001)[2], Wetli CV (1996)[6] and Philippe J Duclos and Lee M Sanderson (1990)[7]. Males are involved in occupations which are mostly outdoor and hence more prone for lightening.

We observed that in 28 cases (59.57%) the victims were married and 19 (40.43%) were unmarried. Murthy OP et al (2009)[4] also reported similar results. This might be due to distribution of cases more in age group more than 21 years.

We found maximum cases i.e. 23 cases (48.94%) were farmers followed by 16 (34.04%) labourer and 7 (14.89%) students. Findings of Murthy OP et al (2009)[4] and Wetli CV (1996)[6] differ from our study. This might be due to most common outdoor activity carried in our region is farming and they lack proper place to hide during lightening.

Maximum cases i.e. 38 (80.85%) were brought dead and did not receive the treatment followed by 5 case (10.63%) who died after 1 day and mean survival period was 10.00 ± 23.83 hours. Murty OP et al (2009)[4], Bluementhal R (2005)[5], Philippe J Duclos and Lee M Sanderson (1990)[7] also noted similar findings. Aslar AK et al (2001)[2] found that the mean duration of hospitalization was short (17.3 days) and ranged from 1 to 62 days. The reason for this might be that after lightening, ventricular arrhythmias are most common effect on the body and this is life threatening condition and needs immediate treatment by skilled person.

In present study maximum cases of lightening i.e. 12 (25.53%) were seen during the month of June, followed by July 08 cases (17.02%), and 7 during August. Also maximum cases i.e. 33 (70.21%) occurred during June to September months which is the rainy season in our region. Similar results were noted by Dokov William (2009)[3] and Brian Mills et al (2006)[9]. Bluementhal R (2005)[5] also reported most cases during rainfall season. The most probable reason might be more number of lightening during this period resulting into more number of cases.

We found that most cases i.e. 10 (21.27) on Saturday followed by 08 (17.02) each on Sunday and Wednesday. Brian Mills et al (2006)[9] found most cases during Saturday (26.4%) and Curran et al (2000)[10] also reported most cases during Sunday followed by Wednesday. The most probable reason is that people indulge in more outdoor activities on weekends and holidays.

In our study most of the cases i.e.18 (38.30) occurred during 1201 to 1800 hours. Bluementhal R (2005)[5], Curran et al. (2000)[10], Wetli CV (1996)[6] and Philippe J Duclos and Lee M Sanderson (1990)[7] also noted consistent findings. This is the time for most of the people to finish their daily work and go back to respective home, hence more susceptible to strike by lightning.

We found burns over body in 38 cases (80.85%). Findings of our study are consistent with that of Bluementhal R (2005)[5] and Wetli CV (1996)[6]. Blumenthal R (2006)[11] discussed

metal objects may burn the underlying skin, or mark the skin due to heat of electrical arcing. Also unique arborescent or fern-like injuries (Lichtenburg figures) should be noted. This is due to high voltage of direct current in lightening.

Magnetization of the metal worn was noted in 14 (29.79%) cases. Wetli CV (1996)[6] also found magnetization in 3 out of 45 cases. Blumenthal R (2006)[11] discussed that metal objects may show signs of fusing, zincification, cuprification and/or magnetization. Metallic objects such as tooth fillings, spectacles, belts, buckles, coins and pacemakers should be specifically commented on. This is usual finding seen in lightening.

Singed hairs were noted in 20 (42.55%) cases. Bluementhal R (2005)[5] and Wetli CV (1996)[6] also found consistent findings.

In the present study cardio-pulmonary arrest following lightening was most common i.e. in 38 (80.85%) cases which lead to immediate death of the victim, followed by burns 5 (10.65%) and 2 (4.25%) each by head injury and pulmonary infarct. The initial response of lightning stroke is paralysis of the vital centers, specifically respiratory center, resulting in apnea, ventricular fibrillation or cardiac arrest. Cardiac arrhythmias are very common with lightning strokes.[12,13]

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