



LIGHTNING : A THREE YEARS AUTOPSY BASED STUDY

Forensic Medicine

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ABSTRACT

Introduction: Lightning is an electrical discharge caused by imbalances between storm clouds and the ground, or within the clouds themselves; most lightning occurs within the clouds. During a thunderstorm, an electrical gradient is formed by the interaction of moisture, warm air, and wind, and this current is eventually discharged as lightning. The exact science behind lightning has not been fully understood. However, a lot of hypotheses have been suggested. **Material and Method :** The data from Jan 2020 to Dec. 2022, was collected for this study. The present study was carried out in department of FMT, JLNMC Bhagalpur. **Observation and Results :** This study observed 43 cases of lightning death among which that maximum cases were male. 33 (76%) and female 10 (24%), religion Hindu 42 (98%) Muslim 01 (2%) age group among more common was 41 to 50 years and 51 to 60 years. Manner of death : almost 100% were accidental. Among month maximum in June (rainy session) and May 2nd most. Nil was January, March, April, November and December. Most common cause of death in a lightning strike victim is a cardiac arrest. **Recommendation :** Recommended precautionary steps to avoid lightning stroke No to go to an open place during lightning, not to go on the open roof of a building during lightning. Not to take shelter under a solitary tree. Not to touch a metallic fencing or such substance. Not to be near an un-arrested telephone wire or antenna, computer or near an inflammable fuel source.

KEYWORDS

Lightning, Electrical gradient, Cardiac arrest

INTRODUCTION

Lightning is the visible 'zig-zag flash of light' which appears in the sky during a thunderstorm due to discharge of electricity between clouds. discharges between charged clouds and the Earth's surface are responsible for considerable damages and casualties. It is therefore important to develop better protection methods in addition to the traditional Franklin rod. Benjamin franklin by his kite experiment for the first time discovered that the lightning flashes are actually electrical discharges. The lightning flash follows the path of least electrical resistance, so the path of lightning is zig-zag. Duration of lightning strike is very short (few milliseconds to 2 sec only) the lightning strike usually gets neutralized by passing through the nearest and tallest object, and it may affect an area of about 100 feet diameter. A typical lightning flash is about 300 million volts and about 30000 AMPS. Lightning occurs as a sequelae to – accumulated electrically charged particles on the surfaces of cloud, snow storm, dust storm, volcanic eruption and nuclear explosion. Lightning of cloud origin is most common.

Lightning has fascinated and terrified humankind since time immemorial. Based on satellite data, the total lightning flash rate worldwide—including cloud-to-ground and cloud lightning—is estimated to be between 40 and 120 flashes per second causing considerable damage and casualties.

MATERIAL AND METHOD

The present study was carried out in department of FMT, JLNMC Bhagalpur. The data from Jan 2020 to Dec. 2022, was collected for this study. This study includes only those cases showing sign of lightning death on police inquest and other unknown cause. Decomposed bodies and the cases where nature of injuries was undetermined was excluded from this study. The various epidemiological features and medicolegal aspects of cases where collected from police inquest, PM reports and other datas (FIR, hospital records etc) and interrogation of the relatives and friends neighbours accompanying the dead body.

In every case of Lightning death, details of these injury were studied for positive factors, external examination, internal examination, number of injuries, part of the body and organ involved, any other type of associated injuries and manner of death, cause of death. This study was also evaluated according to age, religion, sex, marital status, habitat, occupation, place of occurrence.

OBSERVATION AND RESULT

The study of LIGHTNING DEATH AUTOPSY based study was done from Jan 2020 to Dec 2022. During this period a total number of 2967

cases of medicolegal autopsies were conducted in mortuary of JLNMC Bhagalpur, dept. of FMT out of this 43 cases (1.4%) were death due to lightning.

Sex – Among 43 cases lightning death male – 33 (76%) and female – 10 (24%).

Religion – Hindu 42 (98%), Muslim 01 (2%).

Manner Of Death – Accidental 100%, Homicidal 0, Suicidal 0.

Cause Of Death – Asphyxia and shock - 40 cases, septicemia and other causes – 03 cases.

Survival Time Of Lightning Death Victims – Found death at scene/spot death – 40 cases, more than 1 day – 3 cases.

Month Wise Distribution – Maximum in June (Rainy season) and May (2nd most), minimum (Nil) – January, March, April, November and December

Occupation Of Lightning Victims – Farmer – 30, Housewife – 10, Unknown – 3.

Habitat – Urban – 05, Rural – 38 cases.

Site Of Lightning Injury – Shoulder-20 cases, then chest and abdomen 10 cases. thoracic cavity 20 cases followed by abdominal cavity 07 cases, multiple site – 15 cases.

Most common place of lightning death – farm, road (at the site seen). – 35 cases, on the way – 5 cases, during hospitalization – 3 cases.

Age Wise Distribution Of Lightning Death :-

Age group	2020	2021	2022	Total
1 – 10 years	3		3	6
11-20	1	1	7	9
21-30	2	2	1	5
31-40	3		1	4
41-50	2	3	4	9
51-60	3	2	3	8
61-70			2	2
Total	14	8	21	43

Sex And Year Wise Of Lightning Death

YEAR	MALE	FEMALE	TOTAL
2020	10	4	14
2021	6	2	8
2022	17	4	21
TOTAL	33	10	43

Month And Year Wise Distribution Of Lightning Death.

Month	2020	2021	2022	Total
JANUARY				
FEBRUARY	1		1	2

MARCH				0
APRIL				0
MAY	1	2	10	13
*JUNE	8	2	5	15
JULY	2	2		4
AUGUST		1	2	3
SEPTEMBER		1	2	3
OCTOBER	2		1	3
NOVEMBER				0
DECEMBER				0
TOTAL	14	8	21	43

DISCUSSION

Lightning death almost accidental in nature. More prone was farmers, low socio economic class. Natural calamities were not controllable. Human are responsible for unbalance of nature system. Vulnerable circumstances of accidental lightning strokes are open field, top of a building structure, under a solitary tree, not conductive or underground building, where iron strip for earthing of the lightning current has not been used, swimming during lightning. Ungrounded window grill or even grounded window grill in buildings, without protective device or entire house, is also dangerous. Here are some essential guidelines to follow for your safety and well-being:

Keep Away from Electrical Appliances: Refrain from using electrical appliances, including corded phones and computers, during thunderstorms. Lightning strikes can cause power surges that might damage electronic devices or lead to electric shocks.

Avoid Standing Under Trees: While seeking shelter, make sure not to stand under isolated trees or groups of trees. Lightning frequently targets tall objects, making trees a hazardous place to be during a storm..

Steer Clear of Metal Objects: Metal objects, such as fences, poles, and umbrellas, can conduct electricity. Maintain a safe distance from these objects to reduce the risk of being struck by lightning.

Exercise Patience: Wait for at least 30 minutes after the last clap of thunder before leaving your shelter. Lightning strikes can still occur even if the storm appears to be subsiding.

Stay Informed: Stay updated on weather forecasts.

Stay updated on weather forecasts and warnings issued by local authorities. Being aware of impending thunderstorms can help you plan and take necessary precautions.

Educate Children on Lightning Safety: It is crucial to educate children about the dangers of lightning and the safety measures they should follow during storms. Instilling this knowledge early on can potentially save lives in the future.

Skin consequences of a lightning strike – deep burn are unusual after lightning injury. At most, some deep partial – thickness burn. May occur. There are four type of skin effects :- ferning also called feathering or Lichtenberg figures, Linear burns (Usually superficial), Punctate burns (Multiple, closely spaced but discrete circular burns, resemble cigarette burns), Thermal burns (when patient is wearing a metal object like belt, buckle or necklace.

It happens more than 25 million times in the United States and it's one of the most awesome forces in nature, lightning. But these discharges of energy are also one of the most destructive. Although lightning strikes are scarce, North Carolina ranks as one of the more dangerous states for lightning fatalities (15 deaths) in the country (4th most since 2008) – according to statistics from the National Weather Service.

Dr. Griggs says if a person is struck by lightning, it can cause cardiac arrest, which stops a person's body from circulating blood and cause direct injury to the brain and nervous system, preventing the brain from being able to send the appropriate signals to tell the body to continue breathing.

Strikes can also cause a brain hemorrhage or stroke, as well as tissue injuries and deep thermal burns within the body. Dr. Griggs says tissue near bones can suffer the worst damage since a person's bones are the most resistant part of the body to the lightning.

Certainly neurological and muscle injuries can also impact a person

throughout the rest of their life. Those who have suffered a muscle injury are at risk of developing rhabdomyolysis, a condition where a person's muscle begins to break down, resulting in a toxic protein flooding the bloodstream and potentially causing kidney damage.

“It really all depends on how direct the strike is,” Dr. Griggs says. “A person can survive a direct strike – it really depends on how much energy traveled through the body and what organs were affected.”

But the best way to stay safe in the event of a lightning strike – stay indoors.

Tall objects are often struck by lightning so avoid standing near the tallest object, like a tree. If you are in a forest, it is best to stay as far away from the trees as possible. If you are in an open field with scattered trees, better to sit on the ground away from the trees if you cannot find shelter. Bodies of water are especially dangerous places in lightning storms. Lakes, rivers and bays can act as conductor and you can receive an indirect strike if you are standing in the water.

SUMMARY AND RECOMMENDATIONS

The study is an attempt to discover and to analyze patterns of lightning death form among 43 victims of lightning death examined in the Department of FMT, JLNMC Bhagalpur between Jan 2020 to Dec 2022. In India every year hundreds of people lose their lives due to light striking. As nature's electrifying storms sweep across various regions, it is vital for everyone to be well-prepared and informed on how to stay safe when lightning strikes. Lightning can be a deadly force of nature, and taking precautions during such weather conditions is of utmost importance. Here are some essential guidelines to follow for your safety and well-being: Every year hundreds of people lose their lives due to light striking. As nature's electrifying storms sweep across various regions, it is vital for everyone to be well-prepared and informed on how to stay safe when lightning strikes. Lightning can be a deadly force of nature, and taking precautions during such weather conditions is of utmost importance.

CONCLUSION

Death due to lightning is always accidental. Most common site of lightning is shoulders, front and back of chest, abdomen and face. Persons survive within 1 to 2 days. Most common cause of death was due to asphyxia and shock/ cardio pulmonary arrest. Arborescent burns or filigree ferning lichtenberg burn seen up to 80 to 90 percent victim. Recommended precautionary steps to avoid lightning stroke. :- No to go to an open place during lightning., not to go on the open roof of a building during lightning. Not to take shelter under a solitary tree. Not to touch a metallic fencing or such substance. Not to be near an un-arrested telephone wire or antenna, computer or near an inflammable fuel source. Not to handle any inflammable fuel during lightning. In unprotected buildings not to go near the metallic window grill or rods, irrespective of whether the grills and the rods are grounded or not. In protected or grounded buildings, not to go near ungrounded window rods or grills. If lightning starts while in outdoor, shelter should be taken in a building or inside a closed car (with windows closed), or inside grove of trees (not under a solitary tree). If nothing available then to squat as low as possible if on an open field but not to lie down in the open field. To keep away from any metallic fence, metallic stand or structure. India is hot weather country. Actually heated surface heats the air and more hot air leads to stronger convection, thunderstorms and lightning. More lightning occurs near the equator then near the poles. This pattern is also due to difference in heating. Lake Maracaibo in Venezuela is the place on earth that receives the most lightning strikes.

Weather forecast plays important role in reduce the lightning death. Government should more attentive in weather science.

REFERENCES

1. <https://www.nature.com/articles/s41566-022-01139-z>
2. https://economictimes.indiatimes.com/news/how-to/how-to-stay-safe-when-lightning-strikes-essential-tips-for-protection/articleshow/102195307.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst
3. Principles of forensic medicine including toxicology (Apurba Nandy), Page no. 458, 461 third edition 2017 (R).
4. Essential of Forensic medicine and toxicology, 2nd edition S. Chand page no. 332.
5. <https://www.weather.gov.in/safety>