

## Death by Lightning: Effective Public Health Strategies Needed

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### Abstract

Lightning is one of the leading causes of weather-related fatalities. A man, approximately 30 years old, was brought to the morgue of Kishoreganj District Hospital, Bangladesh, in July 2021, known to be lightning strike victim. During postmortem examination, various types of skin burns were found in the body, at an entry site on and near the head, and at an inferiorly located exit site. The skin injuries consisted of superficial burns, charring, and singed hair; however, there was no deep burn. 'Lichtenberg figures' were found. Internal findings at autopsy were nonspecific. Epidemiologically, the total number of global annual lightning fatalities range from 6,000 to 24,000 per year. In recent years, Bangladesh experiences a high rate of lightning deaths. We feel that the number of deaths by lightning should be seen as a call to action. Hence, deaths by lightning should be regarded as a public health problem in the country and necessary measures must be taken. Our case study aims to draw the attention of the physicians and public health department on injuries and deaths due to lightning strike. It is also important for forensic professionals to be familiar with the nature of injuries caused by lightning and lightning strike deaths.

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### Introduction

Lightning is one of the leading causes of weather-related fatalities.<sup>1</sup> In the Indian Subcontinent, the forensic report of a postmortem examination of death by lightning strike was published as early as 1867.<sup>2</sup> However, the medicolegal and forensic perspectives surrounding a lightning strike have not been reported much in Bangladesh widely. Lightning may be defined as a transient, high-voltage electric discharge usually cloud-to-ground estimated to be between 10,000 and 200,000 Amperes and 20 million and 1 billion Volts.<sup>3</sup> Lightning kills an average of 49 people each year in the United States and hundreds more are injured.<sup>4</sup> In Canada, each year on average there are between two and three lightning-related deaths and 180 lightning-related injuries.<sup>5</sup> In contrast, lightning strikes killed 1,697 people in India between April 1, 2020, and March 31, 2021, while in Bangladesh, reported deaths by lightning were 2,328 in the last decade till 2020,

according to disaster management and relief statistics.<sup>6,7</sup> We know that lightning occurs more commonly in warmer climates. The major hotspots are Central Africa, tropical South America, South and Southeast Asia, and the southeastern United States.<sup>8</sup> Lightning can occur during any time of the year, but lightning casualties are highest during summer, especially in June to August.<sup>1,5</sup>

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Lightning strikes occur usually in the afternoon. Evidence showed that two-thirds of all lightning casualties occur between noon and 6 pm.<sup>1</sup> Cloud-to-ground lightning remains a significant natural atmospheric hazard for people residing in Bangladesh, as fierce monsoon storms batter the country each year. Around 85% of lightning fatalities are men.<sup>1</sup> Commonly, the victims are young, active people who are struck during various outdoor activities.<sup>1,8</sup> Even though many people can be struck by the same bolt of lightning, multiple casualties are uncommon.<sup>9</sup> Regional, seasonal, and occupational differences affect your risk of being injured by lightning.<sup>1</sup>

### Case Report

A man, approximately 30 years old, was brought to the morgue of Kishoreganj District Hospital, Bangladesh, in July 2021. He was found unconscious in the paddy field after a heavy rainfall and cloud-to-ground lightning. He hailed from another district looking for a temporary job. He was hired few months back as an agricultural worker. Like every other day, he was working as usual in the field in the rain. In the late afternoon, he was found unconscious by the other co-workers after hearing a thunderbolt nearby the paddy field. They brought him to Kishoreganj District Hospital and he was declared dead by the attending emergency physician. The corpse was sent to the morgue for postmortem examination. During postmortem examination, various types of skin burns were found in the body, at an entry site on and near the head, and at an inferiorly located exit site. A “tip-toe” sign was observed, which is a lightning “blow-out” laceration on the soles of the feet, which was thought to represent the electrical exit wound. The skin injuries over the body consisted of superficial burns, charring,

and singed hair; however, deep burn was absent. ‘Lichtenberg figures’ (arborescent or fern-like injuries) were found. Internal findings at autopsy were nonspecific.

### Discussion

A large range of injuries has been reported in victims of lightning strike including damage to the ears, eyes, skin, heart, and brain.<sup>3,9-11</sup> Forensic expert should look for the hidden findings including distinct skin marks, ruptured tympanic membrane, signs of concussive injury, singeing of hair, magnetization of metal, secondary burns from surface discharge of any metal or coins, and tearing-and-tattering of clothing and shoes with melting of fibres.<sup>3,9-12</sup> Lichtenberg figures, a specific type of nonburn skin injuries that look like the “fern image”, are pathognomonic for lightning strikes.<sup>3,13</sup> The proximate cause of death is cardiac arrest and anoxic brain injury at the time of the strike.<sup>7</sup> It is important to seek out pulmonary and gastrointestinal barotrauma.<sup>3,7</sup> Due to the relative rarity of lightning strike deaths, such deaths need to be carefully examined. However, lightning survivors may suffer keraunoparalysis is a temporary paralysis characterized by extremities (lower more common than upper) that are blue, mottled, cold, and pulseless.<sup>3,7,9,12</sup> Moreover, they may face temporary or permanent neurological sequelae including chronic pain syndromes and cognitive damage.<sup>7</sup> Surprisingly, in Bangladesh, in consecutive two days (May 12-13, 2016), 81 lightning-related deaths were reported.<sup>14</sup> Following the fatalities, the Government of Bangladesh declared lightning a disaster in 2016. However, the number of fatalities caused by lightning neither decreased significantly nor the people got aware in following

years. Recently, on June 4, 2020, at least 25 people were killed by lightning strike in a single day all over the country.<sup>15</sup> On August 4, 2021, several lightning bolts have hit a wedding party in at Shibganj in Chapainawabganj district of Bangladesh, killing at least 16 people and injuring 14 other people, as they had just disembarked from their boat to take refuge because of the thunderstorm.<sup>16</sup> Those incidences are enough to make us vocal – “why would lightning strike not be seen as public health concern in Bangladesh?” Poor or nonexistent lightning detection systems, little or no incorporation of lightning data into forecasting, no warnings to those at risk, and many other factors keep injuries and deaths prevail in population of developing countries like Bangladesh. We feel that the deaths due to lighting should be seen as a call to action. Hence, deaths by lightning should be regarded as a public health problem in the country and necessary measures must be taken.

## Conclusion

Building awareness is the key to prevention. Evidence showed that lightning injury prevention through public education is simple and cost-effective. Government public health department should address the problem and work with other NGOs, research institutions, and advocacy groups to plan effective strategies to ensure lightning safety, promote public education, and create more facilities for injury prevention as well as rehabilitation following injuries. Our case study aims to draw an attention of the physicians and public health department on injuries and deaths due to lightning. It is also important for forensic professionals to be familiar with the nature of injuries caused by lightning and lightning strike deaths.

## References

1. Centers for Disease Control and Prevention (CDC). *Lightning: Victim Data*. Available at: <https://www.cdc.gov/disasters/lightning/victimdata.html> (Accessed January 5, 2022)
2. Dutt OC. *Post-mortem appearances in a case of death by lightning*. *Ind Med Gaz*. 1867;2(6):152.
3. Seidl S. *Pathological features of death from lightning strike*. In: Tsokos M. ed. *Forensic Pathology Reviews*. Vol. 4. New Jersey: Humana Press; 2006. p.3-23.
4. National Weather Service. *Lightning victims*. Available at: <https://www.weather.gov/safety/lightning-victims> (Accessed January 5, 2022).
5. Government of Canada. *Lightning fatality and injury statistics in Canada*. 2021. Available at: <https://www.canada.ca/en/environment-climate-change/services/lightning/safety/fatalities-injury-statistics.html> (Accessed January 5, 2022).
6. Climate Resilient Observing Systems Promotion Council (CROPC). *Lightning Resilient India Campaign 2019-22. Annual Lightning Report 2020-2021*. (June 30, 2021). Available at: <https://reliefweb.int/sites/reliefweb.int/files/resources/Annual%20Lightning%20Report%202020-2021%20%28Executive%20Summary%29.pdf> (Accessed January 5, 2022).
7. Alam H. *Lightning deaths: steps not taken could've saved many lives*. *The Daily Star*. (August 5, 2021). Available at: <https://www.thedailystar.net/news/bangladesh/news/lightning-deaths-steps-not-taken-couldve-saved-many-lives-2144921> (Accessed January 5, 2022).
8. Cooper MA, Andrews CJ, Holle RL, Blumenthal R, Navarrete NA. *Lightning-related injuries and safety*. In: Auerbach P. ed. *Wilderness Medicine*. 7th ed. Philadelphia: Mosby; 2017. p.71-117.
9. Eriksson A, Ornehult L. *Death by lightning*. *Am J Forensic Med Pathol*. 1988;9(4):295-300.

10. Blumenthal R. *Lightning and the forensic pathologist.* *Acad Forensic Pathol.* 2018;8(1):98-111.
11. Blumenthal R. *The explosive effects of lightning: what are the risks?* *Acad Forensic Pathol.* 2016;6(1):89-95.
12. Cooper MA. *Lightning injuries: prognostic signs for death.* *Ann Emerg Med.* 1980;9(3):134-8.
13. Ocak T, Duran A, Tekelioglu UY, Demirhan A, Bekdaş M, Cetin A. *Two cases of lightning strikes resulting in Lichtenberg figures.* *Dermatol Sinica.* 2014;32(1):37-8.
14. Staff Correspondent. *Lightning strikes killed 81 people across Bangladesh during recent thunderstorms, says government.* *bdnews24.com* (May 17, 2016). Available at: <https://bdnews24.com/bangladesh/2016/05/17/lightning-strikes-killed-81-people-across-bangladesh-during-recent-thunderstorms-says-government> (Accessed January 19, 2022).
15. Staff Correspondents. *Lightning kills 25 in a single day.* *The Dhaka Tribune.* (June 4, 2020). Available at: <https://archive.dhakatribune.com/bangladesh/nation/2020/06/04/lightning-strikes-claim-15-lives-across-country> (Accessed January 19, 2022).
16. Abdullah D. *16 killed as lightning strikes wedding reception in Chapainawabganj.* *The Dhaka Tribune.* (August 4, 2021). Available at: <https://archive.dhakatribune.com/bangladesh/nation/2021/08/04/16-killed-in-deadly-lightning-strike> (Accessed January 19, 2022).