



A Historical Overview, Misconceptions and Suggestive Measures of Lightning- A Bangladesh Perspective

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Abstract: Every year Bangladesh experiences high density of lightning as it is a tropical country. In recent years, lightning related deaths and injuries have increased in Bangladesh. In 2016 due to lightning, 81 people have died in just two days. Therefore, the GoB has acknowledged lightning as natural disaster. The survey portrayed that around 70% population explain their belief that it is nothing but ray of light of God and it comes down to earth to punish the sinners. The rest people made an attempt to explain the lightning at their own way. About the lightning safety, approximately 80% of the surveyed people are still yet to acquire basic knowledge on lightning safety and around 90% interviewers acknowledge that they donot trust or rely on the forecasting and monitoring by government on weather and climate change. Still people are not educated on consequences of lightning. However, the paper reviews the lighting safety and awareness programs conducted around the world. It also portrays an overview of lightning history along with the misconceptions of lightning. It also highlighted the surveyed summary of the misconceptions of lightning. Finally, some suggestions are recommended about lightning safety and awareness for Bangladeshi people.

Keywords: Lightning, Lightning Myths, Lightning Misconceptions, Lightning Awareness, Lightning Safety

1. Introduction

Due to the geographic location, Bangladesh is often said to be one of the most disaster-prone countries of the globe in terms of natural hazards. According to “World Risk Report 2015,” Bangladesh was ranked sixth out of 173 countries in the world as natural disaster-prone country [1]. Generally developing country like Bangladesh has disease, illiteracy, hunger, corruption problem. Besides the above one more problem has popped up in recent years that is lightning strikes. In different study revealed that the death toll is excessively high in developing countries [2]. The climate of Bangladesh is tropical monsoon climate characterized by seasonal variation in rainfall and wind pattern. During Southwest monsoon (rainy season) i.e June-September, Bangladesh receives heavy rain. The frequency and intensity of natural disasters have been

increased in manifold in recent years because of climate change. In recent years, lightning injuries and deaths have been increased identified in Bangladesh. In 2016 due to lightning, 81 people have died in just two days. Therefore, the Government of Bangladesh (GoB) has acknowledged lightning as natural disaster [3]. Lightning is a source of wonder, inquisitiveness, stimulation, and anxiety. Lightning is now the subject for religions, researcher and sometimes a topic for politics for its vast power and devastating capacity. Comparing with lightning and thunder, the former one is an electrical energy while the latter is a sound energy. Both occur at the same time during a thunderstorm, but since light travels quicker than sound, lightning are observed first before one can hear the sound of thunder.

Thunder can crier in dense rain and strong winds but lightning is not only fast and very hot but also more hazardous and destructive than thunder. As per the National

Geographic, lightning in Bangladesh is taken place in most cases in May and in the afternoon because the temperature at that time appears high [2]. According to, Vaisala Press Release April 18, 2018, Vaisala Releases Global Lightning Data Strokes from 2013 through 2017 - With nearly 9 billion strokes counted, that adds up to more than one stroke for every person living on Earth. Vaisala recorded 8,761,390,744 lightning strokes around the globe from 2013 to 2017. This exclusive dataset helps meteorologists to develop timely and accurate forecasts and warnings at an extraordinary global scale [4]. Lightning spreads the earth in more than 100 times per second or 8 million times a day [5]. The probability of being hit by lightning roughly depends on population concentration and landscape topographies which is likely to either protect or expose people to being hit [6].

It is now an ethical responsibility to educate the population about the lightning safety as lightning injury is now considered a covert global threat. Lightning is the second major cause of weather-related death in many countries of the world [7]. The principal reason of lightning disaster in Bangladesh is the absence of awareness as literacy rate is very low in rural areas. In other word, the number injuries and deaths depend on generally lack of awareness and proper protection and safety schemes. People in rural areas are so poor that they cannot effort to have even low-cost solutions. Therefore, government involvement in mounting lightning protection schemes is very essential. This paper is to provide an overview of lightning along with some misconceptions and subsequently highlight the suggestive measures for lightning protection in Bangladesh.

2. Historical Overview of Lightning with Respect to Different Regions and Religions

2.1. Beliefs by Different Regions and Communities

The Akkadians portrayed a goddess during 2200 BC where sheaves of lightning bolts were kept in each hand. It was driven by a weather god with lightning bolts formed by the flick of whip [8]. The Greeks used to believe that lightning is an instrument of warning or favor thrown by Zeus at the beginning around 700 BC. Further, they also thought that thunderbolts were invented by the goddess of wisdom, name Minerva and presented to Zeus for punishing the evil. In addition, they used to consider that the lightning was a demonstration of the gods and the place where it was struck was regarded as holy place. Considering the holy places, in Greek and Roman temples was often established at these sites where people are to worship the Gods from those places in an effort to satisfy them [9-12].

As it is revealed from the tradition, Zeus of Greece, Jupiter of Rome and Typhon of Egypt, usually sent lightning bolts from heaven. The Greek used to believe that the thunderbolt was devised by Minerva the Goddess of wisdom and gifted to Lord Zeus to correct the people who are not good. According

to one of the Greek legendary tales, a Cretan called Iasios was hit by lightning hurled by Zeus for endeavouring to ravish Demeter, the goddess of corn [9, 13, 10].

As per Aristotle, lightning initiated from the ignition of telluric fumes that made up storm clouds. However, Socrates claimed that lightning is created by a vortex of air, not a hurled by Zeus to punish the evil [9].

In Roman mythology Jupiter used thunderbolts as an instrument of retaliation and denunciation. Roman used to believe that person who is stuck by lightning, is a sinner and victim was not allowed for burial rituals. Roman emperors were known to wear laurel wreaths or sealskin to ward off lightning strikes. It is very peculiar to know that many key decisions of state used to be taken on by appearance of natural events and lightning was one of them [9, 14]. The ancient Roman empires practiced a worship of assuming the powers of God by envisaging and witnessing lightning and thunder.

According to North American Red-Indian tribes, lightning is caused by the flashing of feathers of a mystic thunderbird and according to their belief, thunder is being produced by the sound of the thunderbirds while swing their wings [9, 10, 15, 16].

Several communities of this globe still believe that there exists the lightning and thunder Gods. For example few Eastern Europeans have faith in St. Elijah being the regulator of lightning and few Latin Americans consider Santiago as the patron saint of lightning.

Africans and some Native American tribes picture lightning as a Thunderbird. The Navajos credit the creation of the Grand Canyon to lightning. Native Australian stories incorporate lightning symbols where the lightning spirit is depicted as having axes attached to his joints, beating together to make thunder. Although lightning is most frequently rendered as fire, it also has been represented in French and Asian histories as stones axes hurled from the heavens. People in both developed and third world countries often regard lightning and thunder with a great deal of fear as mysterious, uncontrollable and unmanageable. Even in civilized Western societies, lightning can take on mystical significance. When lightning struck English cathedral just before enthronement of a controversial bishop in the late 20th century, some regarded it as an omen. [14, 17].

Nigerian Yoruba tribe has still the belief of lightning God. Sometimes, they call the lightning spirit as Shango which means the thrower of thunderbolts. This Nigerian society also strongly believes that person being struck by lightning is a sinner and God has punished him. So other than his nearest relatives should touch his body. Further, whole family of the lightning victim is expelled from the society [18-20]. Bantu tribesmen in Africa still believe the lightning Bird-God, Umpundulo. Even today, the indigenous medicine men of Bantu tribe go out in storms and attempt the lightning to strike far away [9, 10, 20, 21]. Some tribes of South Africa believe, the Syringa tree can attract lightning. Therefore people used to cut that tree and believing the other trees safe, they used to build their house near those trees [22].

2.2. As Per Religious Books

In the Holy Quran of Muslim, at five places Almighty Allah has narrated about lightning. Surah 24: 43; ". And He sends down hail from the sky hail mountains (or there are in the heaven mountains of hail from where He sends down hail), and strikes there with whom He wills and averts it from whom he wills. The vivid flash of its lightning nearly blinds the sight. "(Tafsir At-Tabari) [9, 10]. Again, in the Holy Bible of Christian religion, at 46 places thunder and lightning are narrated as signs of God's anger or a depiction of God's glorious and terrible majesty or some judgment of God on the world. Eg. Psalm 18:14;". He shot his arrows and scattered the enemies, great bolts of lightning and routed them" [9, 10]. According to the pantheistic Hindu religion, Indra was regarded as the God of heaven, lightning, thunder, rain and storms. The Maruts used thunderbolts as weapons. Agni, the god of fire, used to use lightning as a main weapon to annihilate the enemies of divinity [9, 10, 23, 24].

In early statues of the Buddha used to represent him for bearing a thunderbolt with arrows at each end. And in Chinese mythology Tien Mu used mirrors to direct bolts of lightning that is regarded as the Goddess of lightning [14, 25].

2.3. Scientific Explanation

There is a formation of negative charge at the beneath of the cloud and earth ground is positively charge. As opposite charges attract each other, there is a great tendency to link each other. When the negative charge of the cloud is amplified, there is a conduction of negative charge, called a stepper leader, to the ground. Therefore the positive charge at the earth is connected to the stepper leader and positive charge goes upward from the earth. When the positive and the negative charge meet each other, a huge electric current carries positive charge upto the cloud which is known as the return stroke and a bright flash of a lightning bolt is been observed. Thunder and lightning occur at roughly the same time. But one see the flash of lightning before one hear the thunder. This is because light travels much faster than sound.

Benjamin Franklin is generally regarded as the father of electrical science. It is proved from Benjamin Franklin's famous kite experiment in June 1752 that lightning was an electric occurrence and that thunderclouds are electrically charged [26]. From the further experiments conducted in the mid eighteenth century, by Franklin on cloud electricity and lightning which lead to the invention of the lightning protection rod, named after Franklin. That was considered as one of the major achievements on lightning during this period. The concept of installing Franklin Rod to direct the lightning surge to the ground is still valid even today.

3. Methodology

The survey was conducted to get the comprehensive data regarding myths and awareness of lightning in Bangladesh by using both quantitative and qualitative analysis. Again, this paper is framed based on interviews, different research

works, literature from newspaper and websites. Websites of important government and non-government organization were searched. To get the actual information from rural, urban, City Corporation and hilly areas of Bangladesh regarding lightning awareness and misconceptions, qualitative data were collected. Keeping the sociological norms in mind, interviews were conducted by prepared unbiased questionnaires and also by oral discussions.

4. Result and Discussion

Besides surveyed by unbiased questionnaires randomly at villages & upazillas to metropolitan city corporations, plain land to hilly areas, people of different religions, different age level people and different educational level are taken into consideration. These myths have no scientific base, only the belief. This processed augmented to obtain the real picture about the misconception and safety aspect of lighting. However, the survey team could identified ten myths surveying in different regions of Bangladesh. Approximately more than 60% people of different age, education believe that lightning kills the bad people. The other misconceptions are lightning is light of God, if there is no raining there is no threat of lightning, when people is with rubber tires or rubber soled shoes, it is likely to protect human from lightning. Further they also conceive that lightning is unlikely to strikes the same place repeatedly, metal and cell phone attracts lightning, if anyone runs, it will decreases the chances of strike of lightning, tall trees/objects are safe for lightning, lightning victims are dangerous to touch, etc. Apart from survey the lightning myths, team wanted to know about the understanding of lightning from the surveyed areas. Results portrayed that around 70% population explain their belief that it is nothing but ray of light of God and it comes down to earth to punish the sinners. The rest people made an attempt to explain the lightning at their own way. About the lightning safety, approximately 80% of the surveyed people are still yet to acquire basic knowledge on lightning safety and around 90% interviewers acknowledge that they donot trust or relay on the forecasting and monitoring by government on weather and climate change. A small percentage of people who live in city areas admitted that weather forecasting through print and electronic media may provide dividend in respect to awareness. They also suggested to conduct periodic conference, seminar, workshop etc. to enhance awareness both rural and urban areas.

5. Misconceptions About Lightning

5.1. General

It is a common belief around the globe that lightning is initiated by God and main objectives of this lightning is to punish the sinner. Anybody unluckily struck by the lightning is regarded as sinner and the places or objects, it struck, it considered unsuitable to reside [27]. Bangladesh has a very diversely populated country where people of different races,

religions live here. These people bear their own beliefs and traditions which may not be identical to each other. Accordingly, people have their numerous misconceptions, religious superstitions of lightning and social stigma related to lightning injuries [25, 27-29]. To identify the misconceptions along with to unearth the truth about lightning is very important. However, the surveyed identified misconceptions in Bangladesh are described in brief below.

5.2. Lightning Kills the Bad People and Light of God

Maximum people around this world believe this whether someone lives in rural or urban, someone is educated or illiterate. They consider that it is a pure act of God to punish the sinner in a tragic way. Numerous interviews, conversations, survey and literature have proved that statement. It is very difficult to provide scientific justifications as it is the belief of people for years together, a total lack of understanding. Only proper education will enhance the scientific cause of lightning.

5.3. Rubber Tires or Rubber Soled Shoes Protect Human Being from Lightning by Insulating Oneself from the Ground

It is another popular misconception which may mislead not to take adequate protection from lightning [27]. Again it is evident from different sources that leaving a piece of rubber on the roof will protect, is completely a myth that people follow. But fact is that, if lightning is appeared or struck through the air, the air becomes a very good insulator. Therefore, it will be unwise to think that an inch rubber or more will protect human being. To curb the misconception, people need to be educated on lightning.

5.4. Cellular Mobile Phones Can Attract Lightning

This is a major misconception also. Therefore, people will refrain from talking during the lightning period. But it may be applicable for corded phone where lightning current is likely to follow the telephone and power lines [30]. It is to be announced that cellular mobile phone retain its complete safety from electrical effect [17]. Because the electromagnetic wave does not cause ionization of the surrounding air while transmitting to and from a cell phone. Therefore, it does not generate a preferential path for lightning [9].

5.5. Lightning Won't Strike if It Is Not Raining or Cloudy

This is very common misconception. People working on the field, may think as there is no rain, so there is no or less probability of being struck by lightning. But fact is that as lightning only happens due to thunderstorms, it can propagate up to 16 km or 10 miles or more. So anybody or any object within this area may fall prey of lightning before the rain comes down. Further, it is recorded that without falling the rain on the place of strike, around 10% lightning happens [17].

5.6. Lightning Never Strikes the Same Place Twice

It is common and harmless belief. This misconception has no scientific base. But it is revealed that tall buildings like the Empire State Building and Sears Tower are generally struck dozen of time in a year, so as the mountaintops and different radio television towers. If the place prevails the suitable condition, it is likely to be struck by lightning same spot repeatedly [17, 31].

5.7. A Person Who Was Just Struck by Lightning Can Electrocute You if Touched

This misconception delays the rescue operation or not to provide lifesaving drug considering that the victim is still electrified. This myth is likely to lead to early deaths for delayed medical treatment [32]. Moreover, people think lightning dead bodies containing bones become magnet after heavy current flow which is helpful to treat the patients in rural area. As such, they often steal the body from graveyard considering as 'Magical Bone'.

5.8. Running Decreases the Chances of Being Struck by Lightning

This misconception will make someone unsafe during lightning. Therefore, without searching the safe place, someone may endanger himself by running [32].

5.9. Mirrors Repel Lightning

This is a harmless misconception which will not increase the risk of being struck by lightning. This misconception does not have any scientific logic. So mirrors cannot resist lightning or protect someone being struck of lightning. Therefore, this is to be addressed during awareness session.

5.10. Lightning Prefers to Strike Sharp Points or Sharp Edges

This is not true as lightning prefers to follow the least impedance path. Lightning generally avoids sharp points and sharp edges as the local impedance or resistance along a channel appears to be higher. For example, a contractor marked numerous burn marks on the chest not the tip of the crown during the renovation at that the Statue of Liberty. This is because chest area offers least resistance than that of tip of the crown [31].

6. Suggestive Measures for Lightning

6.1. General

Lightning cannot be stopped but it can be minimized the likely damages. Lightning danger can be diminished in numerous ways. But the challenges are poverty, illiteracy, absences of up-to-date equipment for correct weather forecasting and lack of accurate policies and their implementation in developing countries.

All thunderstorms produce lightning and are very

dangerous. Because of this, no one can guarantee an individual or group absolute protection from lightning. It is revealed that illiterate people have the maximum tendency to ignore the basic safety rules of lightning and it is because of poverty. So steps should be taken to raise the literacy rate. And awareness programs on basic safety on lightning should be imparted in all levels especially at rural level.

6.2. Community Awareness

Community awareness like 'When Thunder Roars, Go Indoors!' is the first and best tool for any disaster preparation and response. The government should teach the communities 'Do's and Don'ts' for lightning safety through mass awareness campaigns involving Print, TV, Radio, Social Media, etc. People in risky areas should be taught to avoid open areas, lonely tall trees, towers, metal conductors. It is advised if there is a gathering where group of people are there, allow them to disperse to lessen the casualties.

6.3. Popular Awareness

A popular awareness rule which is broadly publicized by the people all over the world is 30/30 flash-to-bang rule. The rule depicts that one should be in a safe shelter if the flash (lightning) to bang (thunder) is 30 seconds in length or less and one should remain inside this shelter for 30 minutes from the last clap of thunder. This safeguards any elongated distance lightning strikes initiating from the forward edge of a thunderstorm that is, lightning can travel up to 10 km or those from the trailing rear of the thunderstorm respectively do not take anyone by surprise.

6.4. Awareness About any Hazard

Awareness about any hazard is likely to play a significant role in minimizing the effects of a hazardous event. Similarly, early warning system can play a vital role in saving lives and property. It is self-evident that a timely early warning can minimize the potential loss and is a basic component of any disaster risk reduction strategy. However, following are the content to augment public awareness to reduce the lightning hazards:

- a. There should be banner as well as poster presentation in both rural and urban areas.
- b. There should be an endeavour to distribute different types of leaflets, booklets and other reading materials especially in rural communities
- c. Broadcasting of short documentary films or TV clips during monsoon.
- d. Speeches, presentations, seminar, workshop and educational programs for all classes of people by expert team are likely to be very effective effort for understanding the actual threat of lightning hazards. Further, workshops and conferences may be arranged for policy makers, political and social leaders, funding agencies for acquiring useful knowledge on lightning.
- e. People are likely to receive the maximum for the motivational speech from religious teachers at religious

places and can be equally effective in also community gatherings.

- f. Door to door visiting by an expert team or social activists may be encouraged.
- g. The GoB should made an extended plan to plant palm trees across the whole country and can increase priority based budget on the disaster management including lightning strikes.
- h. General mass expects that thunderstorm forecasting and lightning information provided by Bangladesh Meteorology Department (BMD) should be in time and accurate to earn faith about the lightning early warning. In this regard, it is to mention that BMD has surfaced an app, name 'BMD Weather App' to assist the smart phone users to get the required daily essential information services and to keep update about the weather. This application is likely to forecast the latest weather information from the automatic weather monitoring centres situated in various parts of the country.
- i. There should be strict adherence of Bangladesh National Building Code to ensure the construction of safety houses for outdoor work places and other outdoor sites of activities.
- j. The GoB should make an endeavour to strengthen the capacity building of primary health care centres at rural areas for initial management of lightning patients. In this regards, there should be transportation facility, ambulance and the road condition is expected to good so that ambulance can ply to the spot to carry the patients as far as possible.
- k. To curb the vulnerabilities from the lightning deaths, the GoB should encourage more research-based activities at different universities. Further, engineers shall develop creative solutions removing the expensive existing one in lightning protection with the help of modern technology. This innovation should be economically feasible for lightning protection. The GoB should promote such efforts.

7. Conclusion

In recent years, lightning is considered as one of the principal causes of death caused by natural disaster. To conceive the basis of the lighting protection and lightning injuries, one must first trim down the different myths, superstitions, misunderstanding and misconceptions about lightning. Motivation on lightning safety education is quick, easy, and inexpensive and can be communicated effectively. Lightning safety education needs to be correct, consistent, credible, easy to use, easy to remember and interesting to learn. As rural people are general poor and less educated, the GoB should start the motivation from rural areas. Because illiterate people will conceive more unscientific information which are likely to push them in danger including the loss of human life. Further, there should be modern forecast equipment which will forecast the precise, accurate and timely

warnings of lightning. The GoB should be equipped with the medical treatment of lightning casualties within and outside of hospitals along with better road communication to augment the medical help quickly. Awareness can be enhanced by various programs and practice can be regular by strict regulations and guidelines by the government. Government should be very firm in instituting building codes consistent with accepted lightning codes. Science is evolving every day. So engineers need to be updated on the latest technology about lightning. Creative solutions may be developed by engineers using existing technology or materials. These are most effective when they are inexpensive, easily installed and modified, and low maintenance.

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