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Impact Of Thunderstorms On Human Lives Of Coastal West Bengal And Assessment Of Level Of Awareness To Thunderstorm

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ABSTRACT: Coastal West Bengal is being continuously affected and deceased by thunderstorm. Of which electrocution has caused a significantly large number of casualties. In this study an attempt has been made to quantify the occurrences and casualties by thunderstorms along with assessment of thunderstorm awareness level from a recently thunderstorm affected area - Laukhali-Patharghata village of Sandeshkhali-I block under North24 Parganas district.

Key words: Thunderstorm occurrences, casualty, correlation, level of awareness

Introduction

Thunderstorm is a mesoscale and minor extreme weather event. Heavy rainfall, thunder, lightning, hail and squall are the associated phenomena of the thunderstorm. Tornadoes, down-bursts and dust storms are also a type of thunderstorm. The origin of the thunderstorm depends mainly on heated land mass of Chhotanagpur plateau during mid day which initiates convection in the atmosphere and moves to south east direction, after mixing up with warm and moist air mass from the Bay of Bengal, it gets more intensed. Thunderstorm blown over the Bengal during the Bengali month 'Baisakh' known as 'Kalbaisakhi'.Coastal West Bengal becomes affected by thunderstorm mainly during hot season specially in the months of April and May.

Thunderstorms cause great damage to agriculture, infrastructure and even to life. A large number of human life gets electrocuted by lightning, accompanied with thunderstorm. Strong wind and heavy rainfall produced by thunderstorm ravage plentiful agricultural damage and house collapse. Hails make a great damage to crops specially to mango production and paddy production in summer. Tornadoes produce an abundant devastation. It uproots big trees, houses, constructions and snatches number of lives.

Over India lightning is significantly increasing. And with it, mortality rate is increasing significantly(Ray, et.al,2021, Mia, M.Y.,2021).In selected districts of south Bengal (North 24 Parganas, South 24 Parganas,Purbe Medinipur, Haora and Kolkata) thunderstorm and its casualty is increasing notably (Majumder,A.K.,2023). Maintaining 30/30 safety lightning rule is one of the safety measures to be taken just after the thunderstorm (James, R.J. and Nkechinyere,I.E.,2022)

Study area : Coastal West Bengal (about 18,785 Sq.K.M.)is selected as a study area which extends from 21 ̊29' North to 23 ̊15'02" North latitude and 86 ̊33' East to 89 ̊5' East longitude. Coastal zone of West Bengal comprises three districts (North 24 Parganas , South 24 Parganas, and Purba Medinipur).To know the awareness level to thunderstorm, a case study is selected on a recently occurred disastrous thunderstorm affected area - Laukhali Patharghata village of Agarhati Gram Panchayat under Sandeshkhali –I block in North 24 Parganas district.

Objectives:- The main objectives of the study area are as follows.

1. Identification of spatio temporal distribution of disastrous thunderstorms.
2. Identification of spatio temporal distribution of casualty by disastrous thunderstorms.
3. Explore the co-relation between thunderstorm frequency and casualties.
4. Assessment of level of awareness to thunderstorm.

Database and methodology:

Secondary data regarding thunderstorm occurrence dates, intensity, damage and casualties are collected from annual report on "Disastrous Weather Events" by India Meteorological Department, Disaster management Department, Govt. of West Bengal and old news papers from National Library. A primary data is collected for assessment of level of awareness from recently thunderstorm affected people. The methodology of the present work mainly involves compilation, tabulation of data from various sources and statistical analysis of this tabulated data using statistical software. Thunderstorms include lightning, hailstorm, squall rainfall and strong wind. In this study death and injury due to thunderstorm with wind speed below 28 kmph is taken as lightning weather event and reason of casualty is electrocution. Thunderstorm event is considered with association of lightning, rainfall, and strong wind with above 29 kmph wind speed. Cause of death and injury due to thunderstorm is mainly wall collapse, tree uprooting or any other reason is considered as thunderstorm disaster. Even more all the associated weather events are analysed cumulatively. Those thunderstorms are taken into consideration which have at least minimum level of disastrous impact.As the PurbaMedinipur was developed in 2002 study period is selected from 2002 to present 2025. Because disastrous data of present blocks under Purba Medinipur was not possible to separate from previous Medinipur district.

Results and Discussion:- Annual ,monthly, seasonal, decadal, categorical and district wise distribution and annual trend of disastrous thunderstorms and its casualties are analyzed and relationship between disastrous events and casualties are analysed .

Cumulative Occurrences of Thunderstorm and its associated events:

In last 24 years 165 disastrous hit of thunderstorms are enlisted. All the years have experienced occurrences of disastrous thunderstorm. In 2016 highest occurrences in a year is observed with 17 incidents. During last decade (2016-2025) incidents of thunderstorm with associated phenomena is counted 48 which was 77 in number in previous decade (2006-2015). Among the all thunderstorms and its associated phenomena about 55 % incidents are categorized as thunderstorm , 40% as lightning 3 % as hailstorm and 2 % as squall. Out of only thunderstorms with more than 28 kmph wind speed about 10% incidents are categorized as moderate thunderstorm (loud peal of thunder with frequent lightning flashes moderate to heavy rain and maximum wind speed 29 to 74 kmph) and rest were intensified to severe thunderstorm (continuous thunder, lightning, heavy rains and maximum wind speed exceeds 75 kmph). Only two incidents were intensified to tornedo.

Monthly and seasonal variation also exists. About 43 % of total occurrences have been formed in pre monsoon season and 51.5 % occurrences of thunderstorm have accumulated during monsoon season. June (32) is the month of highest occurrences of cumulative thunderstorms and associated events and followed by April (30). Though large number of thunderstorm with more than 29 kmph wind speed is found in the month of April (18). Annual trend of occurrences of disastrous thunderstorm and associated events is reducing (r=-0.389,statistically not significant) as well as lightning (r=-0.359,statistically not significant) and thunderstorm with wind speed above 29 kmph (r=-0.0717,statistically not significant) also maintaining decreasing trend.

Number of occurrences in North 24 Parganas (73 in number) and South 24 Parganas (72 in number) districts are almost same. Purba Medinipur got affected comparatively less times (45 in number). Number of occurrences per 1000 Sq.K.M. over entire study area is 9 but number of events/1000 Sq.km is comparatively high in North 24 Parganas than Purba Medinipur (10) and South 24 Parganas (8).

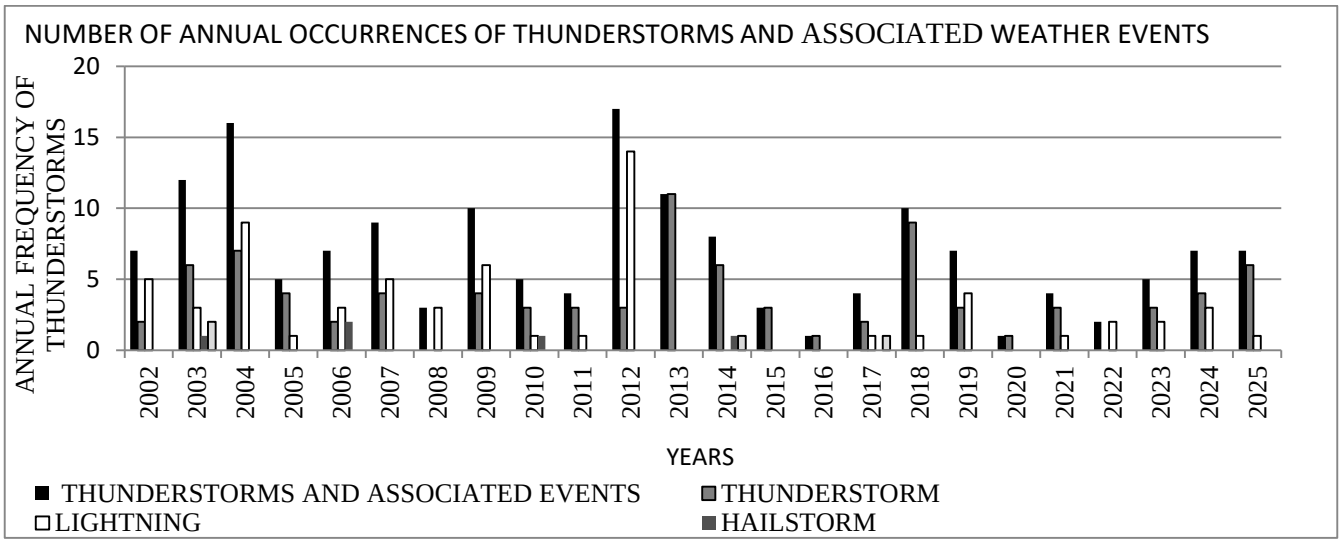

Figure 1: Annual frequency of Thunderstorms and associated weather events

Casualties by Thunderstorm and associated phenomena:

Cumulatively 251 human live loss is witnessed in this area during study period. Number of average casualty per individual event is 1.5 and per year average death by thunderstorm and its associated phenomena is 10.46.Almost half of the total human death caused by lightning (124 in number) and about 47 % (119 in number)human death is due to thunderstorm with wind speed above 29kmph by wall collapse and tree uprooting. Rest 3% human death caused by claws of Hailstorm (4 in number) and squall (4 in number) events. Damage by such events in 2020 was restricted to human injury apart from this year all the years have experienced human death.

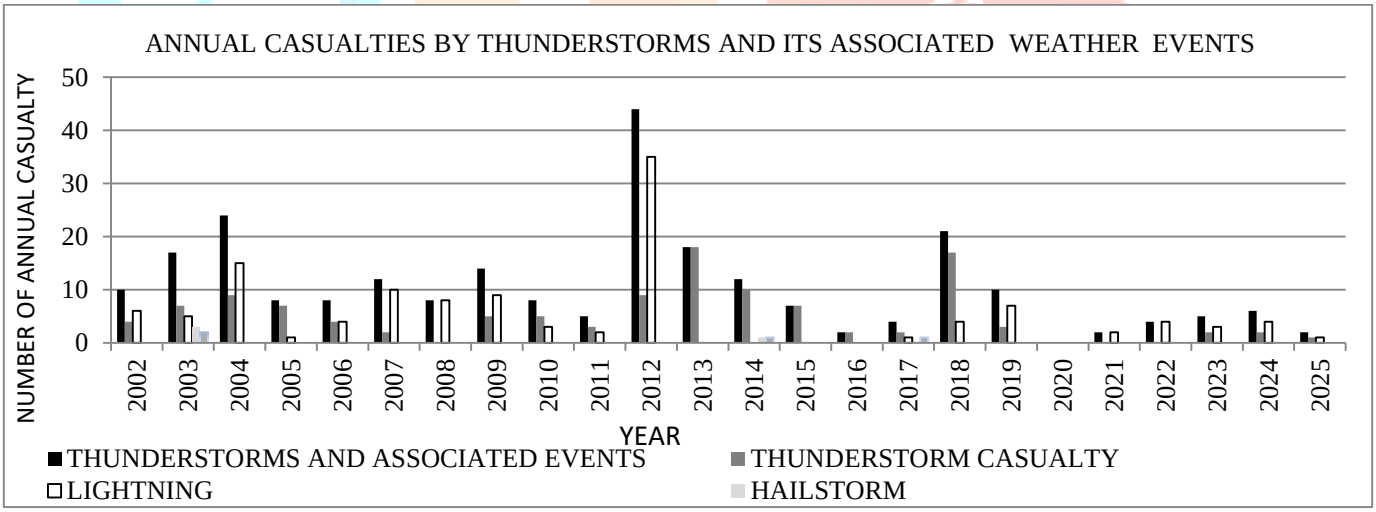

Figure:2 Annual casualties by thunderstorms and its associated phenomena

Highest number of casualties was recorded to be 44 in 2012 followed by 24 human deaths in 2004 and 21 casualties in 2018. In last decade (2016-2025) this cumulative casualty by thunderstorm and its associated phenomena is enlisted as 56.In previous decade (2006-2015)the death toll rose to 136.This decadal drop in human death is a good fortune either for improved awareness or due to reducing frequency or for both.

Number of deceased persons in North 24 Parganas and South 24 Parganas are almost same (95 and 94 respectively) Human death in Purba Medinipur district is comparatively low(62 in number). Number of casualties per one million populations in Coastal West Bengal is 11. In South 24 Parganas and Purba Medinipur district death/Million people is 12 individually while 9 human deaths are registered for the district of North 24 Parganas. Annual frequency of human death by thunderstorm and its associated phenomena is maintaining a reducing trend (r=-0.378, not significant). Individually casualties by thunderstorm (r=-0.257, not significant) and lightning (r=-0.273, not significant) are also reducing.

Correlation between annual frequency of thunderstorm and its casualty:

Annual frequency of thunderstorm and annual casualty by thunderstorm - both are maintaining decreasing trend. Decadal frequency of thunderstorm and decadal casualty is showing a decline from previous decade (2006-2015) to recent decade (2016-2025).

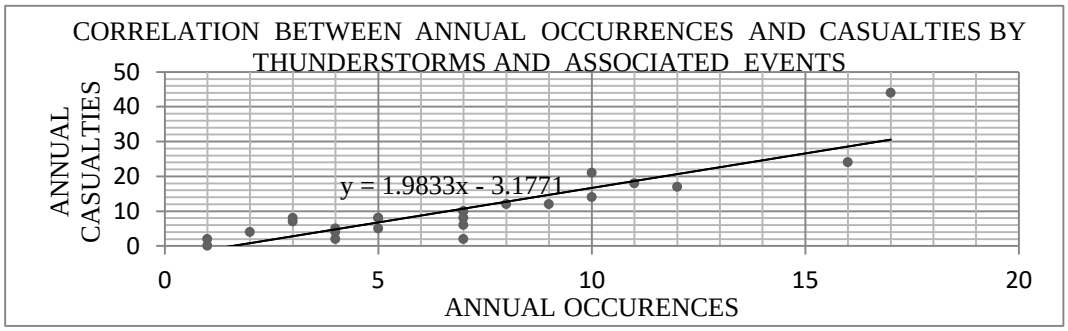

Figure3: Correlation between annual frequency of thunderstorm and associated events and their annual casualties.

A significant correlation is found between cumulative annual frequency of thunderstorm and associated phenomena with its total annual casualty by thunderstorm and associated phenomena (r=0.887, sig.-0.000). Correlation between annual frequency of thunderstorm with more than 29 kmph windspeed and annual casualties by such event is insignificantly positive (r= 0.829, sig.-0.000). In case of lightning, correlation between annual frequency of occurrences is correlated with annual casualty by lightning and such correlation is statistically significant (r= 0.960, sig.-0.000). Correlation between the two elements across three individual districts is also significant.

Level of awareness to thunderstorm:

Primary survey was conducted at Laukhali-Patharghata village of Sarberia-Agarhati Gram Panchayat in Sandeshkhali-I block under North 24 Parganas district. Part of this village namely Dighirpar to Patharghata Uttarpara experienced a tornedo like severe thunderstorm, which passed over this area on 2nd October 2025,around 3.30 p.m. and lasted for few seconds and villagers named it the 'storm of one minute'. It caused a widespread damage to hundreds of houses.Many trees and electric poles were uprooted.20 people sustained injuries. In this part of village ,all the 102 households lives are taken as sample. Number of population is about 498.Of which 258 people are male. About 40.76% population are from reserved category(S.C. and S.T.).Formal education levels among the respondents were low. About 78% respondents have studied up to class VIII and only or illiterate. Cultivation and aquaculture are two major occupations of this area.

About 76.47% of total respondents think to thunderstorm as high risk event in this area. Even though the villagers are under threat of thunderstorm, more than 40% respondents feel that they have adequate preparedness for this event. Thunderstorm is assumes as second highest event in terms of damage and casualties after cyclone. More than 65% respondents do not follow thunderstorm warning. Those who follows this warning mainly obtained them from social media. Only 3 persons are acquainted with the weather application or portal. Similarly only 2persons have heard of 30/30 safety lightning rule.

For determination of awareness level to thunderstorm 5 –points perception scale is assumed (very poor, poor, average, good, excellent) on the basis of another 5 points perception scale (strongly disagree, disagree, neutral, agree, strongly disagree) of 12 individual factors(lie flat on ground, continuing the activity as usual, standing close to a concrete wall, standing under a tree, use of electric appliances, following weather warning, attitude of 'it will not strike on me', lightning can strike any where even if it is not raining, arrangement of village level awareness programme, construction of concrete house, strengthening structure of 'kancha' houses, plantation of coconut trees). The proportion share for each factor on the 5 point scale is determined by ranking responses from 1 to 5.All 12 ranks for each perception scale is added together to get a final rank score. Lowest rank score is taken as dominated level of awareness. Among the 5 point perception scale of awareness the lowest rank score is established as dominated level. Here poor level of awareness is identified over this area.

Conclusion:

On average 7 thunderstorms with its associated phenomena occurs per year. Total frequency is more in North 24 Parganas but number of occurrences per 1000 Sq.K.M.in Purba Medinipur district is more. Number of thunderstorm incidents is higher in June and April. Annual trend of thunderstorm occurrences is reducing which is silver lining to people of study area.Overall 11 casualty per year and two average human death per event is observed. Though human death is more in North 24 Parganas but death per 10 lakh population is more in Purba Medinipur district. Annual fatality is reducing in recent years. Number of annual occurrences and annual casualty is significantly correlated. Higher the frequency greater the casualty is proved in this context. Despite being directly affected by the thunderstorm in recent years,public awareness to thunderstorm remains poor.Although there is partial awareness to storms,yet awareness to lightning risks remain negligible.There ia an urgent need for awareness generation. Otherwise,the present reduction in casualties due to fewer occurrences may reverse with the increasing frequency with greater loss of life.

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