

Mortality assessment caused by the Tropical Cyclones over the India during the year 2011-2021

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Abstract

India is vulnerable to the many disasters like earthquake, landslide, snow avalanche, flood, cyclone heat wave, cold wave, lightning, etc. Of which cyclone is one of the most important and hazardous disaster. Every year India witnesses cyclones. The effects of these cyclones are devastating. India is among the most vulnerable country where recurrent cyclones strikes every year which resulted into the loss of life, loss of property, damage to public property and degradation of environment. India has the coastline of about 7,516.6 km which includes the mainland, Lakshadweep Islands, and the Andaman & Nicobar Islands. The present study focuses on the human mortality caused by the tropical cyclones during the year 2011- 2021.

KEYWORDS: Mortality, Tropical Cyclones, Hazardous, Disaster, Vulnerable

Introduction:

Mortality is one of the important aspects of population change. In general we can say that mortality means the state of death. Mortality is last phase of life, it may occur at any time in once life. India is prone to many natural and manmade disasters. Every year many people lost their lives in these disasters. This research is based on the cyclone events during the year 2011-2021. India is vulnerable to many natural and manmade disasters. Cyclone is one of them. According to the report published by Centre for Epidemiology of Disasters (CRED), UN office for Disaster Risk Reduction, The human cost of disasters: an overview of the last 20 years (2000-2019), India ranked third in terms of number of disasters in the world. The total number of disasters reported between 2000-2019 is 321. One of the most severely impacted areas in the world is the India. It is subject to around 10% of the tropical cyclones that occur worldwide. The majority of these strike India's east coast after having their primary origins over the Bay of Bengal. Every year, two to three potentially dangerous tropical cyclones can form out of an average of five to six that form. There are around four times as many cyclones in the Bay of Bengal compare to the Arabian Sea cyclones. Both coasts frequently experience cyclones. A research of the frequency of cyclones on India's East and West coasts between 1891 and 1990 reveals that a 50 km wide area above the East coast saw roughly 262 cyclones, 92 of which were severe. On the West coast, where 33 cyclones occurred during the same period, 19 of which were severe. Less severe cyclonic activity has been observed over Arabian Sea.

Objectives:

1. To assess the frequency of cyclones during the year 2011-2021
2. To assess the mortality caused by the tropical cyclones during the year 2011-2021.

Study Area:

The study area covers the whole country of India. The total area covered by the country is 3.3 million sq. km. India is located in northern hemisphere. The country extends between $8^{\circ} 4'$ and $37^{\circ} 6'$ latitudes north of the Equator, and $68^{\circ} 7'$ and $97^{\circ} 25'$ longitudes east. It is surrounded by Bay of Bengal in East, Indian Ocean in the South and Arabian Sea to the West. The entire country is divided into six divisions - the Northern Mountains the Northern Plains, the Indian Desert, the Peninsular Plateau, the Coastal Plains, and the Islands. India's climate can be broadly categorized as tropical monsoon. However, despite the fact that a large portion of India's northern region lies outside of the tropical zone, the entire nation has a tropical climate characterized by consistently high temperatures and dry winters. India is second most populous country after China. According to the 2011 Census, India's total population was 1.21 billion, accounting for 17.5% of the world's population.

Data Collection:

The data for this research is based on secondary source. The data for the cyclone occurrences and mortality were collected through Report on Cyclonic Disturbances over North Indian Ocean During 2011 to 2021. The Report is annually published by Regional Specialized Meteorological Centre (RSMC), India Meteorological Department, New Delhi.

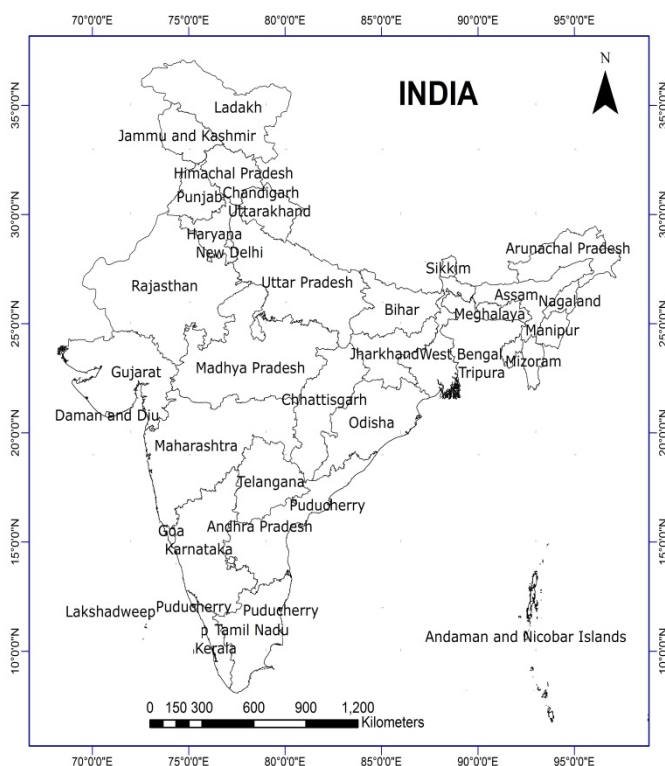
Methodology:

Frequency Analysis:

During the period of 11 years from 2011-2021 the average cyclones are 10. The year 2018 has experienced the highest number of cyclones which is 14. While the year 2012 experienced the lowest number of cyclones which is 5. Year 2011, 2013, 2016, 2017 & 2021 experienced 10 cyclones each year. Year 2015 and 2019 experienced 12 numbers of cyclones. Year 2014 saw the 8 and 2020 saw the 9 cyclones.

Categorization of Cyclones:

During the period of 11 years from 2011-2021 the number of cyclonic disturbances observed were 110. In which Depression (D) 38, Deep Depression (DD)- 24, Cyclonic Storm (CS) – 17, Severe Cyclonic Storm (SCS) – 6, Very Severe Cyclonic Storm (VSCS) – 16, Extremely Severe Cyclonic Storm (ESCS) – 7, Super



Cyclonic Storm (SuCS) – 2.

D	DD	CS	SCS	VSCS	ESCS	SuCS	Total
38	24	17	6	16	7	2	110

Mortality Assessment:

Cyclone is a one of the Extreme Weather Event. The cyclonic events last from hour to few days, but the impacts caused by these events are devastating. One of the impacts is human lives lost. During the years of 2011 to 2021 110 cyclones struck the country which had taken the 1043 human lives. The highest mortality recorded in the year 2021 which is 172. The lowest mortality was recorded in the year 2016 which is 16. During the years of 2011 to 2021 on an average 95 deaths were caused due to these tropical cyclones. (Table.1)

Findings:

During the years of 2011 to 2021 the state of Odisha is most vulnerable due to the Tropical Cyclones, which alone has 232 numbers of deaths. Tamil Nadu stands second vulnerable state which has 193 deaths, followed by West Bengal which has 175 deaths. (Table. 2)(Fig.1)

Interior states like Jharkhand & Bihar are also affected by the Tropical cyclones, but the number of deaths are very low i.e. 3 and 1 respectively. (Table. 2)(Fig.1)

The states of Eastern Coast are more vulnerable and the numbers of deaths are also high as compare to the Western Coast. (Map-1)

Conclusion:

The present research is helpful in analyzing the tropical cyclone disaster. It not only provides the mortality assessment but also gives the understanding of areas with high risk zone of tropical cyclones. This research gives us the overall mortality assessment associated with tropical cyclones which is also helpful for minimizing the mortality. As the map shows that Eastern states of West Bengal, Odisha, Andhra Pradesh & Tamil Nadu and Western state of Gujarat needs to reduce the mortality by taking mitigation, preparedness, response and recovery actions. The research also helpful in analyzing the frequency of cyclones.

Sr. No.	Year	Cyclone Category	Basin	Date	Name of Cyclone	State/Union Territory	No. of Deaths	Total
1	2011	D	Bay of Bengal	22-23 Sept, 2011	-	Odisha	42	88
		VSCS	Bay of Bengal	25-31 Dec, 2011	Thane	Tamil Nadu	39	
						Puducherry	7	
2	2012	CS	Bay of Bengal	28 Oct-1 Nov, 2012	Nilam	Andhra Pradesh	44	61
						Tamil Nadu	17	
3	2013	VSCS	Bay of Bengal	8 -14 Oct, 2013	Phailin	Odisha	38	50
						Andhra Pradesh	1	
		SCS	Bay of Bengal	19-23 Nov, 2013	Helen	Andhra Pradesh	11	
4	2014	D	Land	21st - 23rd July 2014	Land Depression	Odisha	12	58
		VSCS	Bay of Bengal	07-14 Oct, 2014	Hudhud	Andhra Pradesh	46	
5	2015	CS	Arabian Sea	07-12 June, 2015	Ashobaa	Gujarat	81	197
		CS	Bay of Bengal	26 July-02 Aug, 2015	Komen	West Bengal	83	
		D	Land	16-19 Sept, 2015	Land Depression	Odisha	2	
		DD	Bay of Bengal	08-10 Nov, 2015	Deep Depression	Tamil Nadu and Puducherry	31	

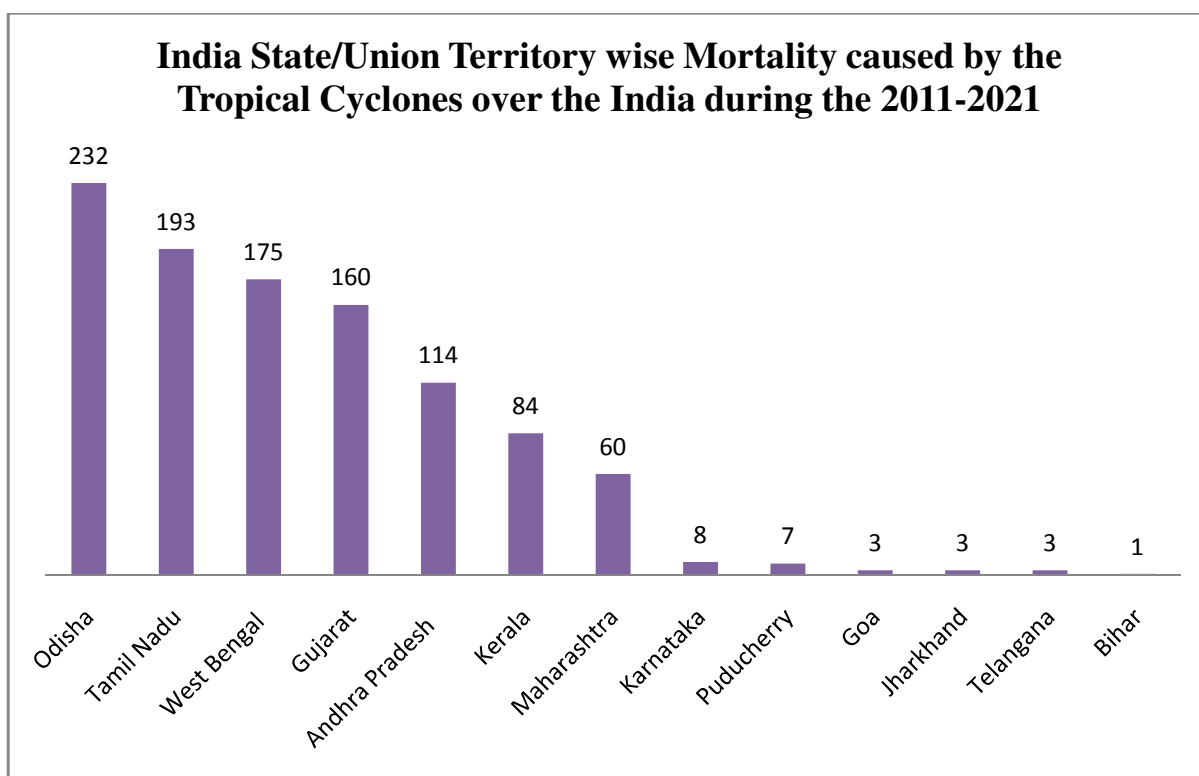
6	2016	VSCS	Bay of Bengal	06-13 Dec, 2016	Vardah	Tamil Nadu	18	18
7	2017	VSCS	Bay of Bengal	29 Nov- 05 Dec, 2017	Ockhi	Tamil Nadu	35	110
						Kerala	75	
8	2018	VSCS	Bay of Bengal	08-13 Oct, 2018	Titli	Odisha	70	110
		VSCS	Bay of Bengal	10-19 Nov, 2018	Gaja	Tamil Nadu	40	
9	2019	ESCS	Bay of Bengal	26 April-04 May, 2019	Fani	Odisha	64	64
Sr. No.	Year	Cyclone Category	Basin	Date	Name of Cyclone	State/Union Territory	No. of Deaths	Total
10	2020	SuCS	Bay of Bengal	16-21 May, 2020	Amphan	West Bengal	90	115
		SCS	Arabian Sea	01-04 June, 2020	Nisarga	Maharashtra	4	
		VSCS	Bay of Bengal	22-26 Nov, 2020	Nivar	Tamil Nadu	4	
						Andhra Pradesh	8	
CS	Bay of Bengal	30 Nov-05 Dec, 2020	Burevi	Tamil Nadu	9			
11	2021	ESCS	Arabian Sea	14 May- 19 May, 2021	Tauktae	Kerala	9	172
						Karnataka	8	
						Goa	3	
						Maharashtra	45	

					Gujarat	79	
					Bihar	1	
	VSCS	Bay of Bengal	23 May- 28 May, 2021	Yaas	Jharkhand	3	
					Odisha	3	
					West Bengal	2	
	CS	Bay of Bengal	24 Sept- 28 Sept, 2021	Gulab	Andhara Pradesh	4	
					Maharashtra	11	
					Odisha	1	
					Telangana	3	
Total						1043	1043

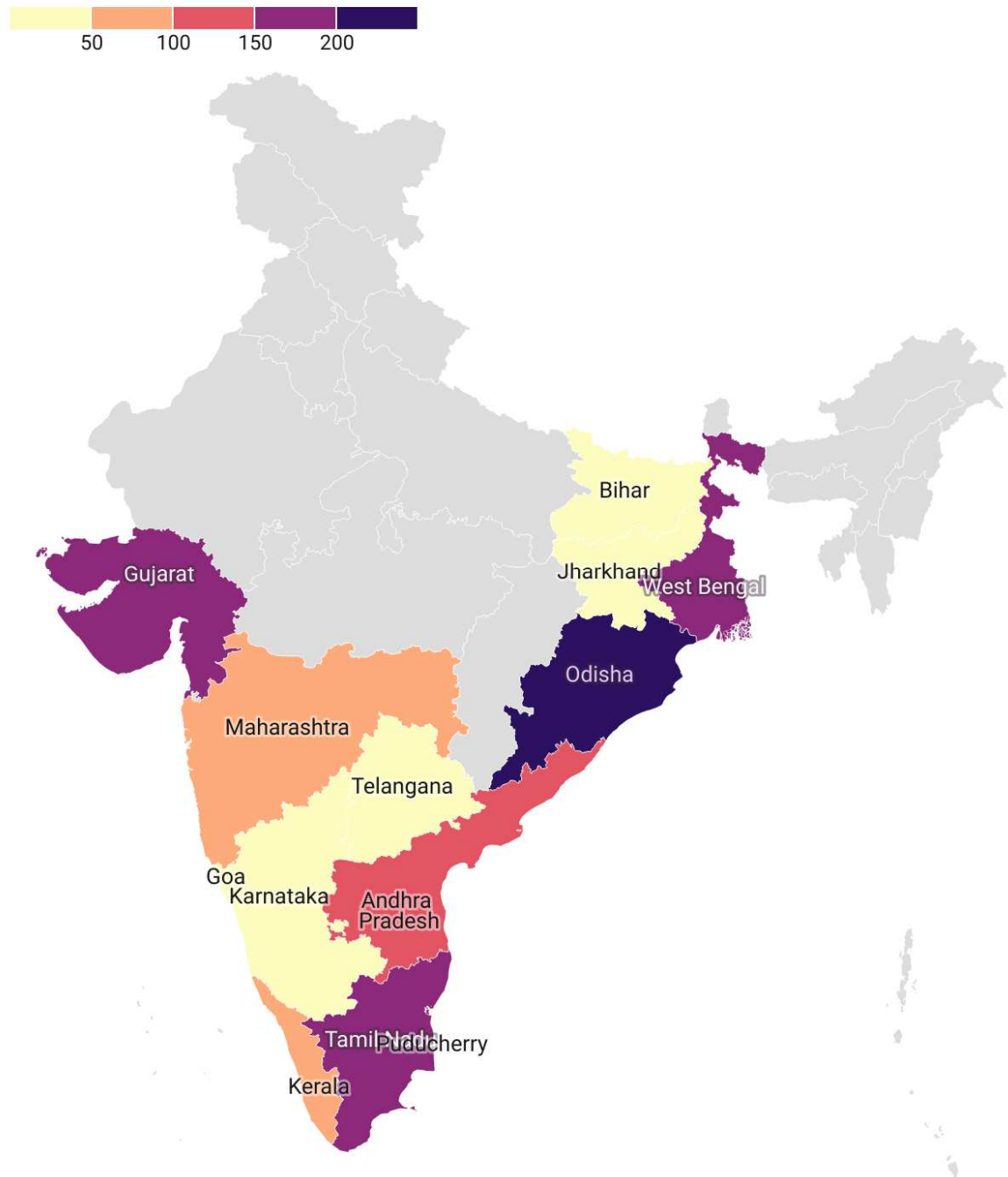
Table 1: Tropical Cyclones over the India during the year 2011-2021 and its associated mortality

Table: 2 India State/Union Territory wise Mortality caused by the Tropical Cyclones over the India during the 2011-2021

State/Union Territory	No. of Deaths
Odisha	232
Tamil Nadu	193
West Bengal	175
Gujarat	160
Andhra Pradesh	114
Kerala	84
Maharashtra	60
Karnataka	8
Puducherry	7
Goa	3
Jharkhand	3
Telangana	3
Bihar	1
Total	1043

**Fig.1: India State/Union Territory wise Mortality caused by the Tropical Cyclones over the India during the 2011-2021**

India - State/Union Territory wise Mortality caused by the Tropical Cyclones over the India during the 2011-2021



Map data: © OSM • Created with Datawrapper

Map-1: India State/Union Territory wise Mortality caused by the Tropical Cyclones over the India during the 2011-2021

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