

Health Hazards by Sea Cyclones in Odisha, the Supercyclone and the Phailin

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Introduction

Besides the many benefits of the ocean, man and other populations inhabiting the coastal region share in the risk for meteorological and seismic hazards originating from the seas. Tropical cyclones (also named as typhoons and hurricanes) and tsunamis represent the most powerful and destructive of all marine hazards. During the last two centuries, tropical cyclones have been responsible for the deaths of about 1.9 million people in the world.¹ During 1980–2000, an average of 11,800 deaths per year was attributed to cyclones.² The deadliest tropical cyclone was the Bhola Cyclone of 1970, which made a death toll of 300,000 to 500,000 lives in Bangladesh. Sixteen of the 18 deadliest tropical cyclones occurred in the Asia-Pacific region. Tsunamis have greater potential to affect the health of millions. Since 1945, tsunamis have killed more people than earthquakes.³ Over 450 tsunamis have been recorded during last 100 years, the deadliest Pacific one of 1994 had killed over 51,000 people⁴ and the Indian Ocean tsunami of 2004 had killed nearly 300,000 and affected over 2,000,000 (two million) people in twelve nations.⁵

The effects of cyclones and tsunamis on human-health cannot be underestimated. Apart from the public health and medical consequences

of these disasters, the social, cultural, and psychological impact of cyclones and tsunamis have an enormous and long-lasting impact on human civilization throughout the world. It is nature's force to demolish civilizations in twinkling of an eye by making and breaking islands in the ocean or even bigger landscapes. Life and health hazards are incidental to the great stroke of nature.

Cyclone proneness of Odisha and history of Cyclonic storms

Odisha's vulnerability to cyclones is noticeable from early days of history. It is on record of Hathigumpha inscriptions about cyclone devastated Kalinganagari and its repair by Kharavela during first year of his reign. Tsunamis causing appearance of new islands and disappearance of existing ones had been strange events for Odia navigators and settlers in South East Asia and the Far East region.

Around the past half century, Odisha has witnessed sea cyclones in 1971, 1973, 1977, 1981, 1983, 1984, 1985, 1987, 1989, 1999 and 2013 which have damaged life and property.

Odisha, with its long coastline of 450 kilo metres, occupies the face of the attracting tunnel for cyclones from Indian ocean northwards, with

indentations of its Ganjam, Khordha, Puri, Jagatsinghpur and Kendrapada to Bay of Bengal, usually these coastal districts facing the direction of flow of the cyclonic storm.

Geographically, the Bay of Bengal is the home ground of cyclones due to its peculiar topography. This acts as an attracting funnel for cyclones in the oceanic milieu. As the cyclone originates and moves towards the coast, it gathers strength being squeezed between the land mass comprising the Indian coast (Andhra Pradesh, Odisha, West Bengal) on the west side with Bangladesh to the north and Myanmar to the east. Due to the constricted path, the cyclone can accumulate greater momentum as it plays within lesser ocean surface before landfall. Out of the 35 deadliest tropical cyclones of the world, the Bay of Bengal has recorded 26, which substantiates its geographic vulnerability. The marine environment that forms the pace of these devastating cyclones is not fully understood. Only very recently there is understanding of how sea surface temperature affects the characteristics of tropical storms and cyclones, and how ocean subsurface temperatures, thermocline depths and thicknesses affect activity of the El Niño Southern Oscillation (ENSO) cycle, tropical cyclone intensification, and landfall prediction.⁶

Health hazards as outcome of Cyclonic Aftermaths

The climate-health relationships that are the easiest to define and study are those in relation to heat waves, the physical hazards of floods, storms, and fires, and various infectious diseases (especially those that are vector-borne). Other important climatic risks to health, from changes in regional food yields, disruption of fisheries, loss of livelihoods, and population displacement (because of sea-level rise, water shortages, etc)

are less easy to study than these factors and their causal processes and effects are less easily quantified.

Drowning during the impact phase of the disaster causes the overwhelming majority of deaths from cyclones and tsunamis. Populations are at risk of death simply by virtue of their physical proximity to low-lying land situated near the coastline. However, there is significant promise for the future in that nearly all these deaths are preventable with the proper advance warning and population evacuation. Very few drowning victims would be expected to survive the initial inundation, even with the added benefit of fully adequate emergency-response capacity. *Preparedness is the key to preserving human life in the setting of cyclones and tsunami disasters.* All other measures are less effective, less compassionate, and much more expensive.

Whenever there is a disruption of routine public health services (like that which occurs after a cyclone or tsunami), there is the potential for secondary adverse health effects to develop among the disaster-affected population. The best opportunity to prevent or lessen secondary health effects is during the emergency-response phase.

Human-Health Impact of Cyclones

The Mortality Trend

Prior to the implementation of early warning, evacuation, and shelter systems, drowning from storm surge accounted for an estimated 90 per cent of cyclone attributable mortality in both developed and developing nations.⁷ Storm-surge drowning deaths have decreased markedly in developed nations due to improvements in hurricane forecasting, evacuation, and shelter procedures.⁸ Now, most of the storm-related mortality, and much of the

morbidity, occurs during the post-impact period; however, if major infrastructure damage is sustained, it can be difficult to document the true extent of mortality and morbidity. In developed nations, the most prominent causes of death and injury are electrocutions from downed power lines, chain-saw injuries, blunt trauma from falling trees, and motor-vehicle fatalities occurring during the early post-impact period.⁹ Unfortunately, storm surge remains the primary cause of mortality following tropical cyclones in developing nations that lack critical preparedness measures.¹⁰ The other causes of fatality are the collapsing mud walls of the residences and the falling trees in the developing countries.

Storm-Associated Illness and Injury

- Injury represents the major cause of death and the primary cause of morbidity for tropical cyclones.¹¹
- The top three cyclone-related injuries are lacerations, blunt trauma, and puncture wounds, with 80 per cent of these injuries being confined to the feet and lower limbs.¹²
- Snakebites are invariably associated with cyclonic events in Odisha.
- An increased incidence of animal and insect bites following tropical cyclones has also been noted.¹³
- Chronic diseases (such as asthma and emphysema) are also known to be exacerbated.¹⁴
- In the last cyclones, communicable disease like diarrhoeal diseases have caused great problem of health management in cyclone devastated area due to water pollution and lack of drainage mechanism. But in developed nations, post-hurricane infectious disease surveillance has occasionally detected increases in self-limiting gastrointestinal disease and respiratory infections.¹⁵ But more typically, no increase in communicable disease is found.¹⁶
- Though the record and report of rising incidence of Malaria as aftermath of cyclones is lacking, there is adequate evidence of rising trend of mosquito menace and Malarial outbreaks in these devastated areas in tropical climates and Odisha, the endemic home of Malaria. But, comparatively there are few reports of isolated outbreaks associated with vector-borne illness in developing nations. For example, interruption of health services including an anti-Malaria campaign that contributed to a Malaria outbreak in Haiti following Hurricane Flora in 1963.¹⁷ The incidence of Dengue fevers rose in Guatemala and Honduras following Hurricane Mitch in 1998.¹⁸
- There was an outbreak of mental imbalance and depressive disorders in Odisha among Supercyclone survivors of 1999 that lasted for more than one year due to socio-economic disarray inflicted by the cyclone. It was more with those who lost their family and relatives. Rates of suicide¹⁹ and child abuse²⁰ appear to rise following natural disasters. The National Institute of Mental Health (NIMH) has been quite proactive in seeking to address mental-health issues of those disaster victims affected by Hurricane Katrina.²¹

Type of morbidity by Cyclone and Tsunami :

Crush injury, Head injury, Asphyxiation, Isolated bone injury, Skin soft tissue injury, Burns, Drowning, Asthma/Emphysema, Hypothermia,

Epidemics, Starvation, Aspiration Pneumonia, Tetanus, Wound infections, Psychological illness.

Cyclonic storms and tsunamis differ on the incidence of death rates, severity of injuries, damage of health care system, aggravation of existing chronic illnesses, food scarcity, want of clean water, loss of shelter, damage of personal and household goods, extent of population movements, loss of routine hygiene, damage of sanitation, disruption of solid waste management, public concern for safety, rise in pests and vectors, loss of electricity and extensive damage to communication networks. The tsunamis record very high incidence of death and toxic exposures compared to cyclonic storms.

Recent evidence of cyclone Phailin in Odisha demonstrates massive destruction to electrification and the whole district may not be restored in months with all efforts. This stimulates for electrification mechanism that would be cyclone proof.

Procedures outlined for emergency healthcare in cyclone anticipation and cyclone are many. Preparedness for managing health hazards, creating awareness for injuries, illnesses and other health hazards, creating trained medical first responders with medical treatment kits with all items that covers managing cyclone casualties, definite planned movement for patient evacuation, dissipation of the disaster management health plans for all coastal medical institutions, activation of the Quick Reaction Medical Teams (QRMT) so as to reach the cyclone affected site immediately along with resuscitation equipments and life saving medicines, cardiopulmonary resuscitation, triage and evacuation work. The National Disaster Management Guidelines of India also provides elaborate description for management of cyclone hit patients at hospitals, provision for mortuaries

with well documentation facilities. Necessary arrangement for disposal of animal carcasses is also a priority.

There is also provision for maintenance of good public health environment in the aftermath of cyclone with supply of safe and sufficient drinking water, protecting existing water sources from contamination, adding chlorine tablets in water for residual disinfection and provision of latrines and proper waste disposal to avoid contamination through flies and other insects are important steps required immediately in the aftermath of a cyclone. Vector control is done by spraying of shelters with residual insecticides. It is recommended to provide insecticide-treated mosquito nets and immunization programmes to prevent communicable diseases. (National Disaster Management Guide)

Healthcare measures on the event of anticipated cyclone and its landfall lies in health education, preparedness and alertness in cyclone prone period. The Disaster Management and Mitigation Plan, 2013; Department of Health and Family Welfare, Government of Odisha elaborated contingency plan for deployment of Medical/Para Medical Staff from State Headquarters, prepositioning of supplies, health education and mass casualty incident management plan appropriate to the situation.

Instances of Two Powerful Cyclones in Odisha:

1. Odisha Cyclone, 1999 (Tropical Storm B 05 or Supercyclone, 1999)²²

The 1999 Odisha cyclone (Cyclone 05B or Paradip cyclone) was the strongest tropical cyclone ever recorded in North Indian Ocean. The Category Five storm made landfall at Paradip just weeks after a category 4 storm that hit

Gopalpur of Ganjam district. A tropical depression formed over the Malay Peninsula on October 25, moved to the northwest and transformed into a tropical storm to hit Odisha at Paradip as a 250 km/h wind speed cyclone on October 28, causing death of about 10,000 people with heavy damage in its path and destruction. Tens of thousands of families from coastal districts of Jagatsinghpur, Balasore, Bhadrak, Kendrapada, Puri and Ganjam were forced to evacuate their homes before the arrival of the storm. More than 44,500 people were placed in 23 Red Cross cyclone shelters. Inland of Cuttack and Khordha districts including the capital city had suffered the brunt of the storm. People were confused on the warning of the high speed of the ensuing cyclone and many did not believe this and were apathetic to the evacuation advice of the government machinery. Mass Casualty Incident, Post traumatic disorders, waterborne disease outbreaks, damage to property and Health institutions, disruption of communication system did take place at unbelievable rapidity, no one could assess the situation nor did administration could presume what hazard the supercyclone is playing with as the state capital was under spell of this disorder and centre was detached in communication link.

The cyclone dumped heavy torrential rain over southeast India with record of flood in low lying areas. The storm surge was 8 metres, struck coast of Odisha and travelled up to 20 kilometres inland. It damaged 90 million trees and destroyed 17110 square kilometres of crops. About 275000 homes were destroyed rendering 1.67 million people homeless. Official statement of 9803 deaths and 40 missing are less than estimated 15000. More than 3312 persons were injured. The number fatality of domestic animal was 2.5 million but total 406000 livestock died due to direct impact of the supercyclone. This snatched away the capability of 5 million farmers to earn

their livelihood. Odisha has been witnessing disasters almost every alternate year, be it cyclone, flood or draught. After being battered by the supercyclone in 1999, the state economy could revive only in five to seven years. The state's *per capita* income declined rapidly in the second half of the 1990s, disaster-wise the worst phase. It is now half the national average. An average of 900,000 hectares of agricultural production is lost every year because of disasters. Similarly, between 1980 and 2000, agriculture's contribution to the state GDP fell by 16 per cent.

The health hazards of the super cyclone were enormous. Huge number of death and drowning in rising and engulfing Bay of Bengal at Erasama Block of Jagatsinghpur district is a black record of cyclonic death for the state. There were large number of fractures and injuries due to falling trees and collapsing walls. The healthcare system was inoperative for weeks due to communication breakage and the falling plantations. The state of worst hit Erasama Block was unreachable due to large number of dead human and livestock bodies and pollution of water sources. The super cyclone not only damaged the physical health of the worst hit areas, the mental health was deranged with long anxiety, depressions and abnormal behavioural patterns. There are reports of these health hazards, but no systematic follow up records.

2. *Phailin Cyclone, 2013*²³

A Very Severe Cyclonic Storm (VSCS) PHAILIN originated from a remnant cyclonic circulation from the South China Sea. The cyclonic circulation lay as a low pressure area over Tenasserim coast on 6th October 2013, marked as a well marked low pressure area on 7th October over north Andaman Sea, then concentrated into a depression over the same region on 8th October and moving west-

northwestwards, it intensified into a deep depression on 9th morning and further into cyclonic storm (CS), 'PHAILIN' in the same day evening. It further intensified into a severe cyclonic storm (SCS) in the morning and into a VSCS in the forenoon of 10th Oct. over east central Bay of Bengal. This VSCS, PHAILIN crossed Odisha & adjoining north Andhra Pradesh coast near Gopalpur (Odisha) around 2230 hrs IST of 12th October 2013 with a sustained maximum surface wind speed of 200-210 kmph gusting to 220 kmph. The term 'PHAILIN' is derived from a Thai word meaning 'sapphire'; it was category 1 hurricane in SSHWS (Saffir-Simpson Hurricane Wind Scale) scale of measurement by 10th October and it attained a peak of category 5 hurricane and made landfall near Gopalpur; subsequently it weakened over land and degenerated into well marked area of low pressure resulting in torrential rainfall.

Heavy rainfall resulted in the death of a woman in Bhubaneswar after a tall tree fell on her. Gusty winds resulted in falling of trees, electric towers, poles and lines. It was also reported that due to high winds, many people were killed in Odisha. In a period of 24 hours ending on 13 October, Banki and Balimundali in Odisha received heavy rainfall of 381 mm and 305 mm respectively. As the storm moved inland, wind speeds picked up from 100 km/h (62 mph) to 200 km/h (120 mph) within 30 minutes. Berhampur, the closest city to the point of landfall suffered devastation triggered by gale winds, with fallen trees, uprooted electric poles and broken walls in various places of the city. However, there were no reports of damage to life. As of 18 October, 44 people have been reported dead from Odisha with huge losses across Odisha.

It is for the first time after the Super Cyclone of 1999 that the state has witnessed a

cyclonic storm that has had such severe impact. Heavy rains have inflated the rivers Baitarani, Budhabalanga, Rushikulya, Subarnarekha and Jalaka, affecting the downstream areas in the districts of Mayurbhanj, Balasore, Bhadrak, Keonjhar, Jajpur, Kendrapada and Ganjam. It has caused serious challenge to administrative apparatus of the State.

Appreciation of Emergency Evacuation Plan for Phailin

Somehow appearance of Phailin corroborates with disaster management awakening of India. The disaster management as per the Disaster Management Act, 2005 and the National Disaster Management Guidelines: Management of Cyclones, National Disaster Management Authority, Government of India and Disaster Management and Mitigation Plan, 2013; Department of Health and Family Welfare, Government of Odisha somehow seem as if these were awaiting show success story of a serious cyclone management.

The Disaster Management Act, 2005 lays down the institutional, legal, financial and coordination mechanism at the central, state, district and local levels. These institutions are not parallel structures, and will work in close harmony. The institutional framework will ensure implementation of the national will for a paradigm shift in DM from a post-event and relief-centric syndrome to a regime that lays greater emphasis on preparedness, prevention and mitigation, leading to a more prompt and effective response to disasters. The institutional framework under the DM Act includes the creation of NDMA at the national level, SDMAs at state levels and DDMA at district levels.

The evacuation plans have been outlined in all cyclone management ethics. But the

procedure elaborated in National Disaster Management Guidelines of India. Evacuation Plans (EEPs) i.e. Evacuation of human and livestock population is the only prescribed means to save them from cyclone. It is definitely a hard task when it involves greater area with large population. In fact, it is to be carried out on the information of a warning level prior to the impact. For successful evacuation, there must be continuous dialogue between different stakeholders and responder groups with a well defined coordination plan of action like designing of department of specific customised action plans, preparedness of the organisations, online inventory of emergency rescue and relief resources, coordinated approach among machineries (armed forces, paramilitary forces, NDRF, civil society, community based organisations (CBOs, ULBs, PRIs, Civil Defence, etc), transportation and accommodation facilities.

One of the biggest ever emergency evacuation in human history was carried out by the Government of Andhra Pradesh during the May 1990 cyclone by mobilising 2,019 teams and 745 vehicles, which evacuated 6,51,865 people from 546 villages from all the nine coastal districts to 1,098 relief camps. (National Disaster Management Guidelines, p.137)

Odisha's preparedness and dealing with Phailin²⁴

The Government of Odisha issued a high alert to the districts of Balasore, Bhadrak, Mayurbhanj, Keonjhar, Dhenkanal, Jajpur, Cuttack, Jagatsinghpur, Kendrapada, Puri, Khordha, Nayagarh, Ganjam and Gajapati. As a preparatory measure to face the cyclone emergency, the Puja Holidays were cancelled and the employees were kept alert, asking them to ensure the safety of people. Food and relief

materials were stocked-up at storm shelters across the state. Distant storm warning signal was raised to two at Paradip and Gopalpur ports of the state. The Chief Minister of Odisha wrote to the Union Defence Minister seeking support from defence personnel, particularly the Air Force and Navy, for rescue and relief operations. Odisha government had made arrangements for over 100,000 food packets for relief. Indian Air Force helicopters were kept on standby in West Bengal and emergency evacuation measures were taken up at war-speed. A total of 1,154,725 people were evacuated in the wake of the storm and the following floods in the state.

Odisha government's "effective" management of the very severe cyclonic storm Phailin, which hit the state's coast on October 12, has earned praise from the United Nations. Margareta Wahlstrom, Special Representative of the UN Secretary General (SRSG) for Disaster Risk Reduction said, "Odisha's handling of the very severe cyclone will be a landmark success story in disaster management."

After the incidence of the cyclone Phailin, the number of blocks, Urban Local Bodies, Grama Panchayats, villages; people affected; human casualties, crop area affected, persons evacuated, cattle evacuated and houses damaged have been promptly documented by administration.²⁵

Thus this massive evacuation of Phailin is exemplary, it surpasses that of 1990 Andhra evacuation.

Conclusive Statement :

Damages can be as large as the volume of the cyclone, yet preparedness can avert the damage to life though not to property to great extent. Rehabilitation and healthcare management

can restore the activity of the affected area. Phailin management reveals a win of human attempt over natural devastative force of cyclone; it prompts timely steps of disaster management team with wholehearted support of population at risk. Health awareness and precaution can save out of the dangers.

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