MODULE ON TRAINING OF MEDICAL OFFICERS ON DISASTER MANAGEMENT



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Publishing the modular training handbook on Disaster Management for Medical Officers under the Department of Health & Family Welfare, Government of West Bengal, by a district which has encountered dreaded AILA and innumerable episodes of devastating cyclones, massive tidal waves and widespread flood through the ages, may be coincidental but appropriate.

Here we have compiled the excerpts of the brainstorming sessions among the state and district level authorities as well as Medical Officers concerned on the subject throughout the state. West Bengal is a state, which is located in the most vulnerable area in the global warming related disaster atlas, where we would like to assert to combat the future situation including predicted catastrophes in a more prepared, organized, disciplined, efficient and effective way so that loss of human lives, live-stocks and properties can be minimized.

We are thankful to The Director of Health Services and Ex-officio Secretary, Department of Health & F. W., GoWB; The State Mission Director, National Health Mission, GoWB and The Secretary, PHP, Department of Health & FW, GoWB,for rendering the opportunity to publish the handbook. We are also in debt to The Jt. DHS (PH & CD), The ADHS (EC, NC&ES), The ADHS (MPHW), Sri Amit Chowdhury, The Jt. Secretary, Department of Disaster Management, GoWB and Dr. Anish Banerjee, The Lead Consultant, Hospital Disaster Management Policy, National Disaster Management Authority (NDMA) for their precious contribution.

We hope that the module will re-sensitize our Medical Officers on how to deal with disasters and how to sustain our services during disasters. We regret any mistake in this edition unknowingly. It is our great pleasure that we have to reprint the document.

Thanking all,

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MODULE ON TRAINING OF MEDICAL OFFICERS ON DISASTER MANAGEMENT

PUBLIC HEALTH BRANCH DEPARTMENT OF HEALTH & FAMILY WELFARE

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I. Introduction

Disaster

A disaster is defined by WHO as any occurrence that cause damage, ecological disruption, loss of human life and deterioration in health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community.

Hazard on the other hand is defined as the physical event that pose a threat to people, structures or economic assets, geographic area and which may cause a disaster.

Thus Disaster = Hazard + Vulnerability

II. Types of Disaster & Management

a) Natural disasters

West Bengal is prone to different kinds of disaster. Flood is the commonest and widespread among all natural disasters and can occur nearly anywhere in the state. Flooding along the rivers is a natural and inevitable part of life. Cyclones have also wreaked substantial damage periodically. In addition, there have been other natural calamities, such as drought, earthquake, erosion of river bank, landslide, tsunami etc.

West Bengal lies along the Bay of Bengal which is exposed to cyclone related hazards. West Bengal has 20 districts including Kolkata and covering 66 Sub-divisions, 341 Blocks and 3354 Gram Panchayats (G.P.). The total area of the state is 88,752 sq km having a dense population of more than 91 million people of which about 68% live in the rural areas and the population density is 1029 per square kilometer (2011).

There are 4 marked seasons (a) cold, dry weather from December to February; (b) hot, dry weather from March to May; (c) monsoon period from June to September; (d) post monsoon period in October and November. Over 70 per cent of the rain falls between June and September. The mean annual rainfall varies from 1026mm at Nalhati in Birbhum District to as high as 5323mm in Buxa in Jalpaiguri District. The state also has as long as 350 km of coastal line and long international border with Bangladesh, Bhutan and Nepal. The other important characteristic is that the Southern West Bengal has the confluence of Fresh-water river and Tidal-water river system.

Sl. No.	Nature of calamity	Name of District	
1	Flood	Murshidabad, Malda, Howrah, Hooghly, Coochbehar, North 24 Prgs, Birbhum, Jalpaiguri, Alipurduar, Purba Midnapore, Uttar Dinajpur, Dakhhin Dinajpur, Nadia, Burdwan, South 24 Parganas, Paschim Midnapur, Kolkata, Bankura	
2	Draught	Bankura, Purulia, Birbhum, Paschim Midnapore	
3	Cyclone	Purba Midnapore, Paschim Midnapore, North 24 Prgs, South 24 Prgs, Howrah, Hooghly	
4	Earthquake	Northern districts of West Bengal	
5	Landslide	Darjeeling	

Disaster prone districts of West Bengal

Man made disasters

Man made disaster includes incidences which are caused due to civilization, industrialization, urbanization etc. Falling of tree, deforestation, construction of big dams, unplanned mining, hazardous industry affecting environment, huge number of people living in unhealthy condition, construction of metropolis with high rise buildings, fast moving traffics, mass transport like aeroplane, rail, laboratories using pathogens and radioactive materials, nuclear plants all have hazard components. All these hazardous conditions can cause disasters depending upon vulnerability.

Terrorist activities add to these man made disasters. Main man made disasters are

- Accident with mass casualty
- Fire
- Building collapse
- Chemical (Industrial)
- Biological
- Radiological
- Nuclear

Disaster limits Economic development

Disaster can wipe out the gains of economic development. Disasters result in the destruction of fixed assets and interruption of production and trade, diversion and depletion of savings and public and private investment. At the local level, disaster can seriously impact household livelihoods and push already vulnerable groups into poverty. The loss of income earners, through death or injury, the interruption of production or access to markets and destruction of productive assets, are all example of the ways in which disasters affect local and household economies.

Disaster limit social development

A population that has been weakened and depleted by natural disaster, particularly when it coincides with losses from malnutrition etc. will be less likely to have the organizational capacity to maintain irrigation works, bandhs in fields for water harvesting, hill slope terraces, shelter belts. Without these social assets communities become more vulnerable. In addition to the loss of social assets themselves, there are many examples of disaster events destroying the gains of the health, sanitation, drinking water, housing and education sectors that underpin social development.

Women suffer additional stress in disaster situations and also bear a disproportionate burden of additional domestic and income generating work necessary for survival following disaster event. When women are exposed to additional stresses, the level of social development is reduced.

Hazard

Hazard can be defined as potential threat to human and their welfare. The hazardous event varies in terms of magnitude as well as in frequency, duration, area extent, speed of onset, spatial dispersion and temporal spacing.

Vulnerability

It is defined as the extent to which a community, structure, service and geographic area is likely to be damaged or disrupted by the impact of a particular hazard, on account of their nature, construction and proximity to hazardous terrain or a disaster prone area. Vulnerability is the potential for harm.

Vulnerability to disaster is a function of human actions and behaviour. It is determined by a combination of several factors, including awareness of hazards, the condition of human settlements and infrastructures, public policy and administration, the wealth of a given society and organized abilities in all fields of disaster and risk management. There is a close correlation between the trends of increased demographic pressure, escalated environmental degradation, increased human vulnerability and the intensity of impact of hazard. Poverty and vulnerability is integrally linked and mutually reinforcing.

Types of vulnerability

- i) **Physical vulnerability:** It relates to physical location of people and elements at risk (building, infrastructure) and proximity to hazard.
- **ii) Socio economic vulnerability:** This relates to the degree to which a population is affected by calamity in relation to prevailing social and economic conditions.
- iii) Psychological vulnerability: This relates to hopelessness, helplessness, negative attitude, unawareness etc.

A growing recognition that natural disaster is not only on account of hazard themselves but also of socio-economic condition of societies that render them vulnerable to natural disasters is slowly gaining recognition.

Risk and Risk Analysis

Risk is a measure of expected losses (deaths, injuries, assets, economic activities etc) due to potential hazard (of a particular magnitude) occurring in a given area over a specific period of time. Risk Analysis involves determining the probability of event happening and the level of vulnerability of the people that may be affected by the event. Disaster is a realisation of the Risk.

Formula and method for estimation of risk:

The formula used for modelling risk combines three components. The risk is a function of hazard occurrence probability, element at risk (population) and vulnerability. The following hypothesis was made for modelling the risk : the three factors explaining risk are multiplying each other. This was introduced because, if the hazard is null, then the risk is null:

0 (hazard) x population x vulnerability = 0 (Risk)

The risk is also null if nobody lives in an area exposed to hazard (population = 0), same situation if the population is invulnerable, (vulnerability = 0, induce a risk = 0).

Simplified Equation of Risk $R = H \times Pop \times Vul$

Where :

R is the risk, i.e. the expected human impacts (number of killed people). **H** is the hazard, which depends on the frequency and strength of a given hazard. **Pop** is the population living in a given exposed area.

Vul is the vulnerability and depends on socio-politico-economical context of this population.

Change concept of disaster management

Previously disaster management meant relief management and the activities centred on post calamity relief. The new approach is risk management, which includes preparedness, mitigation and prevention apart from the present responsibility of relief, rehabilitation and reconstruction. Another corner stone of the approach is that mitigation has to be multi disciplinary, spanning all sectors of development. Risk Management is incorporated with Crisis Management in the new approach.

Disaster Response cycle :



Prevention: [Activities prior to disaster]

- Mapping, soil testing, satellite picture analysis etc. and identification and demarcation.
- Structural and non-structural measures like seismic retrofit, earthquake valve, household seismic safety, mounting of furniture and appliances etc.
- Seismic and weather forecast.
- Installation of warning devices etc.

Preparedness: [Activities prior to disaster]

- Basic training and regular simulation exercise and drills for all.
- Preparation of Disaster Action Plan and arrangement of man power, logistics and fund
- Rapid Response Team (RRT) formation, training and meeting.
- Storing of food, drinking water, medicines and essential items in vulnerable points; arrangement of vehicles, boats etc.

- Formation of flood centres, storm cellars, fallout shelters, bunkers etc.
- Establishment of 2nd and 3rd line supply and communication
- Creation of back up services including power and drinking water.
- Arrangement of Personal Protective Equipments (PPE) and devices including masks, gloves, helmet, life jacket, torch, emergency kit etc.
- Preparation of relief and recovery services mainly fire, health and tele-communication services.

Response: [Activities during disaster]

- Search, rescue, first aid and shelter
- Field care
- Shifting in safe place / base hospital.
- Triage on the basis of severity and priority
- Tagging
- Identification of dead, removal of corpses, keeping in morgue etc.

Mitigation: [Activities following disaster]

- Immediate medical relief including surgeries.
- Vaccination
- Mitigation of structural damages with categorization
- Food supply
- Arrangement of drinking water, clothing, blanket, sanitation, personal hygiene etc.

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- Nutritional supplement
- Assurance
- Building code, vulnerability analysis etc.

Recovery: [Activities following disaster]

- Temporary housing
- Addressal of claims
- Long term medical care
- Family reunion
- Restoration of structures

Rehabilitation: [Activities following disaster]

- Reconstruction of households
- Complete medical treatment
- Financial and logistic support
- Counseling and mental support
- Arrangement for education / cultivation / employment
- Land / housing distribution

Management of Specific disaster

a) Natural

A. Flood

Flood and water logging has almost become an annual feature in our country. The same is true for our state also. In West Bengal due to flood a good number of people in some specific districts get affected and have to face problems regarding health and medical care. From our past experience it can be said that 763 GPs of 143 blocks of 16 districts get affected resulting in huge displacement of population in makeshift shelters. Naturally this brings in challenges before district health administration.

Challenges are:

- a) **Preparedness:** Natural calamity is usually sudden and gives little time to make alternate or additional arrangements to provide health care to affected people. Thus preparedness is necessary.
- **b)** Accessibility to health care: Huge numbers of people get displaced to makeshift shelter or school buildings which do not have adequate amenities. Often large populations get marooned without having accessibility to existing health establishments.
- c) Alternate Health establishments: Often health establishments get affected by flood and become non functional. Alternate places are to be identified and existing health facility is to be shifted in time.
- d) Availability of drugs and manpower to flood affected people in time.
- e) Prevention of diarrhoea and other communicable diseases.
- f) Treatment of drowning, lightening, electrocution, mud wall collapse etc. patient.
- g) Treatment of snake bites cases.
- h) Transportation of serious patients.
- I) Arrangement of safe drinking water, sanitation and immunisation.

Preparatory Measures:

- 1. CMOH should brief all district & sub divisional MOs and health personnel about the preparedness plan so that all sorts of steps can be taken to mitigate the effect of flood.
- 2. Contact address of a) Meteorology department, b) Authorities controlling water dams like DVC etc. and c) Disaster Management department should be kept with CMOH. Forecast information on cyclone or depression or release of water from reservoirs should be collected immediately as because this time period is crucial for taking immediate steps.
- 3. ACMOHs of subdivisions and BMOHs of blocks already identified as likely to be affected by flood should prepare their own contingency plan. The blocks and areas thus earmarked are to be equipped with necessary drugs, disinfectants, sera etc. for treatment and preventive measures to combat the immediate emergencies.
- 4. A buffer stock of drugs, disinfectants, AVS etc. should be kept ready at the different health institutions/centres so that prompt medical and health relief can be catered. Ensure that the stocks are kept in dry raised platforms preferably in the first floor in flood affected areas.



- 5. For Medical and Public Health Relief Works in the affected areas a clear cut written staff deployment plan is to be chalked out both for IPD/OPD/SC and field activities with staff available within the block and all concerned are to be informed. Such list should contain names and addresses with contact number of all the staff. BMOHs to depute the field staff from non affected areas and to deploy them in affected areas within first 24 Hrs. For broader realignment ACMOHs and CMOHs will act.
- 6. The list of available vehicles at the district including at DRS, at ACMOH office, at Block level are to be on road position and of single command. So also the list of Ambulances running under PPP at RH/BPHCs has to be updated and maintained. Dy. CMOH-I is to see that minor repairs of vehicles are done and all vehicles are on road.
- 7. Pre Monsoon routine Disinfection of all drinking water sources to be planned and done.
- 8. Plan to raise the height of Tube Wells platforms in the affected areas, so that the tube well do not get submerged during flood/water logging. This is to be ensured at all the Flood Shelter Points and identified Temporary Rescue Centres. It is also to be ensured that adequate toilet facility is made available at all the Flood Shelter Points and identified Temporary Rescue Centres, pregnant women, elderly and physically and/or mentally challenged persons.

Medical care and Public Health services to be rendered during flood:

- 1) After getting information from Meteorology department or water reservoir authorities on impending disaster following steps are to be taken on emergency basis.
 - a) Control room should be set up at District level and if necessary at Sub-divisional level.
 - b) One administrative officer of health should be in charge of control room. It should remain functioning for 24 hours.
 - c) Control room should have phone and computer. Preferably a data entry operator may be placed at control room.
 - d) Phone number of district and block level officers of general administration, police and panchayat should be made available at control room.
 - e) Contact number of control room and officer concerned should be intimated to State Head Quarter.
- 2) BMOH of the affected block and Dy. CMOH II in the district should be declared as 'Nodal Officer's regarding flood management. Phone number of such 'nodal officers' and other BMOHs should be readily available.
- 3) Man and materials may be pooled, if required, from unaffected areas for the time being till the replenishments are received from appropriate sources. 10% of doctors and staff who have been identified for rendering such service in flood affected area should be intimated for necessary movement. 8-10 teams of MOs and Para medical staff should be kept ready well ahead.
- 4) If necessary leave of health staff may be cancelled.

- 5) Relief operations are usually conducted by the district administrative authorities and the respective Panchayet Samities. Hence close liaison should be maintained with these bodies at all levels.
- 6) General administration should be approached for hiring of boats/ vehicles to transport medical team and logistics where they are not available. They are also approached for lime for disinfection process.
- 7) Identification of possible drinking water sources and disinfection of water sources by Chlorination should be made in collaboration with Panchayet functionaries, P.H.E. Department and local people.
- 8) A clear map should be obtained from general administration on the location of temporary shelters where flood affected people are placed and also the villages where people are marooned without communication route.
- 9) BMOHs are to prepare the detailed list of Health Care Delivery System in the context of the flood/water logging situation in the affected areas and deploy staff accordingly. All Health Centers (RH/BPHC/PHCs) are to be kept running. If any SC is not approachable then the staff should be utilized at a nearest temporary accommodation to cater the medical and Public Health relief works in consultation with the PRI.
- 10) Number of medical teams should depend on the number of shelters and marooned villages and a movement route for medical team should be prepared. However it is to be ensured that all the Rescue Centers are visited at least once daily. Later on for Public Health and Medical relief works in the field, para medical teams to be formed and mobilized as decided at the Block Level Meeting with a definite plan and distribution.
- 11) If necessary additional medical OPD camps or medical camp with indoor facility should be set up depending on available resources and need.
- 12) Common medicines for treating injuries, gastrointestinal diseases, respiratory diseases, fever, malaria, scabies, eye infection and for rendering first aids should be kept in adequate quantity with the medical team. All Block Primary Health Centres and PHCs, where possible should possess a stock of at least 50 vials of injection A.V. S. to treat snake bite cases. Those who have not electrical power may posses the dry variety of A. V. S.
- 13) Everyday afternoon 'Nodal Officer' must review the situation with his team and line departments and take necessary measures.
- 14) Daily report on flood situation, affected population including relief work should be submitted to the respective higher authorities and ultimately by the respective C.M.O.H. to the State Public Health Branch by available communication like phone/fax/radiogram/E-mail etc.).

Action during Post flood period:

 As soon as flood water recedes, disinfections of wells, tube-wells and ponds with Bleaching powder and/or Bleaching Powder-Lime compound must be undertaken with the help of the PRI. Priority will be the tube wells which were submerged.

- 2) C.M.O.H. is to ensure that raw bleaching powder is to be used only for disinfection of drinking water source. For all other purpose (say, for house, camp etc.) bleaching powder is to be mixed with lime at the ratio 1:9.
- 3) Halogen Tablets should be distributed to the families with necessary health education in submerged areas where Tube wells and Wells are posing threat to water pollution.
- 4) BMOHs are to maintain close surveillance/strict vigil for any outbreak at the rescue camps and at the community level. All cases of diarrhoeal disease, ARI, fever cases and skin diseases are to be treated promptly to prevent outbreaks. Necessary RDT and Blood smears from all fever cases are to be collected and examined for malaria parasite mainly plasmodium falciparum.
- 5) General public should be motivated to maintain sanitation, hygiene and to use safe drinking water and actively participate in the disinfecting and preventive activities. The local Panchayat and Panchayat Samity may be approached for all out assistance for all public health measures. Monitoring of disinfection activity through field water test (H₂S strip test) should be done.

The personnel having responsibility toward medical relief operation should be highly careful in performing their entrusted duties so that any mishap can be avoided.

B. Cyclone

The Bay of Bengal and the Arabian Sea together generate about 5-6 tropical cyclones annually of which 2-3 could be quite severe. Data has shown that nearly four times more cyclones occur in the Bay of Bengal than in the Arabian Sea (262 cyclones in the east compared with 33 cyclones between 1891 and 1990). Cyclone seasons are May-June and mid-September to mid-December. Months of May, June, October and November are known for severe storms. The cyclones surveillance is done by satellite INSAT and powerful cyclone detection RADAR installed at Kolkata, Paradeep, Vishkapatnam, Machhilipatnam, Chennai, Mumbai, Goa, Cochin and Bhuj. The vigil is so satisfactory that no cyclone can escape detection and it has been possible to issue timely warnings through cyclone warning centres located at Kolkata, Bhubaneshwar, Visakhapatnam, Chennai, Mumbai and Ahmedabad.

Tropical Cyclones are intense low pressure systems which develop over warm sea. They are capable of causing immense damage due to strong winds, heavy rains and storm surges.

Common types on injuries encountered with -

Cyclones and Storm :

- a) Mortality is not so high unless tidal waves and storm surges.
- b) Collapse of various structures.
- c) Crush asphyxia takes toll due to collapse.
- d) At times objects are lifted in the air and carried along by the wind. It may also cause injuries at the place where it falls.
- e) Common injuries are lacerations, fractures, cuts, bruises etc. mostly caused by flying objects and also crush injuries due to collapse.

Tornado :

- a) Severe crush injuries of skull and thorax are the main causes of death in tornado. Cases of severe crush injuries of chest and abdomen are seen also.
- b) Common injuries are fractured skull, other fractures, crush injuries of chest and trunk, lacerations and bruises etc. At times foreign materials may be deeply embedded with soft tissues at the site of injury.

General precautionary measures -

Before cyclone season :

- 1) Check the structures of the house, secure loose tiles, repair doors and windows.
- 2) Remove dead or dying trees, movable objects like plumber piles, loose sheets, garbage cans, and signboards etc.
- 3) Demolish condemned buildings.
- 4) Keep hurricane, torch lights ready for use with kerosene and dry cells.
- 5) Keep transistor set ready with dry cells.
- 7) Keep some wooden boards and paper tapes ready for protecting glass windows.

When cyclone threatens:

- 1) Keep radio on. Listen to latest weather bulletin / warning and pass on the information to others. Avoid being misled by rumours.
- 2) Board up glass windows provide strong support to outside doors. If wooden boards are not available, paste paper strips on glasses.
- 3) Get extra dry food store extra drinking water. Make provisions for children and adults requiring special diets.
- 4) Keep hurricane/ lantern, and torch handy.
- 5) Kerosene tin, cans, agricultural implements, garden tools and other objects become weapons of destruction in strong winds store them in covered room.
- 6) Be sure that window / door on opposite side of wind can be opened.
- 7) Be alert for high water where rivers may flood due to accompanied heavy rains. Well built double storied buildings on high ground may serve as cyclone shelter. Get away from low lying areas early if advised to evacuate - do not run risk of being marooned.
- 8) Move valuable articles to upper floors to minimize flood damage.
- 9) Remove cattle and other live stocks to safer places.
- 10) Remember if "eye" passes over this area, there will be lull in wind for about half an hour followed by stronger winds from opposite direction.

Post cyclone measure:

- 1) Remain in shelter until advised to return home.
- 2) Keep away from loose and dangling wire from electric lamp post.
- 3) Drive vehicles carefully in the area.
- 4) Disinfect well or other drinking water sources if required.
- 5) Help removing dead bodies and carcasses and immediate disposal.

C. Heat Stress

Anybody can fall victim to an overexposure of heat and sunlight. This particularly occurs during summer when temperature remains high during daytime. Most susceptible are children and elderly persons, those suffering from diabetes, heart problems and anybody with poor general health.

Complications:

- 1. Heat Stroke.
- 2. Heat Exhaustion
- 3. Heat Cramp

Heat Stroke occurs when the cooling mechanism of the human body goes wary and fails to produce sweat. This happens when body is exposed to high temperature consistently for a long time.

Heat Exhaustion is a situation when the body's cooling mechanism works but due to exposure to heat such work goes beyond capacity. Due to this a person gets excessive sweating and the liquid content of the body goes down.

Heat Cramps are mostly known to accompany heat exhaustion but in some cases this occurs completely on its own. This too happens when the sweating is excessive and body loses salt (sodium, potassium, calcium) through sweat.

Heat Stroke :

Symptom

High body temperature, extreme cases will be in coma, no sweating and unconsciousness.

Measures to be taken

- a) Bring the patient to indoor.
- b) Use ice packs all over the body.
- c) Wrap a wet bed sheet.
- d) Switch on the fan.
- e) Stop these measures when the body temperature falls to 101° Fahrenheit.
- f) Give water to drink.
- g) If unconscious rush to the hospital.

Heat Exhaustion:

Symptom

Excessive sweating, low blood pressure, unconsciousness, if severely affected may collapse. Measures to be taken

Measures to be taken

- a) Cool the patient.
- b) Give ORS.
- c) If unconscious rush to hospital.

Heat Cramp :

Symptom.

Excessive sweating, pain in muscle, headache, inability to move limbs.

Measures are to be taken

- a) Cool the patient.
- b) Give ORS.
- c) Remember not to give plain water.

D. Drought

Drought originates from deficiency of rainfall over an extended period of time, usually a season or more. Drought should not be viewed as merely a physical phenomenon or natural event. It is a protracted emergency, which invariably leads to shortage of food. The socio environmental problems of poverty and illiteracy compounded by inadequate health services and lack of potable water have a cascading effect resulting in economic disaster.

Health effect of drought :

The health impact is more so in the sphere of nutrition affecting children, lactating and pregnant mothers. This vulnerability is reflected in high infant mortality in the drought affected area. High mortality witnessed among under five children in drought effected area are also due to high incidence of water borne diseases and infectious diseases such as measles which itself creates vicious cycle among the undernourished. In addition the aged, infirm and the disabled pose special problem.

During drought, diseases like gastroenteritis, dehydration, heat stroke, heat exhaustion, pneumonia, cholera, typhoid, dysentery, measles, parasitic disease, viral hepatitis, skin diseases and others including nutritional disorders pose special problems. There may be outbreaks of communicable diseases. Use of unconventional foods may lead to food poisoning.

Management :

Pre drought phase.

- a) Preparedness measures with sensitization of personnel.
- b) Strengthening system of surveillance and epidemiological investigation system.

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c) Review of stock of drug and logistics.

Drought phase

- a) Assessing geographical extent of nutrition and health impact.
- b) Prompt identification and confirmation of disease outbreak.
- c) Activating RRT.
- d) Continuous monitoring.
- e) Inter sectoral coordination.

Post drought phase

- a) Rehabilitation of victims.
- b) Evaluation of control measures.
- c) Documentation and sharing of experience.

Role of Health Facilities :

In drought affected areas the health facilities should keep a watch on report of unusual number of cases as also increased number of deaths that might be caused by infectious diseases. All hospitals in the affected area should be prepared for attending large number of cases in the aftermath of an epidemic outbreak. The medicines and vaccines for expected disease outbreak should be stockpiled.

All drinking water sources need to be identified and every effort made to disinfect the same with chlorine and bleaching powder. It is preferable if it is done daily during drought period to prevent epidemic.

Nutritional supplementations would be a focused area. The same could be channelized through ICDS. For areas not covered under ICDS, the same should be channelized through the panchyatiraj institutions, PHC, sub centres etc.

E. Landslide

These are slippery masses of rock, earth or debris, which move by force of their own weight down the mountain slopes or river banks. Landslides are common disaster phenomena in the district of Darjeeling. Landslide is primarily nature's way of adjustment to slope stability. Here the process has been intensified by human interference, mainly through rapid deforestation, incorrect construction procedure and unplanned tapping of natural resources.

Though landslide occurs gradually, sudden sliding can occur without warning. They may take place in combination with earthquake, floods and volcano eruption. As there is no established warning method indicating occurrence of landslide, hence it is difficult to predict and results in huge loss of life.

Causes of landslide are

- a) Geological weakness.
- b) Erosion.
- c) Intense rainfall.
- d) Human excavation.
- e) Earthquake shaking.
- f) Volcanic eruption

Element of risk

The most common elements of risk are the settlements built on steep slope, those built at the mouth of the streams emerging from mountain valley. Buildings constructed without appropriate foundation for a given soil and in sloppy area are at risk.

Effect of Landslide

- a) Physical damage: Landslides destroy anything that comes in their way. They block or burry roads, lines of communication, settlements, river flow, agricultural land. Due to landslide flood may also occur.
- b) Casualties : They cause maximum fatalities depending on the place and time of occurrence. Catastrophic landslide may kill thousands of persons.

Main mitigation strategies

- a) Hazard mapping will locate areas prone to slope failures. These maps will serve as a tool for mitigation planning.
- b) Any development activity initiated in such area should be taken after a detail study of the region and slope protection to be carried out.
- c) In construction of roads, irrigation canals etc proper care is to be taken to avoid blockage of natural drainage.
- d) Relocate settlements and infrastructure that fall in possible path of landslide.
- e) Increasing vegetation cover is the cheapest and most effective way of arresting landslides. This helps to bind top layer of the soil with layer below, while preventing excessive run-off and soil erosion.

Management during emergency condition

Landslide is an emergency and Disaster Management Team should be active immediately for rescue operation. Effort should be made to restore communication route and provide essential relief. As regards health, Triage and transportation of patient is necessary. Nearby hospital should have contingency plan to tackle such situation and accommodate a huge number of casualties.

F. Earthquake

An earthquake is a major demonstration of power of the tectonic forces caused by the endogenic thermal conditions of the interior of the earth. It is a series of underground shock waves and movements on the earth's surface caused by the natural processes. The motion on earth's surface may range from a faint tremor to a wild motion capable of shaking buildings apart and causing gaping fissures to open in the ground.

The earthquake becomes a disaster only when it strikes the populated areas. Sometimes moderate earthquakes on Richter scale inflict great damages by stimulating and augmenting other natural physical processes such as landslide, tsunami, flood and fire.

Effects of earthquake :

- a) Physical damage : Damage or loss of buildings and service structures, disturbances in ground water conditions. Fire, flood due to dam failure etc.
- b) Casualties : Often high near epicentre and in places where the population density is high and structures not resistant to earthquake forces.
- c) Public Health : Multiple fracture injuries, moderate to severe injury, breakdown in sanitary condition and large number of casualties can lead to epidemic.
- d) Water supply : Severe problems due to failure of the water supply distribution network and storage reservoirs. Fire hydrants supply lines, if vulnerable, can hamper fire service operations.

- e) Transport network : Severely affected due to failure of roads and bridges, railway tracks, airport runway and related infrastructure.
- f) Electricity and Communication : All links get affected. Transmission towers, transponders, transformers collapse.

Major mitigation strategy:

- a) Engineered structures following definite guideline.
- b) Capacity building for engineers / architects, disaster management teams, urban local bodies, general administration etc.
- c) Seismic Hazard assessment.
- d) Community based Mitigation including community preparedness and community education.

Measures to be adopted :

- a) Preparation of disaster management plan.
- b) Establishment of alternative means of telecommunication.
- c) Mobilisation of fire service.
- d) Rescue of casualties trapped under debris.
- e) Provision of hospital, medical and nursing staff.
- f) Setting up First Aid posts and emergency hospitals.
- g) Removal of debris.
- h) Emergency sanitation, alternative supply of water, care of animals.
- i) Care of homeless, establishment of camps, distribution of essential commodities.
- j) Identification of dead and their disposal.
- k) Mobilization of transport.
- I) Restoration of communication.
- m)Prevention of panic and up keep morality of people.

Do's and Don'ts for common people in case of earthquake:

What to do :

- 1) Come out of house quickly when earthquake is felt.
- 2) If there is no time to come out of house then take shelter under heavy table or cot.
- 3) Outside house, stand in open space or field.
- 4) Switch off TV, Fridge, Gas. Use only battery operated radio.
- 5) Use earthquake resistant technology while constructing house.

What not to do :

- 1) Do not stand near glass door, window and almirah.
- 2) After coming out from house do not stand near big building or electricity posts.
- 3) Do not stay inside running vehicle during earthquake.
- 4) Do not stand at stairs or hanging balcony.

G. Tsunami

Tsunami is a Japanese word meaning "harbour waves" : These waves, which often affect distant shores, originate from undersea or coastal seismic activity, landslide and volcanic eruptions. Whatever the cause, sea water is displaced with a violent motion and swells up, ultimately surging over land with great destructive power.

If the earthquake or underwater movement is near the coast, then tsunami may strike suddenly and if earth movement is far in the sea then it may take few minutes to hours before striking the coast. The onset is extensive and often destructive. The causes of tsunami are

- a) Fault movement at sea base plate. This leads to earthquake as well as tsunami.
- b) Landslide either occurring underwater or originating above sea and then plunging into the water.
- c) Volcanic activity under water.

Warning :

Tsunami is not a single giant wave. It consists of ten or more waves which are termed as a "tsunami wave train". With the use of satellite technology it is possible to provide nearly immediate warning of tsunamigenic earthquakes. Warning time depends upon the distance of epicentre from the coastal line. The warning includes predicted times at selected coastal communities where the tsunami could travel in few hours.

Vulnerability :

All structures located within 200 meters of the low lying coastal area are most vulnerable to the direct impact of tsunami waves as well as impact of debris and boulders brought by it. Structures constructed of wood, mud, thatch, sheets and structures without proper anchorage to foundations are liable to be damaged by tsunami waves and flooding. Other elements at risk are infrastructures facilities of port, harbours, telephone and electricity poles. Ships, fishing boats near the coast add to the destruction caused by tsunami waves.

Disaster effects :

- a) Physical damage : The force of tsunami can raze everything in its path. It is the flood effect of tsunami that greatly affects human settlements, road, bridge and other infrastructures.
- b) Environmental damage : Generation of debris, release of toxic chemicals into the environment on account of chemical leak, spillage, utility breakage and even release of nuclear material.
- c) Casualties and public health : Deaths occur principally from drowning as water inundates homes. Many people are washed away to sea or crushed by giant waves. There may be injuries from battering by debris.
- d) Water supply : Breakage of water mains and contamination.
- e) Crops and food supplies : May be hampered causing shortage of food.

Preparedness measures :

- a) Hazard mapping : Hazard map to be prepared with designated areas expected to be damaged by tsunami waves and flooding.
- b) Early warning system : Tsunami warning to be communicated in local language to general people particularly fishermen and those living in coastal area.

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c) Community preparedness : To be ensured in coastal areas.

Main mitigation strategy :

Site planning and engineering structure, which includes

- 1) Site selection for settlement.
- 2) Elevation of coastal homes above mean sea level.
- 3) Construction of water breakers to reduce velocity of waves.
- 4) Construction of community hall at higher locations which can act as shelter during tsunami.

B) Man-made disaster

A. Mass Casualty

- This may be in the form of
- a) Accident
- b) Terrorist act

Accident :

This includes collapse of building, bridges etc., Fire, traffic accident like that of train, aeroplane, tube rail, ship, bus etc. which are carrying large number of passengers.

Terrorist Act :

This may include bombing and blast which may be by suicidal squad. Explosions sometimes may be accidental. Here the severity of disaster will depend upon the locality and timing of the blast, which determines the number of people those get affected.

Blast injury can be categorised in four groups.

- a) Primary : Caused by blast wave and it affects gas or air filled organs (Ear, lung, gut, eye). It is the commonest cause of death.
- b) Secondary : Penetrating or blunt trauma injury caused by flying objects.
- c) Tertiary : Injury caused when people are thrown against hard objects like wall.
- d) Miscellaneous : All other explosion related injuries like smoke inhalation, burn, crush injury. Patients may have injuries caused by one or all four mechanisms. Injuries are more severe for explosion in enclosed area. Severity of injury increases with proximity to explosion, solid objects (wall) or structural collapse. Blast lung presents early (4 hours) and blast abdomen presents late. Tympanic membrane rupture may indicate multi-organ blast injury. But blast lung can occur in the absence of tympanic membrane rupture.

The peculiarities of these incidents are suddenness and tackling of huge number of patients. In case of terrorist attack panic and rumor needs to be handled properly and general administration and media have a major role to play. Rescue of injured gets priority and various departments are involved in the process.

As regards provision of medical care, Triage at the site and also at Emergency of hospital is important. Hospitals, near vulnerable area like beside highway, rail line, near airport and those hospitals situated in densely populated area like near market, shopping mall, railway station etc., should develop their own disaster management plan. Disaster management plan for hospital is discussed separately in another chapter.

Triage

It is a dynamic continuing process that aims to do the most for the most. It reacts to physiological effects (change in vital sign) rather than anatomical effects (the easily visible). Principles of Triage

P 1	Life threatening (Breathing only after airway is cleared or respiratory rate less than 9 or more than 30 per minutes)	Immediate treatment
P 2	Urgent (unable to walk and respiratory rate between 10 to 29 per minutes)	Urgent treatment
P 3	Minor (Walking)	Delayed treatment
P 4	Dead (Not breathing even after airway is cleared)	No treatment

B. Biological disaster

Biological disasters are events caused by microbial agent or its toxin in human, animals or plants that cannot be dealt adequately by the community within its own resources. Such biological event may occur due to (i) epidemic of infectious diseases caused by a microbial agent or toxin in human, animals or plants (ii) Non-intentional accidental release of microbial agents such as from laboratories or during transportation of samples (iii) Intentional use of microbial agents to cause harm such as use of biological agents or toxins as weapons of mass destruction (biological warfare) or (iv) microbial agents or toxins used by terrorists to cause panic/harm to human, crops or livestock (bioterrorism /agro-terrorism).

The scope of action by Department of Health is limited to natural outbreak of communicable diseases or that due to non-intentional accidental release of microbial agents such as from laboratories or during transportation of samples.

Department of Home Affairs is the nodal department for bioterrorism/agro-terrorism and Department of Agriculture is the nodal department in matters pertaining to biological disasters affecting agriculture/livestock. Ministry of Defence is the nodal agency to control epidemic arising out of bioterrorism/bio warfare.

Preparedness

The State unit of the Integrated Disease Surveillance Project (IDSP) looks after Surveillance network. The surveillance system establishes threshold levels for communicable diseases (of public health importance) from the existing data. The information received through print/visual media and through the 24X7 call centre is verified through IDSP district units. This apart, any biological event, unusual for that time and place would also be reported.

Based on available epidemiological data, list or mapping of communicable diseases are to be done, which may include epidemic prone diseases with special focus on **emerging** and **re-emerging diseases** with clinical attributes and public health measures that need to be instituted. All the international airports/ports/ground crossings within the geographic jurisdiction of the State would have facilities for screening passengers / cargo / products of animal or plant origin that can be activated on getting information from World Health Organization (WHO) of occurrence of a public health emergency of international concern that requires restriction of travel and/or trade.

Rapid Response Team (RRT) comprises of an epidemiologist / public health specialist, microbiologist and a medical / child specialist and other experts (entomologist, veterinary expert etc.) as deemed appropriate and availability. The RRT is primarily responsible for conducting the outbreak investigations.

Laboratory which has **Bio Safety Level [BSL]-2** arrangements and **BSL-2** lab that could follow **BSL-3** precautions are a must for laboratory diagnosis of hazardous pathogens.

Hospitals with critical care facility should be prepared for management of pandemic/epidemic situation. Some of the emerging diseases like **Nipha**, **Cremean Congo Hemorrhagic Fever** etc. are potentially nosocomial with disastrous effects. The health care providers are at increased risk. Hence all such identified hospitals should follow strict infection control practices.

Biological disasters may overwhelm the capacity of hospitals. To mitigate such situation, separate screening centres may have to be established for triage of cases on OPD basis. Schools, community halls, panchayat halls need to be identified where temporary hospitals/isolation facilities can be set up.

Response Protocol

- a) **Early Warning Signal:** Early warning signs would be deciphered with analysis of the surveillance data, review of reports from various sources including media and its verification.
- b) Trigger Mechanism: Trigger mechanism will be activated with response from (i) GOI informing about a public health emergency of international concern notified by WHO. (ii) Occurrence of illness in a population clearly above the threshold / frequency for that particular time and place within the State or in other States (for which GOI has issued an alert). (iii) Epizootic outbreak with potential threat to human population within the state or neighbouring state. (iv) Even two or more cases of an exotic disease not having reported for long time or a new emerging disease.
- c) **Control Room:** Control Room at State Head Quarter as well as district affected should be activated.
- d) **Deployment of Rapid Response Team:** The team will conduct a Rapid Epidemiological Assessment that would include outbreak investigation.
- e) Instituting Public Health Measures: Often there is a window of opportunity for prevention, delaying entry or containment of certain outbreaks that has yet not affected the country. This will include a series of pharmaceutical interventions (contact tracing providing chemoprophylaxis to those suspected to be exposed, and / or targeted vaccination to those at high risk) and non-pharmaceutical interventions (Screening and Quarantine at point of entry, individual hygiene measures, social distancing measures etc).

- f) Enhanced surveillance with case definition of the disease will be put into operation for early detection of cases. All reporting units around the affected districts(s) in particular would be put on alert to look for and report suspected cases.
- g) Samples would be collected by trained health workers. It would be sent to the identified laboratory. The laboratory would be informed telephonically or through e-mail about the sample dispatch.
- h) Public health measures specific to water borne, vector borne, zoonotic and respiratory diseases etc., as the case may be, would be implemented.
- Non pharmaceutical interventions like social distancing measures such as school closure; market closure; cancellation of mass gatherings etc. depending upon the nature and magnitude of the outbreak. However enforcing social distancing measures also necessitates maintaining law and order.
- j) **Risk communication :** Media would be addressed by Spokesperson designated by Government.
- k) Hospital/domestic care : The identified medical college, district and sub district hospitals, both in government and private sector would provide clinical care. Guidelines as appropriate for the public health emergency would be followed for isolation, medical and critical care. Large number of cases would call for triage and domiciliary care of mild cases. For such purpose, number of screening centres would be opened.

Suspected agents of Biological disaster

- a) Anthrax
- b) Botulism
- c) Brucella
- d) Plague
- e) SARS
- f) Small pox
- g) Tularaemia
- h) VHF (Lassa fever, Ebola/Marburg, Crimean Congo HF)

To suspect agents of biological disaster as Differential Diagnosis

SI No	Presence of Clinical Symptoms & Signs	To suspect as D/D
1	Neurological symptoms / signs (Symmetrical descending flaccid paralysis)	Botulism
2	Fever and chest symptom / sign (cough and/or sputum, chest pain, dyspnoea)	SARS, Pulmonary anthrax, plague, tularaemia
3	Fever and generalised rash	Small pox
4	Fever and localised skin sign and / or local lymphadenopathy	Cutaneous anthrax, Tularaemia
5	Fever and shock and/or bleeding tendency or DIC	VHF, anthrax, plague, tularaemia

Generalised guideline for management

SI No	Guidelines to be followed	A N T H R A X	B O T U L I S M	B R U C E L A	P L G U E	S M L P O X	S A R S	T U L A R A E A I A	V H F
1	Consult with clinician or microbiologist	Y	Y	Y	Y	Y	Y	Y	Y
2	Isolate patient in single room & restrict entry				Y	Y	Y		Y
3	Doctors, Triage nurse and others who came in close contact are to be strictly isolated					Y			
4	Ambulance used by patients should not be used again till decontaminated					Y			
5	Standard and Airborne infection control procedure is to be followed (PPE)				Y	Y	Y		Y
6	Standard infection control procedure to be followed (PPE)	Y	Y	Y	Y	Y	Y	Y	Y
7	All specimen containers are to be marked 'high risk' along with request form	Y	Y	Y	Y	Y	Y	Y	Y

Laboratory specimens that need to be collected and transported to identified laboratory

- 1) Blood culture
- 2) Paired sera
- 3) Swab/ aspirate of skin lesion
- 4) Nasal swab/ throat swab/ nasopharyngeal aspirate

- 5) Sputum for microscopy, culture, sensitivity
- 6) Bronchoalveolar lavage
- 7) Urine
- 8) Faeces
- 9) Vomitus
- 10) Cerebro spinal fluid

C. Chemical disaster

Chemical agents are mostly used in industry and huge amount of such chemicals need to be transported for industrial purpose. Though big industries are situated away from residential area but often this restriction is not maintained. Moreover vehicles carrying chemicals face accident with spillage of the chemical agent in populated area. Sometimes chemicals are stored near residential area and this may lead to incident of chemical disaster. During World War I chemical agents were used as warfare material but presently use of chemical agent by terrorists has become a real threat. Use of nerve gas Sarin by extremist group in Japan in 1994 and 1995 (Tokyo subway) resulted in 18 death. Recent chemical genocide in war-ravaged Syria is another example. HAZCHEM are hazardous chemicals used in industry and HAZMAT are hazardous materials. Both have the potential to be used by terrorists as they can be used in vaporised/ aerosol form.

Name	Characteristics	Clinical features	Management
Hydrogen Cyanide or Cyanogen	This is used extensively in industry. It is a colourless gas and highly inflammable. It is absorbed by inhalation.	Absorption after inhalation results in rapid effect on CNS within seconds or minutes of exposure. In minimum exposure the symptoms are dizziness, headache, nausea, confusion, chest pain/tight chest, dyspnoea. But with severe exposure there may be convulsion, cyanosis and death results from respiratory or cardiac arrest.	Promptly removal of the patient from hazard site. Maintenance of airway and oxygen. Specific antibody available. Mouth to mouth resuscitation is not be administered.
Chlorine	It is used in industry. Chlorine gas is irritant and corrosive. It is heavier than air and thus accumulates in low lying areas and closed spaces. Chlorine gas reacts with water to form hydrochloric acid and hypochlorous acid. Chlorine gas effects skin, eye and respiratory system.	Skin: Irritation, erythema, redness. Eye : watering, blepharospasm. Inhalation : Cough dyspnoea, tight chest / chest pain, nausea, vomiting, pulmonary oedema, pneumonitis, cardiac arrest.	Remove patient from site. Remove clothing of patient. Maintenance of airway and oxygen. Treatment of respiratory complications.

Some common hazardous chemicals are

Lewisite	Lewisite is used in industry. It is oily volatile liquid. In gaseous form it is heavier than air. It is fat soluble. Lewisite is rapidly absorbed through skin, eye and by inhalation. Liquid form is more severe than gas and develops immediate clinical effects.	Eye : watering, blepharospasm, periorbital oedema, corneal ulcer. Skin : Burn feeling with appearance of blisters. Exposure to liquid form may cause deep burn. Respiratory system : Burning pain in throat, cough, dyspnoea, hoarseness of voice, oedema of throat and larynx causing laryngeal obstruction, pneumonitis, ARDS.	Maintain airway and oxygen supple-mentation. Bronchodilator. Remove patient from site, remove patient's clothing and decontaminate. Antidote, Dimercaprol.
Mustard	This is oily volatile liquid. Gas form is heavier than air. It is used in industry and this chemical was used as chemical warfare in World War I. Mustard is rapidly absorbed through skin, eye and by inhalation. Liquid form is more severe and tissue damage is immediate but clinical effects appear late.	Eye : watering, bleph- arospasm, periorbital oedema, corneal ulcer. Skin : Erythema with blisters. Respiratory system : Hoarseness of voice, cough, dyspnoea, fever, laryngeal oedema, pneumonitis, ARDS leading to death.	Maintain airway and oxygen supple- mentation. Remove patient's clothing, decontaminate with water & liquid soap (Rinse – wipe – Rinse) Eye treatment. Treatment of respiratory symptoms. There is no specific antidote
Nerve agents (Organophosphate) / Sarin	It is a colourless to brown liquid and odourless. It is volatile to varying degree and vapour form is heavier than air. Like organo-phosphorous pesticide it inhibits activity of acetyl- cholinesterase. Sarin or nerve agents are highly toxic and death results from respiratory arrest due to CNS depression and muscle paralysis	Clinical effects depend on dose, duration and route of exposure. Local effects are immediate but systemic effects may be delayed. Mild exposure: pin point pupil, dizziness, excess saliva, localised muscle twitching. Moderate exposure : Drooling, confusion, breathing difficulty, marked muscle twitching,	Decontamination. Remove clothing (Rinse – wipe – Rinse) Specific antidote: Atropine, Pralidoxime, Diazepam. Other symptomatic treatment

		vomiting, diarrhoea, urination. Severe exposure: Disorientation, convulsion, excess secretion, cardiac arrhythmia, respiratory arrest, death.	
Phosgene	It is a colourless gas but at room temperature it appears as misty cloud. It has musty smell and is heavier than air. It degrades slowly. Phosgene is extensively used in industry.	Phosgene is absorbed by inhalation. It is irritant to skin, eye and respiratory system. Immediate Effects: Watery painful eye, Blepharospasm, nausea and vomiting, tight chest/chest pain, dyspnoea, laryngospasm, contact burn if contact with liquid form. Delayed effect: Frothy sputum, wheeze, cough, pulmonary oedema, hypoxia, severe pneumonia, ARDS leading to death.	Maintain airway and oxygen supple-mentation. Removal of clothing. Symptomatic treatment. No specific antidote
Ricin and Abrin	Ricin can be extracted from seeds of castor oil plants and Abrin from seeds of rosary peas. Thus Ricin is obtained at castor oil plant. Toxin may be swallowed, inhaled or injected. Symptoms of Ricin/ Abrin are delayed and the toxin causes inhibition of protein systhesis leading to cell death	Symptoms after ingestion. Abdominal pain, cramp. Vomiting, diarrhoea (may be bloody) GI bleeding Dehydration Abnormal LFT Hypovolaemia DIC, multiorgan failure. Symptoms after inhalation. Fever Cough Dyspnoea Tight chest/ chest pain. Pulmonary oedema. Respiratory failure, ARDS	Decontamination and remove clothing (Rinse – Wipe – Rinse) Maintain airway and oxygen supple- mentation. Prevent aspiration of vomitus. Correction of fluid and electrolyte loss. Symptomatic treatment. Whole bowel irrigation if Ricin is ingested. No specific antidote.

General principles of treatment :

- 1) To be alert to the unusual, the unexpected and the unexplained incident. If in doubt seek expert advice.
- 2) Decontamination is essential. It is intended to reduce risk of harm to the patient, to others and to wider environment. Protocol of decontamination includes Rinse Wipe Rinse with liquid soap and water. Decontaminate the patient as well decontaminate the area.
- 3) Remove the casualty from the source and perform prompt decontamination.
- 4) Cordon off the chemical contaminated area about 100 meter diameter.
- 5) Ascertain wind direction and clear downwind side up to a distance of 500 meters.
- 6) Alert hospitals immediately to receive mass casualties.
- 7) Rescue team is to be formed and put to full gear with
 - Medical doctor
 - Nurse
 - Fire personnel
 - Chemical expert
 - Police personnel
 - Disaster volunteers

8) Identify the agent with Three Colour Detector (TCD) which is provided with the container.

- 9) Contact chemical agent expert for advice.
- 10) In case of nerve agent, antidote is to be given immediately.
- 11) Wear decontaminated suit and appropriate PPE.
- 12) Remove patient for treatment.

Don'ts :

- 1) Do not crowd.
- 2) Do not go to downwind direction.
- 3) Do not enter cordon off area without clearance.
- 4) Rescue crew should not remove PPE until they are decontaminated and declared safe.
- 5) Do not handle contaminated clothing or PPE with bare hands.

D. Radiation and Nuclear disaster:

Radiation is a form of energy emitted spontaneously by radioactive materials. Man made source of radiation are a) Used in medical science (Diagnostic Imaging, Radiotherapy), b) Nuclear power station, c) Industry (Mining, Food irradiation etc) and d) Nuclear fuel and nuclear weapons.

Radioactive particles

- a) Alpha particles: It is heavy and loses momentum rapidly and can travel for short distance. It cannot penetrate human skin. It is hazardous only when inhaled, ingested or injected.
- b) **Beta particles:** It travels further and can penetrate more. It can penetrate dermis. Causes radiation skin injury on prolong exposure and hazardous to internal organs only when inhaled, ingested or injected.
- c) Gamma ray & X ray: It can travel many meters in air and can easily penetrate human body causing organ damage. The effect can be attenuated by concrete or lead shield.
- d) **Neutrons:** This can travel far and can penetrate everything (except thick layer of concrete or water). It is highly damaging and it is present at early stage of nuclear detonation or accident.

Exposure occurs when all or part of the body is irradiated. Key factors of exposure are **duration**, **distance** and **shielding**. A person is contaminated when radioactive material is deposited on skin or clothing (external contamination) or into body (internal contamination). External Radiation contamination is in the form of dust or particulate matter and can be readily removed by decontamination. Radiation safety precautions are not needed for patients who have been exposed to radiation but not contaminated.

Radiation dose & limits:

- a) Chest X Ray :
- b) Annual effective dose limit For radiation worker
- c) Acute Radiation sickness
- d) LD 50/60 (Dose killing 50% of those exposed within 60 days)

20 micro sievert.20 millisievert (20000 micro sievert)

1 sievert and above above 4.5 sievert

Dose less than 1 sievert	Dose 1 sievert to 8 sievert	Dose more than 6 to 20 sievert	Dose more than 20 sievert
Usually Asymptomatic	Haemopoetic	Gastrointestinal	CNS / CVS Syndrome
Symptom mild or	syndrome	Syndrome	Almost immediate
absent Nausea,	Anorexia, nausea,	Early nausea, vomiting,	projectile vomiting,
vomiting in first 48 hrs.	vomiting, fatigue 1-4	diarrhoea, anorexia,	burning sensation of
Mildly depressed WBC	hrs after exposure	fatigue.	skin, explosive bloody
at 2-4 weeks. No fetal	Latent period 2 days	Latent period hours to	diarrhoea, collapse,
defect if less than	to 4 weeks.	1 week Severe GI	confusion, loss of
100 millisievert.	Bone marrow	symptoms (cramp,	consciousness. There
Counselling to pregnant	depression, leucopenia,	diarrhoea, haemorrhage,	may be lucid interval
woman needed if dose	low platelet count.	dehydration). Bone	(hours). Neurological
more than 100	3-4 sievert cause hair	marrow depression	and cardiological
millisievert.	loss at 2-3 weeks	LD 100 with 10 sievert	symptoms predominate.
	LD 50/60 with 4.5	exposure and death	Convulsion, coma,
	sievert exposure with	within 2 weeks.	shock Death within
	out treatment.		2-3 days.

Sign & Symptoms of ARS (Acute Radiation Sickness)

Management

- a) Stabilise airway, breathing, circulation.
- b) Assume all patients are contaminated unless proved otherwise.
- c) Make sure you and the area you work is protected from possible contamination (PPE).
- d) Do not handle object or shrapnel directly. Use tong or forceps and in lead lined container.
- e) Assess contamination using instrument and decontaminate. Removing patient's clothing can reduce external contamination by 90%.
- f) Symptomatic treatment for nausea, vomiting, erythema and replace fluid loss.
- g) Assess dose of radiation and duration (what? when? where? how long?)

- h) Use irradiated blood products.
- i) Seek expert advice early (Medical Physics, Nuclear Medicine).

Suggested protocol of actions are to be undertaken if any incident of accidental/ intentional radiation hazard occur in a community.

Radiation Incident

1. Risk Assessment

- a) Who are affected?- Numbers, Time, Place, Person, Age, Gender
- b) Set up incident control team
 - District Magistrate (incident commander)
 - Police
 - Radiation Expert
 - Laboratory support
 - Media
 - Hospital representatives
 - Any other as relevant

2. Implementation of public health actions

- a) Organise for treatment of affected
- b) Briefing of health care personnel regarding use of appropriate PPE
- c) Collect data from affected persons on
 - Site of exposure
 - Duration of exposure
 - Movements place of work, travel, persons in contact

3. Media messages (to include)

- a) What is radiation
- b) What is the current situation
- c) Who are affected
- d) What is the government doing to mitigate the situation
- e) What are the signs and symptoms of Acute Radiation Syndrome
- f) If the people felt ill where should they go for diagnosis and treatment

4. Screening of exposed

- a) Identify numbers exposed
- b) To decide which is the best way to undertake screening- radiation expert to advise
- c) How the results will be communicated

5. Long term effects

a) Public health specialist will organise analytical epidemiological studies

- b) Close monitoring for adverse health effects
- c) Dissemination of results
- d) Lesson learnt
- e) Structured Debrief

Sphere Handbook

This is a book on international guidelines on various rescue and rehabilitation works during and after disease. It provides standards regarding following aspects.

- Wash (Water supply, sanitation and hygiene promotion) : It includes standards regarding water supply, hygiene promotion, excreta disposal, vector control, solid waste management, drainage
- Food provision and nutrition
- Shelter and non-food items.
- Health actions

It includes guidelines and parameters on Health System, Communicable Diseases, vulnerability in Non-communicable Diseases, Child Health, Sexual Reproductive Health, Injury and Mental Health.

III. Consequences of Disasters

- a) Injury
- b) Shock
- c) Death
- d) Family separation
- e) Damage of properties
- f) Displacement
- g) Economic loss
- h) Loss of human resource
- i) Loss of infrastructure
- j) Loss of time
- k) Epidemic

IV. Disaster Management: Basic Components

1) Guideline for Control Room.

Role of Control Room is very essential in combating health effects of disasters. It not only collects information from disaster affected districts but also monitors the relief work (medical aid) as well as movement of health personnel, drugs and logistics. Control Room also analyses the data received from districts to identify outbreak and initiate necessary action. Guidelines are to be followed are,

- 1. Control Room to be situated at state and district head quarter.
- 2. Control Room should have
 - a) A board displaying map of affected districts.
 - b) Name and contact number of CMOH and deputy CHOH II of all districts (for State) and name and contact number of nodal officer of the affected blocks.
 - c) Phone number of important line departments like General Administration, Police, Disaster Management, Relief, Telephones, P.H.E. etc.
 - d) Phone number of Meteorological department, DVC and such other water reservoir bodies for early signal regarding heavy monsoon, water release etc.
 - e) Functioning communication links (Telephone, Fax, and Internet) with computers.

- 3. Mode of function :
 - a) With information from Meteorological Department and/ or DVC, Farakka and Teasta Barage Authority etc. order will be issued for functioning of Control Room.
 - b) Responsible senior officer of Public Health branch will be declared as Officer in charge of Control Room and his phone number will be made available to all concerned.
 - c) Officer in charge of the Control Room will prepare roster for control room. One health administrative officer, one dealing assistant and one data entry operator will be assigned duty in each shift.
 - d) Circular regarding Headquarter Control Room will be issued to CMOH of all districts particularly of disaster affected districts for reporting. All blocks particularly effected blocks are to be informed about District Control Room.
- 4. Members of Control Room will ensure the followings
 - a) Those assigned duty at Control Room should not take leave without prior intimation.
 - b) There should be charge hand over between staff of Control Room during shift change.
 - c) Information is to be collected from flood affected area. Information should include
 - Name of affected blocks
 - Number of affected GP
 - Number of villages affected with number of population.
 - Number of rescue camps with number of people sheltered
 - Number of medical teams working with breakup of medical officers and para medical staff.
 - Daily report of diseases, cases of accident, drowning, snakebite etc.
 - Daily report of disinfection work carried out by medical teams.
 - d) Display a map of the affected area at Control Room, highlighting the blocks affected, station of medical camps, existing health facility etc. The map has to be updated regularly.
 - e) If possible GIS mapping of flood affected area may be displayed.
 - f) Data of reported communicable diseases to be analyzed regularly and in case of any indication of outbreak IDSP will be informed.
 - g) Collect information regarding availability and movement of drugs and logistics in flood affected area as well as at DRS/CMS. In case there is need of drugs and logistics all relevant information has to be submitted to higher authority so that order can be issued.
 - h) Officer in charge of Control Room with other officers of Public Health should regularly, preferably during evening, sit with members of Control Room to take stock of the situation.
- 5. State Control Room will maintain a database of doctors, nursing staff and health assistants of non affected districts. On demand from disaster affected districts a roster will be prepared from the database and movement order will be issued by Health Directorate.
- 6. Before issuance of inter district movement order of medical teams it has to ensured that health officials of the district where the team will report are properly informed and has made necessary arrangement about their stay and movement.
- 7. If necessary DHS and DME will be consulted for availing help from teaching faculty of medical colleges particularly in investigating and managing outbreak / epidemic of communicable diseases as a fall out of natural disaster.

All these activities of Control Room is to be continued till the disaster situation is controlled and health emergencies managed.

2) Incident Command System:

It is a Management System that is on-scene, all hazards, flexible modular system, adaptable to any scale of disasters (natural / man-made). It was developed by USFS (United States Forest Services) in the 70's for managing a series of forest and urban fires. Incident Command System was introduced in India in 2003 (example: relief and rehabilitation at Tsunami effected area of Tamil Nadu in December 2004). This provides accurate information, strict accountability, planning, and cost effective operations and logistical support for any incident. ICS is emerging as the "common language" of disaster response internationally. In Indian context it is called **"Incident Response System"**.

Problems Identified in Pre-ICS period

- a) Too many people reporting to one supervisor
- b) Different emergency response organizational structures
- c) Lack of reliable incident information
- d) Inadequate and incompatible communications
- e) Lack of structure for coordinated planning between agencies
- f) Unclear lines of authority
- g) Terminology differences between agencies
- h) Unclear or unspecified incident objectives

Advantage of ICS

- a) Provides for a single management system for multi-jurisdictional incidents
- b) Modular Allows expansion and contraction depending on size and complexity of incident
- c) Used on any type or size of incident
- d) Structured to integrate any type of resource including police, military, technical experts, NGOs, and international resources
- e) Can be used to manage sudden onset disasters, long-term relief efforts, or non-emergency events

Basic concepts of Incident Command System are that it is a non-Permanent Organization. It is activated in response to an emergency. It is NOT a permanent organizational structure or secretariat. During an emergency, ICS qualified personnel leave "regular" positions to take part in ICS. The responsible official establishes policy, direction, parameters and delegates authority to the Incident Commander.

Major Organizational Functions of Incident Command System

INCIDENT RESPONSE SYSTEM ORGANIZATION CHART



Major Contributors To Incident Command Plan

- a) Incident Commander : Overall responsibility.
- b) Operations Section : Direct tactical actions.
- c) Planning Section : Collect and analyse data. Prepare action plan.
- d) Liaison Officer : Knows terms of agreements involving use and release of other agency's resources. Coordinates various agencies.
- e) Safety Officer: Considers physical condition of personnel, personal needs, and adequacy of transportation. Develops safety procedure and safety plan. Has authority to stop unsafe acts.

- f) Logistics Section: Provides support. This includes Finance, which looks after cost accounting and procurement.
- g) Finance/Administration Section: Cost accounting and Processing any claims, time records, and costs of individual resources which are factors in determining release.
- h) Types of Resources :
 - Single Resource: Single responder or machine unit and there is no single leader.
 - Task Force: Single leader under whom different teams of responders work.
 - Strike Team: Single leader under whom multiple responders of uniform nature of work.
- Resource unit may include technical specialists like Medical specialists, Epidemiologist, Meteorologist, Hazmat (Chemical agent) specialists, Environment impact specialists, Flood control specialists, Fuel & flammable specialists, Structural Engineer etc.
- j) Staging Area: Temporary location for resources awaiting assignments.

Incident Command System Organization is FLEXIBLE AND MODULAR. Incident need will determine the required organisation. Essential Steps In Incident Action Planning are based on 'management by Objective'. The steps are

- a) Understanding the situation
- b) Establish incident objectives and strategy
- c) Develop tactical direction and assignments
- d) Prepare the plan
- e) Implement the plan
- f) Evaluate the plan

Role of Incident Commander.

- a) First priority:
 - I. To assess people involved in incident.
 - II. Identify responders.
 - III. Identify other agencies which are to be involved.
- b) Know policy of government or organisation in relation to the incident.
- c) Establish incident objectives.
- d) Develop appropriate strategy.
- e) Execute with tactical directions and monitor.

Incident Command Post is to be established at suitable point, preferably central point in relation to communications. The Post should not be located in the midst of din and chaos created by incident. Incident Commander and 2nd level Officers should work from there. However Information and media officer should have office separated from Incident Command Post so that media demand does not obstruct IC effectiveness. Information and media officer will provide info display and handouts as required to combat the situation. He is also responsible to provide message to people at large. Usually Incident Commander remains in charge throughout the operation. But in some situations there may be transfer of Command, like

- a) When an incident becomes overwhelming for Incident Commander.
- b) More qualified and experienced senior officer arrives at the scene.
- c) The incident situation changes over time both territorial and type of agencies involved.
- d) When incident extends over time.

3) Hospital Disaster Plan

Purpose:

- 1) To provide policy for response to both internal and external disaster situations that may affect hospital staff, patients, visitors and the community.
- 2) Identify responsibilities of individuals and departments in the event of a disaster situation.
- 3) Identify Standard Operating Guidelines (SOG's) for emergency activities and responses.

Several types of hazards pose a threat to the hospital:

- a) Internal disasters: fire, explosions, and hazardous material spills or releases.
- b) Minor external disasters: incidents involving a small number of casualties.
- c) Major external disasters: incidents involving a large number of casualties.
- d) Disaster threats affecting the hospital or community (large or nearby fires, impending tornado, flooding, explosions, etc.).
- e) Disasters in other communities.

Hospital Disaster Management plan should address the followings :

Lines of Authority:

The following persons, in the order listed, may be incharge:

- 1) Administrator,
- 2) Director of Nursing,
- 3) Nursing Supervisor on duty at time of disaster,
- 4) Emergency Room Supervisor (EMO).

Communications:

- A. A Command Centre should be set up at the Security Desk to handle and coordinate all internal communications. When the disaster happens the person in charge may assign a nurse to the communications system in the E. R. This nurse will answer all radio calls from this station. At least one messenger has to be assigned to each such operator to deliver messages, obtain casualty count from triage, etc. The messenger, nurse and key persons on behalf of departmental Heads will be notified by hospital authority or person in charge for proper collection of information from wards, ER and Triage area.
- B. A "Visitor Control Centre" should be set up in the front lobby. Families of casualties will be instructed to wait there until notified of patient's condition. Normal visiting hours will be suspended during the disaster situation. A hospital staff member will stay with the family members. A list of the visitor's names in association with the patient they are inquiring about should be kept. Volunteers may be needed to escort visitors within the facility.
- C. Telephone lines should be made available for outgoing and incoming calls. One line should be designated as the open line to the external Command Centre. The person in charge will designate assigned staff to monitor the phones.
- D. If possible a communication centre for Press may be arranged within hospital premises for percolating information to public.

Supplies and Equipment :

Extra supplies should be obtained from purchasing personnel through messengers. Outside supplies will be ordered by the Purchasing Director and brought into the hospital.

Valuables and Clothing :

Large paper or plastic bags should be made available in the treatment areas and the storeroom for patient's clothing and valuables.

Morgue Facilities:

Patients pronounced Dead on Arrival to be tagged with a Disaster Tag stating "do not remove personal effects". The top sheet from the tag will be taken to the Command Centre in Emergency Department for casualty list purposes. Bodies may be stored in the hallway / space and hospital personnel will remain with bodies. After bodies have been identified, the information will be filed on the Disaster Tag and Medical Records notified as to the identification of the patient. A complete record of all bodies must be maintained along with the name of the agency removing them, e.g., police, fire department, undertaker, etc. Be sure that appropriate paperwork is filled out.

Responsibilities of Individuals and Departments:

Administrator: In a major disaster he will do the following functions:

- a) Check with local authorities to verify the disaster and obtain additional information.
- b) Authorize announcement of disaster to hospital personnel.
- c) Ask for help from local police and voluntary organizations as deemed necessary.
- d) Stay in the area of administrative offices to be available to assist, as requested, by disaster coordinator.

Director of Nursing: In a major disaster do the Administrator's functions, if he is absent. Director of Nursing is responsible for notifying all department heads or alternates. Will be responsible to see that families of victims are notified as soon as possible. These calls may be made by the physician who treats the victim.

Nursing Supervisor: Is responsible for determining the extent of the disaster, whether it is a "major" or a "minor" disaster. If it is a major disaster, then the Administrator and Director of Nursing will be notified (if not present at time of disaster). The Director of Nursing would then notify all department heads. Will attempt to find adequate numbers of nursing personnel and keep a list of those notified.

Admitting Office: Assign responsible person as soon as possible to manage the situation. Not to accept routine non-emergency admissions.

Duties of Medical Imaging Personnel: Department Head will :

- a) Call any or all personnel needed.
- b) Arrange for extra supplies to be brought in if needed.
- c) Coordinate flow of work and delegation of work areas.
- d) Other Technologists will perform all x-ray exams as needed and assigned and perform all clerical duties.

Laboratory: Call personnel from nearby hospitals and clinics as necessary. Have arrangements made to obtain additional blood, equipment and supplies from area agencies.

Pharmacy: Have list of drug suppliers that can provide emergency supplies quickly. Keep minimum supply of emergency drugs on hand at all times. Pharmacy should remain open and have a staff to deliver needed medicines to needed area.

General measures:

- a) Arrange space for Triage Area near Emergency to scrutiny patients most in need of emergency treatment.
- b) All hallways or traffic areas are to be clear of cleaning carts, equipment etc.
- c) To set up extra beds in hospital if needed, as well as transporting storeroom supplies and bringing in extra supplies from other areas.
- d) Find extra space to provide patients like Canteen space, Seminar room etc.
- e) All doors should be locked immediately except employee entrance, Emergency Department door, and front lobby.
- f) Clean receiving area, and clean rooms between cases in treatment areas.
- g) If possible discharge and move hospital patients to create more room for casualties.
- h) In case of Internal Disaster prepare for evacuation of patients to safer area.
- i) Intensive Care Unit After notification of disaster, the ICU doctor will evaluate patients in the Intensive Care Unit for possible discharge. Use established discharge criteria as a guide. Transfer patients out if indicated and prepare to admit more critically ill patients.

Example:

Disaster Management Plan of AIIMS Hospital, New Delhi.

Disaster Committee : The following officers of AIIMS hospital form the Disaster Committee under the chairmanship, Hospital Management Board.

- a) Prof & Head, Deptt. of Orthopaedics
- b) Prof. In charge, Accident & Emergency Services
- c) Prof. & Head, Deptt. of Surgery
- d)Prof. & Head, Deptt. of Medicine
- e) Prof.& Head, Deptt. of Forensic Medicine
- f) Prof. & Head, Deptt. of Neuro Surgery
- g) Prof.& Head, Deptt. of Anaesthesiology
- h) Prof. & Head, Deptt. of Radio-diagnosis
- i) The Nursing Superintendent
- j) Officer In charge of all Supportive Hospital Services
- k) Prof.& Head, Deptt. of Gastroenterology
- I) Secretary, Hospital Management Board

Types of Disasters Expected

- a) Vehicular accidents and aircraft emergencies
- b) Bullet and Blast injuries
- c) Collapse of a building
- d) Fire
- e) Food poisoning Gastro Enteritis
- f) Any other like drowning etc.

HQ for Disaster plan coordination

a) Control Room: Room No 12, Tel: 26862663,26593308 round the clock

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b) MS Office, Tel: 26594700, 26861389

Information and Communication: Receiving information at Radio Telephone Desk which is already established. One Hot line from Police HQ to the Control Room. Details to be ascertained on the Hot lines are

- a) Time and place of occurrence
- b) Nature of accident
- c) Approximate number of causalities
- d) Source of information

Activating the Plan:

On receipt of information from authentic source the Duty Officer will activate the plan and inform the MS, Chairman, HMB and Security Officer

Reception Centre:

- a) For moderate load : The present Casualty OPD will function as the reception area
- b) For heavy load : Main hall of ground floor OPD will be converted into reception area
- c) Police and Security personnel of AIIMS will act as Traffic Controllers directing the patient and relatives to the respective reception centres

First Aid and Sorting: Triage

- a) For Moderate Load : Existing casualty MedicalTeam will function for First aid and sorting
- b) For heavy Load : The centre will manned by teams each consisting of :
 - One General Surgeon
 - One Orthopaedic Surgeon
 - One Physician
 - One Anaesthetist
 - Two Sisters
 - Two Nursing Orderlies
 - One sweeper
 - A team of two stretcher bearers each having one stretcher.
- c) The responsibilities of First Aid Centre will be quick sorting of causalities into
 - Priority one : Needing immediate resuscitation
 - Priority two : Immediate surgery
 - Priority Three : Needing first-aid and possible surgery
 - Priority Four : Needing only first-aid

d) Action :

- Priority one will be attended in Casualty and if need arises will be sent to ICU
- Priority two will be transferred immediately to casualty OT and MOT
- Priority three will be given first-aid and admitted if bed is available or transferred to other hospital
- Priority four will be given First Aid and discharged home.
- e) Brought in dead or those who may die while receiving/resuscitation will be segregated. Temporary morgue for keeping dead bodies will be created in the long varandah opposite mechanical laundry.

f) Necessary identification and handing over of bodies to the relative after medico legal clearance will be done in this area. This will function under care of the department of Forensic Medicine.

Additional Bed Space :

In addition to the area marked on first floor, extra bed space will be created as follows:

- Utilisation all pre-operative beds.
- Any vacant beds will be requisitioned by the MS for this purpose
- By discharging following categories of patients, a) Convalescing patients needing only nursing care, b) Elective surgical cases, c)Patients who can have domiciliary care or OPD advise, d) Ward side rooms and Seminar rooms of the wards may have to be used temporarily

Drugs and Equipment:

The Medical and Surgical Stores Officer will be called at once to open the store. As an immediate measure the buffer stock earmarked in casualty will be utilised. All essential drugs will be stocked in the medical stores and issued on orders of MS. Dressing material and items of surgical stores are similarly kept in reserve. A dozen emergency trays containing life saving drugs will be kept ready in medical stores. For first few hours and for immediate use the drugs will be requisitioned from emergency stock lying with Sister I/C of Casualty. Approximately 400 bottles of Crystalloids are kept available.

Emergency Blood Bank :

Efforts shall be made for blood of all the available groups to the stocked in plenty. Volunteers and Voluntary Organisation will be approached to donate as much blood as possible.

Staff :

- I. Medical Staff : In addition to members of regular clinical units the faculty members of para and preclinical discipline will be asked to render help to assist the clinical staff in managing the causalities. The duty roster of regular consultants and stand by doctors is to be made available in control room.
- ii.Nursing Staff : A pool of nursing staff will be created by the Nursing Supdt. so that nursing staff is available at short notice. This pool should be out of nurses staying in the hostel for operational reasons.
- iii. Volunteers. Volunteers will be invited by the coordinated efforts of Faculty I/C Hosp Admn, if necessary.

Documentation Centres :

- I. For small load of casualty; documentation shall be done at the casualty OPD itself
- ii. For large load of casualty; it is to be established in ground floor OPD at the central registration office of OPD.
- iii. The staff working at registration counter and nursing staff will be utilised for documentation and identified volunteers may be used for this purpose.

Hospital Security:

Security of staff, patients and hospital building and equipment being of paramount importance, during such disasters, the security officer has been requested to tune up and organise the security arrangements for this purpose.

Food Service:

Supply of nourishment to the patients and emergency duty staff will start immediately by the staff of the dietary services under direct supervision of Head of the Department of Dietetics or Dietician-in-charge of Kitchen. Most of the patient for first 24-48 hrs will be using only liquid or semi solids. By then efforts can made supply of proper meals.

Information Services:

Faculty of Hospital Administration will function as information officer and all information to press, radio and other media, individuals, organisations, government or otherwise will be issued by him. He will get prior clearance from competent authorities before issue of such information.

Engineering and Maintenance Service:

The engineers will make sure that water and electricity is made available without interruption. All the standby electric power generators will be regularly checked, inspected and maintained in excellent serviceable condition.

Discharge Procedure:

After appropriate treatment the casualties fit to bed is charged shall be discharged to go home or to other hospital for convalescence. For all cases discharged the destination will be noted by the hospitals and police informed.

Success of Plan:

Disaster is an emergency situation. Timely help of every individual is needed to make this plan a success to reduce the Mortality and Morbidity. In such state of affairs the individual and personnel consideration take low priority in the face of duty to the profession for sake of amelioration of human suffering.

V. STANDARD OPERATIVE GUIDILINES FOR MEDICAL OFFICERS TO TREAT COMMON HEALTH EMERGENCIES ENCOUNTERED DURING FLOOD.

During flood a large number of people take shelter at school/make-shift camps on road side or dam. In some cases villages remain marooned without any communication. Major challenges before health providers is to make health services accessible to those displaced or marooned people and to make drug and logistics available to treat common health emergencies and related communicable diseases in constrained situation. The following operative guideline is intended to help medical officers to treat such health emergencies in such constrained situation.

1. Management of Drowning

Drowning both in deep and shallow water leads to obstruction of airway by either aspiration of fluid or by laryngeal spasm. This leads to ineffective oxygenation to the vital organs. If brain tissue suffers from such condition for more than 5 minutes, brain death occurs. Salient features of drowning patients are :

- a) semi-consciousness/unconsciousness
- b) cyanosis
- c) pink frothy sputum
- d) hypothermia
- e) cardiac arrest.

Treatment:

After the drowning patient is rescued to dry place, **cardio pulmonary resuscitation (CPR)** is to be started.

a) The victim should be flat on his back and his mouth should be checked for debris.



b) If the victim is unconscious, open airway, lift neck, and tilt head back.



c) If victim is not breathing, begin artificial breathing with four quick full breaths.



d) Check for carotid pulse.



e) If pulse is absent, begin artificial circulation by depressing sternum.



f) Artificial mouth breathing



Do not attempt to drain water from victim's lungs. Only sub diaphragmatic pressure could be advocated if any foreign body is suspected inside respiratory tract. Cover with blanket to prevent hypothermia. If patient is brought to health centre then treat with moist oxygen inhalation, nasogastric intubation to remove swallowed water; antibiotic and inj. Lasix to treat pulmonary oedema; I.V. sodium bi-carbonate to treat metabolic acidosis.

If no recovery, refer patient to higher centre.

2. Management of snake bite:

In India we have two broad types of poisonous snakes: (a) Elapids (Cobra, Krait) bite which causes neurotoxicity, (b) Viperies (Viper) bite of which causes haemolysis. There are some mixed Venom species and most sea snakes are myotonic.

In West Bengal, we usually find six poisonous snakes. Among them five are neurotoxic :

1) Monocled Cobra (Keute), 2) Spectacled Cobra (Gokhro), 3) King Cobra (Sankhachur), 4) Common Krait (Kalach) and 5) Branded Krait (Sankhamuti), 6) Russell's Viper (Chandrabora) is haematatoxic.

How to know that the patient is bitten by poisonous snake?

- Local pain or burning pain with progressive oedema indicate bite by neurotoxic snake.Local pain, oedema, oozing from bite wound and even petechial haemorrhage indicates bite by haematotoxic snake.
- ii) Systemic -
 - a) Descending paralysis with Ptosis, diplopia, palsy of pharynx, slurring of speech, difficulty in swallowing, saliva develops in case of bite by neurotoxic snake. Ultimately cyanosis, respiratory paralysis, coma appear.
 - b) Gum bleeding, haematuria, mucosal bleeding, haematemesis, shock in case of bite by haematotoxic snake.

Treatment:

- 1. Rest to the limb with snake bite on splint with loose bandage. No tight bandage is to be applied.
- 2. Do not interfere with bite wound (no washing or cleaning).
- 3. Administer Inj. T. Toxoid.
- 4. Observe every case at least for 24 hours and reassure the patient.
- 5. See the signs of poisoning. To test haematotoxicity, collect a few ml of venous blood in a dry, clean glass test tube and keep for 20 minutes. If there is no clotting then it is an indication of haematotoxicity. This test is called 20 WBCT.
- 6. Administer AVS if there is sign of poisoning (local or systemic). Start AVS (Anti Venom Serum) infusion (10 vial) with Normal Saline at a rate of 15 20 drops/min which may be increased to complete infusion by 1 hour. Dose is same for both adult and child. (Keep adrenaline and hydrocortisone ready for any reaction to AVS).
- Injection Atropine (IV) and Neostigmine (IM) are to be given if there is sign of descending paralysis (neurotoxicity). If there is no improvement within 1 hour repeat Atropine and Neostigmine and administer 2nd dose of AVS (10 vials).
- 8. In case of sign of hematotoxicity (coagulation failure) Start AVS infusion (10 vial) with Normal Saline at a rate of 15-20 drops/min which may be increased to complete infusion by 1 hour. Repeat 20 WBCT after 6 hours. If still there is no clotting then 2nd dose of AVS (10 vials) is to be administered. If necessary treat for hypotension.
- 9. In some cases 30 vials or more may be needed depending on signs of improvement.
- 10. Refer patient to higher centre, if there is deterioration, for haemodialysis or ventilator support.
- 11. In Kalach bite (common krait), bite mark usually not seen and patient usually complaints of pain abdomen, diarrhoea etc. But Kalach is a very poisonous snake. Take proper history and treat with adequate AVS.

3. Management of Common injuries :

During flood patients may have injuries due to collapse of house by force of water. These are mostly blunt injuries resulting in fracture or head injury.

Remove injured patient to a safe place.

- a) Remove clothing and have rapid survey of whole body.
- b) Ensure air way and turn neck to lateral side.
- c) Check breathing.
- d) Check bleeding; if present, control bleeding by compression bandage or application of tourniquet.
- e) Splint the injured limb.
- f) Administer Inj. T. Toxoid and analgesic. Avoid sedation before proper diagnosis.
- g) Infuse IV fluid to overcome blood loss. If shock is present, it should be corrected promptly.
- h) Refer patient to higher centre in case of serious injury.

4. Management of diarrhoea :

Diarrhoea is common in flood affected population mainly due to non availability of safe drinking water, absence of hygiene and sanitation, crowding of people in school building or makeshift camps used as shelters. Providing safe drinking water and proper sanitation should be given top priority and help of PHE and other departments should be availed of. However, treatment of





AMRI FIRE

MUMBAI BLAST



NAMNI ASSAM FLOOD



BHOPAL GAS TRAGEDY



LADAKH MUD FLOOD



KEDARNATH





IAF SUPER HERCULES CRASHED NEAR GWALIOR



SMOG IN BEIJING



AFTERMATH OF TSUNAMI



9/11 IN NEW YORK



CHERNOBYL DISASTER



INS SINDHURAKSHYAK



AFTER EXPLOSION



BULLET TRAIN



AFTER COLLAPSE





MH 370 BOEING 777

diarrhoea in flood situation becomes challenging for medical personnel and every effort should be made with the resources available to treat cases and prevent death. Treatment of diarrhoea becomes more challenging in case of children.

Principles of management of diarrhoea :

- (a) Replacement of fluid lost through stool and vomitus.
- (b) Continued feeding: Feeding should be started as soon as dehydration is corrected. Breast feeding should be continued in presence of dehydration.
- (c) Rational use of drugs. Drugs are required only in indicated cases.

In case of dehydration :

- 1. Examine the patient and assess dehydration. The child is categorized as "**no dehydration**", "some dehydration" or "severe dehydration".
- If no dehydration is present, then give 50-100 ml of ORS after each loose stool for children less than 2 years. For older children 100-200 ml ORS after each stool (1cup equals 200 ml). Breast feed or normal feed to continue, Zinc supplementation to be given.
 [Practically demonstrate preparation of ORS and ensure that family members understand.]
- 3. In case of moderate dehydration treat the child under observation (either at Medical Camp or PHC). During first 4 hours give ORS 75 ml X body weight in kg or

Age	<4 months	4-11 months	1-2 years	2-4 years	Above 5 years In
In ml	200-400	400-600	600-800	800-1200	1200-2200

- Use low osmolar ORS.
- If vomiting occurs, wait for 5-10 minutes and then resume ORS therapy more slowly at 3-4 minutes interval.
- Continue breast feeding.

In case of severe diarrhoea treatment is to be done preferably at health centre. **IV fluid (Ringer's lactate or normal saline)** has to be administered. Volume of IV fluid is to be infused :

• Less than 1 year age- a) 30ml/kg in 1 hour

b) 70ml/kg in next 5 hours.

• Age 1 year or more a) 30ml/kg in ½ hour

b) 70ml/kg in 2 ½ hours.

Important to note :

- a) Patients with severe/moderate diarrhoea should be re-examined after 2 hours. Look whether urine passed.
- b) If dehydration not corrected, repeat ORS/IV fluid regime.
- c) Change plan of treatment according to dehydration.
- d) Look for signs of over hydration and treat accordingly.
- e) If fluid cannot be administered through IV route, give ORS through nasogastric tube.
- f) Patient should continue normal feed (available food during flood)
- g) Anti-microbials to be used only in case of cholera, dysentery, amoebiasis and giardiasis.

- h) Suspect cholera in a child above 5 years of age or adult if he is having severe watery diarrhoea with associated vomiting and a disproportionately severe dehydration. Any case of watery diarrhoea from a declared zone of epidemic of cholera should be taken as cholera. Stool sample may be collected and sent to lab in Cary Blair medium.
- i) Bacillary dysentery: Anti-microbials should be started along with other modalities of treatment.

Most common cause of severe diarrhoea outbreak in food affected population is cholera. Proper hand washing can prevent diarrhoea. Make everyone aware about hand washing before preparing food, serving food or taking food and after defecation. Aware people to add halogen tablets or bleaching solution to drinking water before use.

Specific anti-microbials for treatment of cholera

- (I) **Tetracycline-** 12.5mg/kg body weight/dose, 6 hourly for 3 days (should not be given in children below 7 years of age, because of chance of teeth staining).
- (ii) Trimethoprim (TMP) Sulfamethoxazole (SMX)-TMP @ 5mg/kg body weight/dose, 12 hourly, for 3 days.
- (iii) Furazolidine- 12.5mg/kg body weight/dose, 6 hourly for 3 days.
- (iv) Chloramphenicol- 20mg/kg body weight/dose, 6 hourly for 3 days.
- (v) Erythromycin- 12.5mg/kg body weight/dose 6 hourly for 3 days.

Specific antimicrobials for treatment of dysentery

- (I) In most areas the drug of first choice is Nalidixic acid. Dose 55mg/kg/day in 4 divided doses.
- (ii) Fluroquinolones like Norfloxacin, Ciprofloxacin are very effective. (But their use in children has not yet been approved due to risk of arthropathy. However they have been widely used without any such obvious side effect).

Ciprofloxacin- 20-30mg/kg/day in 2 divided doses for 5 days.

Norfloxacin- 10-15mg/kg/day in 2 divided doses for 5 days.

- (iii) **Third generation Cephalosporins** are useful, i.e., Oral Cefixime 10mg/kg/day in 2 divided doses. usually the drug treatment is given for 5 days.
- (iv) Oral Azithromycin- 12mg/kg once daily on 1st day followed by 6 mg/kg once daily for 4 days.

Specific anti-microbials for treatment of amoebiasis and giardiasis.

Amoebiasis :

• Metronidazole : 10mg/kg/dose 3 times a day for 5 days.

• Tinidazole can also be given as a single dose (50mg/kg orally) in two divided doses. Giardiasis:

• Metronidazole : 5mg/kg/dose 3 times a day for 5 days.

5. Management of other communicable diseases :

Communicable diseases, especially water borne diseases, are common in population displaced due to flood. In some cases where live stocks are kept in same shelter as people, cases of leptospirosis may occur.

(1) Enteric Fever (Typhoid Fever):

High fever of more than I week with variable gastro intestinal symptoms. Diagnosis can be done at field by **"typhi dot"** kit. Treatment can be done with **Cifrofloxacin** and **antipyretic**. Should be referred to higher centre for continued fever. Advice to be given about hygienic disposal of faces and safe drinking water.

(2) Viral Hepatitis :

History of mild fever with pain in right hypochondria followed by jaundice. Treatment is **absolute rest** and **plenty of glucose**. Tab Domperidone can be given to control nausea. In case of altered sensorium, patient to be referred to higher centre. Advice to be given about disposal of faces and safe drinking water.

(3) Scabies :

Highly communicable disease due to mite and characterised by itching and secondary infection. Treatment can be done by application of **Benzyl benzoate** from head to foot except face and scalp. For pruritus, tab. Cetirizin, Loratidine etc. can be prescribed. Ensure that all family members/persons in close contact are treated with Benzyl benzoate.

6. Acute Respiratory infection (ARI):

a) Fever with Cough and Cold (Acute Nasopharyngitis) :

- i. No need of random antibiotics (Majority viral).
- ii. Commercial cough formula usually not needed. Cough mostly self-limiting.
- iii. Cough syrup may be needed :- a) with exhausting cough associated with severe vomiting : simple cough syrup (coedin-free) – e.g. dextromethorphan may be used.
- iv. In cough with bronchospasm : salbutamol.
- v. Nose block : Clear by N. Saline drop + moist wick. No medicated nasal drop usually needed.
- vi. Paracetamol for fever.
- vii. Normal feeding : Extra fluid.
- viii. Look for signs of pneumonia.
- b) Children aged 2 months to 5 years with cough and difficult breathing. (Clinical Classification to facilitate treatment decision).

Clinical Category	Essential Features	Treatment Strategy
Very severe pneumonia	Central cyanosis, Lethargy, unconsciousness, Convulsion Not able to drink/feed	In patient care. Referral to health centre
Severe pneumonia	Lower chest indrawing or nasal flaring No sign of above	In Patient care. Referral to health Centre
Pneumonia	Fast breathing:AgeResp. Rate/min2mo - 12mo.5012mo - 5yrs.40No sign of severe of very severe pneumonia.	Home care. Oral Co-trimoxazole, or Amoxycillin or Ampicillin. for 7 days.
No pneumonia	Only cough and cold with or without fever	Paracetamol for fever. No antibiotic.

N.B. : Children below 2 months with fast breathing, chest in drawing etc. should be referred to health centre.

Clinical Condition	Features	Treatment Strategy
Common cold	Fever, cough, nose-block	Discussed
Acute Otitis Media	Pus from the ear for<2wk, sudden persistent Ear pain, or redness & decreased mobility of ear drum on otoscopy.	Cotrimoxazole, Ampicillin or Amoxycillin for 5 days
Streptococcal pharyngitis	Tender, enlarged cervical lymph nodes plus white pharyngeal exudate. Absence of signs of Nasopharyngitis.	Ampicillin/Amoxycillin for 10 days.

ACUTE UPPER RESPIRATORY INFECTIONS

DOSAGE OF COTRIMOXAZOLE & AMOXYCILLIN BY AGE OR WEIGHT CATEGORIES:

AGE OR WEIGHT	CORTIMO- XAZOLE Adult Tablet Single Strength (80mg TMP+400mg SM)	CORTIMO- XAZOLE Paediatric Tablet (20mg TMP+100mg SM)	CORTIMO- XAZOLE Syrup (40mg TMP+200mg SM per 5ml)	AMOXY- CILLIN Tablet 250 mg	AMOXY- CILLIN Syrup 125 mg in 5 m
2 months up to 12 months (6 – 9 kg)	1/2	2	5 ml (1 TSF)	1/2	5 ml (1 TSF)
12 months up to 5 years (10 – 19 kg)	1	3	7.5 ml (1½ TSF)	1	10 ml (2 TSF)

* TSF : Tea Spoon Full

- 7. Management of burn :
- a) Non pharmacological :
 - i. IV fluid replacement.
 - ii. Exposure (face and eyes) or dressing (trunk and limbs) with Silver sulphadiazine ointment, paraffin gauze etc.
- b) Pharmacological :
 - Inj. Cefataxim, Inj. Diazepam, Inj. Ranitidine, Inj. Pentazocin etc.
- c) Management of systemic complication.
- d) Management of non-specific complication.
- e) Referral to Burn Unit.

VI. Annexure - a)

Some important guidelines on water disinfection :

- 1. Disinfection of household drinking water :
 - a) Preparation of **Chlorine solution**: Add 3 (three) table spoon of bleaching powder in 1 liter of water. Stir the solution and discard the sediment. This chlorine solution in ready for household use and it can be kept in covered colored container for one month.
 - b) Add 3 drops of chlorine solution to 1 liter of water for drinking purpose or add 1 halogen tablet. The water can be used for drinking after half hour.

2. Disinfection of tube well and well :

Routine disinfection

- a) Disinfection is usually not done during winter months (November to February).
- b) During pre monsoon months disinfection to be done once a month (March to June/July).
- c) Disinfection to be done twice a month during monsoon season (June/July to September/ October).

Suspected diarrhea outbreak situation

- a) Disinfection is to be done once every week. Number of diarrhea cases are to be monitored (whether increasing or decreasing).
- b) If there is increase in number of cases then disinfection to be done twice every week till number of new case is controlled.
- c) In spite of disinfection being done twice a week, if there is report of new cases, then daily disinfection may need to be done.

3. Method of disinfection of tube well and well :

- a) Roughly one match box (normal size) of **bleaching powder** (10 12 gram) is needed to disinfect 1 tube well and 3 match box (33 gms) for well of standard diameter of 2 meter.
- b) Make paste of bleaching powder with water, stir it and then allow the sediment to settle. Supernatant solution is to be put in a bucket. Dip the bucket in the well water and strip up and down several times.
- c) In case of tube well handle and seat valve to be removed by PHE/PANCHAYET. Supernatant solution as prepared to be poured into the pipe.
- d) There will be smell of chlorine in water if the well/tube well water has been adequately chlorinated.
- e) Water of well or tube well to be consumed 6 hours after disinfection. So preferably disinfection may be done in the evening when it is not used by the dwellers. However if disinfection can not be done in the evening then it has to be done during daytime.

4. Disinfection of ponds and water bodies used for drinking and cook water and mouth washing.

Department of Health & Family Welfare Government of West Bengal

Daily Report of Flood situation.

Name of District. Date: From Date:

Status & Medical Team

SL	block	GP	Affec-ted	No of	People in	No of	M	C	Nur	se	PM	w
No	affec- ted	affec- ted	people	rescue centre	res. centre	medical team	Existing in affected block	Detaile d	Existing in affected block	Detaile d	Existing in affected block	Detaile d

Distribution of cases

Block	Diarrhoea				Fever/ Cough				Snake bite			
	Day	Cumu lative	Death	Death Cumul ative	Day	Cumu lative	Death	Death Cumu- lative	Day	Cumu lative	Death	Death Cumu lative

Distribution of cases

Block		Drov	wning		Accident				
	Day Cumu Death		Death	Death	Day	Day Cumu		Death	
		lative		Cumu		lative		Cumu	
				lative				lative	

Disinfection activity

Block	Tube Well		Well			House	Pond		
	Day	Cumulative	Day	Cumulative	Day	Cumulative	Day	Cumulative	

Logistics distribution & stock position

Block		Tab Ha	alozn		ORS			AVS				Bleaching powder (bags)				
вюск	Distrib	ution	Sto	ock	Distrib	ution	Ste	ock	Distrib	ution	Ste	ock	Distrib	ution	Sto	ock
	Day	Cumu	Block	DRS	Day	Cumu		DRS	Day	Cumu	Block	DRS	Day	Cumu	Block	DRS
		lative				lative				lative				lative		

NB: In case of death name and particulars of the person to be provided.

LIST OF ESSENTIAL MEDICINES, EQUIPMENTS & CONSUMABLES TO COMBAT HEALTH EMERGENCIES DURING NATURAL DISASTER

SI.No.	Items	Sl. No.	Items		
01	Bleaching Powder	02	Tab. Halogen		
03	Inj. AVS	04	Normal Saline		
05	Ringer lactate	06	Inj. T. Toxoid		
07	ORS low osmolar	08	Tab. Paracetamol		
09	Tab. Ibuprofen	10	Paracetamol syrup		
11	Tab. Norfloxacin	12	Tab. Azithromycin		
13	Tab. Antacid	14	Tab. Cotrimoxazole		
15	Tab. Antihistaminic	16	Cotrimoxazol syrup		
17	Tab Ciprofloxacin	18	Tab Metronidazole		
19	Gentamycin Eye/Ear drop	20	Metronidazole syrup		
21	Vitamin A Oil	22	B.B. Lotion		
23	Antibiotic ointment	24	Gauge		
25	Cotton	26	Bandage		
27	Plaster of Paris	28	Syringe needle		
29	Transfusion Set	30	Scalp Vein Set		
31	Inj. Ranitidine	32	Povidone iodine lotion		
33	Tab Isosorbid mononitrate	34	2% Lignocaine		
35	Inj. Frusemide	36	Inj. Adrenalin		
37	Inj. Pralidoxime (PAM)	38	Inj. Pentazocin		
39	Inj. Hydrocortisone (100mg)	40	Inj. Neostagmine		
41	Inj. Diazepam	42	Inj. Ondensetron (4 mg)		
43	Inj. Aminophylline (250 mg)	44	Recuscitation Kit		

Annexure - d)



Aila near peak intensity on May 25th, 2009

Case Study 1: Cyclone Aila

Cyclone Aila (IMD designation: **BOB 02**, JTWCdesignation: **02B**, also known as **Severe Cyclonic Storm Aila**) was the second tropical cyclone of the 2009 North Indian Ocean cyclone season. A relatively strong tropical cyclone, it caused extensive damage in India and Bangladesh with highest wind sustained three minutes sustained (110 km / hr) and one minute sustained (120 km / hr).

As of 27 May 2009, 330 people have been killed by Aila, and at least 8,208 more are missing, while about 1 million people are homeless. Health officials in Bangladesh confirmed a deadly outbreak of diarrhea on 29 May, with more than 7,000 people being infected and four dying. In Bangladesh, an estimated 20 million people were at risk of post-disaster diseases due to Aila. Damage totaled \$552.6 million (2009 USD).

Impact _

In India, at least 149 people were killed, two by electrocution, and hundreds others were left homeless as torrential rains led to flooding. High winds uprooted numerous trees, blocking roads throughout the region. More than 15,000 people in eight villages were reportedly isolated from relief crews by severe flooding. At least 18 of the 45 fatalities in West Bengal were in Kolkata, the region where Aila made landfall. All transit systems in the city of Kolkata were halted and daily life was at a standstill due to the storm. The areas and districts affected by the cyclone in West Bengal include East Midnapore, Howrah, Hooghly, Burdwan, South 24 Parganas and Kolkata. In the West Bengal state, more than 1,00,000 people were left homeless as a result of Aila. At least 100 river embankments were breached by storm surge produced by the cyclone. Throughout the country, at least 1,50,000 people were left homeless. In northern areas of the state, heavy rains triggered numerous landslides in Darjeeling that killed 22 people and left 6 others missing. At least 500 homes were also damaged in the area. At least 50,000 hectares of agricultural land was lost during the storm, costing an estimated Rs. 125 crore (US\$26.3 million). Throughout the state, an estimated 40,000 homes were destroyed and 1,32,000 others were damaged. At least 3,50,000 people affected by Aila. Later reports indicated that upwards of 2.3 million were displaced by the storm as 1,75,000 homes were destroyed and 2,70,000 were damaged.

The outer bands of the storm also produced torrential rains and high winds in eastern portions of Odisha state, with the heaviest rainfall being recorded at Paradip at 260 mm (10 in) and winds peaked at 90 km/h (56 mph). Numerous trees were uprooted and power lines were downed, causing widespread power outages. High waves produced by the storm inundated coastal villages, forcing residents to evacuate to safer areas. Roads were also blocked by flood waters or debris, hampering relief efforts. An estimated 1,000 acres (4.0 km²) of Odisha crop land were lost due to Aila.

The remnants of Aila produced gusty winds and heavy rains in the eastern Indian state of Meghalaya between 25 and 26 of May. Rainfall amounts peaked at 213.4 mm (8.40 in) and winds reached 60 km/h (37 mph). Several homes were damaged in the area and power was cut due to fallen trees and power lines. No injuries were reported in the state. Several streets were flooded and some homes were reported to have standing water.

In Bangladesh: Torrential rains from Aila resulted in at least 179 fatalities from flooding. More than 400,000 people were reportedly isolated by severe flooding in coastal regions of Bangladesh. Numerous villages were either completely submerged in floodwaters or destroyed. Dozens of people are reportedly missing throughout the country. A storm surge of 3 m (10 ft) impacted western regions of Bangladesh, submerging numerous villages. Several rivers broke through embankments, causing widespread inland flooding. In one region alone, more than 50,000 people were left homeless. Despite warnings to remain at port, numerous fishing vessels sailed into the storm. Port officials stated that more than 500 fishermen had gone missing since the storm made landfall. In Patuakhali, a dam broke and submerged five villages. Numerous homes were destroyed by the subsequent flooding and tens of thousands of people were left stranded in the villages. In Chandpur, two pontoons sank while docked in port. At least 800 people were injured by the storm and 2.6 million were affected. Unofficial reports indicate that the death toll in the country has reached 121. An estimated 58,950 animals were killed by the storm with up to 50,000 deer missing. On the island of Nizum Dwip, nearly all structures were severely damaged or destroyed, leaving roughly 20,000 people homeless. Throughout the country, Aila left an estimated 500,000 people homeless. Later press reports stated that more than 6,600 people were injured by the storm and 3.3 million were affected. Damages to water embankments throughout the country was estimated at Tk. 1 billion (US\$14.4 million).

Environmental impact

The Sunderbans, a region which houses 265 of the endangered Bengal Tigers, was inundated with 6.1 m (20 ft) of water. Dozens of the tigers are feared to have drowned in Aila's storm surge along with deer and crocodiles. As of 27 May 2009, one tiger has been found alive; it was found in a waterlogged cowshed following the cyclone's landfall. Additionally the forest remains under an estimated 2.4 m (7.9 ft) of water. On 27 May, conservationists have begun a search for the tigers throughout the forest. The search teams were supplied with fresh drinking water for the tigers as their natural water source was inundated with salt water from Aila's storm surge.

Aftermath.

India

State Government in co-operation with the central counterparts took up the rescue and the rehabilitation program. Army was deployed to the affected areas. The next day, the army used helicopters to provide food to the affected population. About 2,500 troops were deployed to West Bengal on 26 May 2009. Several naval relief teams were deployed to the Sunderbans region where an estimated 400,000 people were marooned by flooding. Roughly 100 relief camps were established in West Bengal shortly after the storm passed. On 27 May, 400 troops form theNational Disaster Response Force were deployed to the state for relief operations. The Government of India released Indian rupee 10,000,000 (US \$209,775) in relief funds to the affected areas on 26 May. Two MI-17 helicopters were also sent to air-drop food supplies to the worst affected areas in West Bengal.

Bangladesh

Immediately following the storm, a 33-member team of the Bangladesh Navy was deployed to the affected regions. The Red Cross also quickly responded, supplying water purifying tablets and other relief items. The Deputy Commissioner of Satkhira district allocated ten tonnes of rice and Tk.100,000 (US\$1,450) in immediate relief funds for that district. The government later allocated Tk. 1.2 million (US\$17,143) and 1,000 tonnes of rice for the affected areas. These amounts further increased to Tk. 12.3 million (US\$175,714) and 2,500 tonnes of rice.

Five days following the impacts of Aila, the Bangladeshi Health Organization confirmed that a widespread outbreak of diarrhea which has infected over 7,000 people. Another outbreak of water borne diseases, namely dysentery, has infected over 3,000 people. At least two people have been confirmed to have died from diarrhea and two other fatalities were reported. Officials feared that the outbreak would lead to many fatalities in isolated areas that have not received aid and have been without food and clean water for nearly a week.

Annexure - e)

Case Study 2: Cyclone Phailin



Phailin near peak intensity on October 11, 2013

Very Severe Cyclonic Storm Phailin (Thai meaning "sapphire") was the second-strongest tropical cyclone ever to make landfall in India, behind only the1999 Odisha cyclone. The highest wind was sustained three minutes (250 km / hr) and one minute sustained (260 km / hr). On 10 October 2013, Phailin intensified rapidly and became a very severe cyclonic storm equivalent to a category 1 hurricane on the Saffir-Simpson hurricane wind scale (SSHWS). On October 11, the system became equivalent to a category 5 hurricane on the SSHWS before it started to weaken during the next day as it approached the Indian state of Odisha. It made landfall later that day, near Gopalpur in Odisha coast at around 2130 IST (1600 UTC). It subsequently weakened over land as a result of frictional forces, before it was last noted on October 14, as it degenerated into a well marked area of low pressure.

Officials from Odisha's state government said that around 12 million people may be affected. As part of the preparations, 600 buildings were identified as cyclone shelters and people were evacuated from areas near the coast, including Ganjam, Puri, Khurdha and Jagatsinghapur districts in Odisha. The cyclone prompted India's biggest evacuation in 23 years with more than 550,000 people moved up from the coastline in Odisha and Andhra Pradesh to safer places.

Preparations and impact Andaman and Nicobar Islands

On October 8, the IMD warned the Andaman and Nicobar Islands that squally to gale force wind speeds would be recorded over the islands and surrounding sea areas during the next two days. They also warned that heavy to very heavy rainfall would occur over the islands while some damage to thatched huts, power and communication lines was expected. These warnings were continued until October 11, when the IMD noted that no further adverse weather, would occur over the Andaman and Nicobar Islands. Within the islands the Directorate of Health Services opened a Medical Camp in Rangat, while the Deputy Commissioner, Police and Fire Services all ensured there were no casualties. Between October 8–10, rainfall totals of 734 mm (28.9 in) and 434 mm (17.1 in) were recorded in Mayabunder and on the Long Island.

Andhra Pradesh

The Andhra Pradesh government and the Chief Minister met representatives of the Army and Navy seeking their assistance if required. Utility workers striking against the division of Andhra Pradesh called off their strike partly in view of the cyclone threat to the coastal districts. The state government ordered the evacuation of 64,000 people living in low-lying areas.

The coastal districts of the state escaped the force of the cyclone. However, Srikakulam district experienced heavy rains and gale-force winds which uprooted tall trees and electric poles, shutting down power to areas. Throughout the state, one person was killed and damage amounted to 500 million rupee (US\$8.1 million). A total of 134,426 people were evacuated in the wake of the storm.

Odisha

In Odisha, the government issued a high alert to the districts of Balasore, Bhadrak, Mayurbhanj, Keonjhar, Dhenkanal, Jajpur, Cuttack, Jagatsinghpur, Kendrapara, Puri, Khurda, Nayagarh, Ganjam and Gajapati, and cancelled the Dusshera holidays of employees of all 30 districts of the state, 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 the ports of Paradip and Gopalpur 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 1,000,560 food packets for relief. Indian Air Force helicopters were kept on standby in West Bengal to move in for help at short notice. A total of 1,154,725 people were evacuated in the wake of the storm and the following floods in the state.

Heavy rainfall resulted in the death of a woman in Bhubaneswar after a tall tree fell on her. Gusty winds resulted in downing of trees and powerlines. It was also reported that due to high winds, seven other 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. Brahmapur, 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 property or life according to the city police. As of 18 October, 44 people have been reported dead from Odisha.

Losses across Odisha amounted to 42.4 billion rupees (US\$688 million).

Jharkhand

During October 13, heavy rain from the outer bands of Phailin lashed Jharkhand. A rainfall total of 74.6 mm (2.94 in) was recorded at Ranchi, while Jamshedpur recorded 52.4 mm (2.06 in), and Bokaro recorded 58.4 mm (2.30 in).

Barring an early morning lightning strike at Simdradhao village in Giridih district in which a person was killed, according to police, there were no reports of rain-related casualty anywhere in the state. The Disaster Management Department and the district administrations were monitoring the situation.

Other Indian states

The areas of West Bengal, Chhattisgarh, Bihar and eastern parts of Uttar Pradesh are likely to experience heavy rainfall and strong winds. There is risk of trees falling and disruption of light or electricity poles. However, the effect here will not be as severe as that in Odisha and Andhra Pradesh.

A Merchant Ship MV Bingo was feared to have sunk in rough seas off the coast of West Bengal due to Cyclone Phailin. The Crew of 20 were spotted in lifeboats by the Coast Guard and attempts are being made to rescue them.

Nepal

The eastern region of Nepal experienced heavy rainfall and winds while it was lighter in the central and western part of the country. Rainfall began in the eastern and mid-western region since early morning on 13 October and began in the central regional too in the afternoon. The impact of the cyclone continued until 15 October. Nepalese great festival Dashain was affected by the October rain. It caused flood in Kosi and Gandaki rivers in Nepal.

Annexure f) Class	Control of Fire (Small) Type of fire	Remedies
Α.	Fire involving solid fuel like paper, cloth, rubber, plastic etc.	Water
В.	Fire involving spirit, liquid fuel, oil, hydrocarbon etc.	Cut off air (O ₂) & stop vapourization, no water. Foam, AEFF
С.	Fire involving gas or vapour like LPG	Do not touch electric switch, open windows and doors. Remove combustible materials from the surrounding. CO ₂
D.	Fire involving combustible metals	No water, no foam. Chemical Powder, TEC, Purple K.