

Earthquake : Challenges for Public Health

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History of mankind is marked with some of the greatest natural disasters. Every time a challenge is put up by the nature, humans are able to stand up and fight their way out and survive the difficult times. As the definition of disaster states a disaster is “any occurrence that causes damage, ecological disruption, loss of human life or deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area”.

Earthquakes are devastating disasters which have shaken many empires since ancient times. The morbidity and mortality caused by different events vary according to time, place and population density of the place. The world is divided into seismic zones based on the tectonic plates and the magnitude of earthquakes. Various impacts of earthquake are as given below.^[1]

	Most common effect on Environmental Health	Level of Damage
Water supply and waste water disposal	Damage to civil engineering structures	1
	Broken mains	1
	Damage to water sources	1
	Power outages	1
	Contamination(biological or chemical)	2
	Transportation failures	1
	Personnel shortages	1
	System overload(due to population shifts)	3
	Equipment, parts and supply shortages	1
Solid waste handling	Damage to civil engineering structures	1
	Transportation failures	1
	Equipment shortages	1
	Personnel shortages	1
	Water, soil and air pollution	1
Food handling	Spoilage of refrigerated foods	1
	Damage to food preparation facilities	1
	Transportation failures	1
	Power outages	1
	Flooding of facilities	3
	Contamination/degradation of relief supplies	2
Vector control	Proliferation of vector breeding sites	1
	Increase in human/vector contacts	1
	Disruption of vector-borne disease control programmes	1
Home sanitation	Destruction or damage to structures	1
	Contamination of water and food	2
	Disruption of power, heating fuel, water supply or waste disposal services	1
	Overcrowding	3

1. Severe possible effect.
2. Less severe possible effect.
3. Least or no possible effect.

India comes amongst top ten earthquake prone countries of the world and at higher risk than most other countries. ^[2] According to the latest seismic zone map of India, about 59 percent of India's land area is vulnerable to moderate or severe seismic hazard. ^[3] Recent earthquake in Nepal has again given an opportunity for an insight for the public health experts worldwide. Earthquakes are capable of causing marked damage to local health system. The most common effects caused by earthquakes on environmental health are damage to civil engineering structures, broken mains, damage to water sources, power outages, transportation failures, personnel shortage, equipment, parts and supply shortages. ^[1] This may create many short term and long term public health problems. Current article is an effort to uncover special challenges posed by earthquakes to public health system. Some of them are discussed below.

Physical Injuries :

The utmost priority following an earthquake is to provide first aid and other emergency healthcare to the injured victims. An immediate search, rescue and first aid can prevent a lot of morbidity and disabilities. Disruptions of transportation facilities, as it was evident in recent earthquake of Nepal, can significantly delay the management of injured to and increase the death toll. Therefore it is important that the local government, community and health personnel are well equipped in first hand management of victims. Peripheral workers should be trained in first aid and triage. Inclusion of first aid in school curriculum can also help to build up capacity of community in first aid. However another observation showed that at the time of earthquake, local health personnel or their relatives are also victimized. Therefore it becomes even more important to establish communication and transportation, so that outside help can arrive as soon as possible. In a country like India, where population density is high, the morbidities and mortalities caused by a disaster can be too high for the tertiary

level health facilities to handle. The persons who are at higher risk of mortality due to an earthquake are females, elderly population, those with disabilities, hospitalized and those who remain indoors at the time of earthquake. ^[4] The majority of the injured are likely to have minor cuts and bruises; a smaller proportion will suffer from simple fractures, and a minority (but a significant number) will present with serious multiple fractures or internal injuries requiring surgery, blood transfusion and other intensive treatment. ^[5] In urban areas, special forms of injuries like burns and electrocution are also common. Appropriate triage can significantly reduce the burden on the tertiary level health institutes at the time of calamity. Medical care is particularly difficult in hospitals without reserve water supplies and backup electrical generators. Undamaged public schools and military quarters are transformed into make shift emergency health centers to accommodate the large number of injured. ^[6]

Water, Sanitation and Hygiene:

A large population gets displaced due to loss of their residences, following earthquakes. This population needs shelters, food, water and sanitary conditions. Temporary camps or shelters set up to accommodate this population can be epicenters for epidemics unless care is taken to maintain WASH (Water and Sanitation, Hygiene). Disruption of drainage lines and water lines may result in contamination of drinking water with drainage water. This may give rise to communicable diseases like diarrheal diseases, typhoid fever, hepatitis A and E. The risk gets multiplied as large population is sheltered in small area which makes it easy to transmit the disease. Temporary tents made from water resistant material and temporary closed latrines (separate for males and females) should be set up to accommodate the displaced community if safe buildings are not available. The safe water can be provided by effective chlorination of the available water along with frequent testing for water quality.

Management of Relief material :

The loss of communication leads to delay in the outside response to the disaster. It also interferes with the effective distribution of the resources

following the disaster. Once the communications are set up, the relief from outside areas starts pouring in in form of food supplies, cloths, medicines, vaccines etc. The management authorities have to be prepared to receive these resources. Large amount of food and medicines need appropriate storage facilities with low temperature. If storage facilities with low temperature like freezers are not available, dry ice can be used to keep the temperature low while storage. The managerial capabilities of a public health person comes under test, when he/she has to face political influences in distribution of relief material. It is quite important that the relief material received from outside reaches first to those who need the most. Excess resources from outside can also become liability. The humanitarian care in form of health personals, volunteers also requires food, water and other resources till their stay. It becomes difficult for the local health management to take care of excess burden caused by outside population. Therefore it is also important to limit the outside relief to "as required only". In the recent earthquake of Nepal, it was observed that government had put a ban on entry from outside for almost three months, for the same reason. In areas where nuclear power reactors are located, a special form of hazard looms on the population. Damage to such reactor can expose the people to radioactivity. Radioactive exposure of community and contamination of environment following earthquakes are a big public health issue in Japan.

Control of Communicable Diseases :

Failure to control communicable diseases can amplify the mortality manifolds if preventive measures are not taken. One of the examples is a major earthquake in Haiti (2010) which killed about 220,000 people during and immediately after the event. The outbreak of cholera (said to be introduced unintentionally during relief work) has caused nearly 750,000 cases of the disease in Haiti and neighboring Dominican Republic, killing 9,200 people in the two nations.^[5] Earthquake is also responsible for breaking routine health services like immunization services. The vaccine preventable diseases like tetanus, diphtheria, pertusis may raise their heads following earthquakes. Overcrowding in temporary shelters

may also pose threats of acute respiratory infections. Earthquakes also disrupt routine vector control activities, which can predispose the community to vector born diseases like malaria and dengue.

Other Public Health Challenges :

There are chances of increase in skin infections and sexually transmitted diseases in the overcrowded shelters. Make shift set ups should be formed to tackle the issues regarding reproductive health like contraception, safe deliveries, clinical management of sexual violence etc. Disruption of routine health services also results in break in management of Non Communicable Diseases (NCDs) like hypertension, diabetes, stroke etc. Therefore there are chances of increase in the emergencies due to complications of such NCDs. Corpses do not pose any danger to health if death was due to initial impact of the earthquake. However deaths following communicable diseases are serious dangers to community if not managed properly. Due to loss of earning capacity or earning members, inadequate nutrition may pose danger of development of malnutrition. The psychological trauma caused by the disability, loss of relative or loss of property takes longer time to recover.

Since the predictive means are unavailable for earthquake, preparedness remains the only solution for the management of this disaster. National Disaster Management Authority (NDMA) of India is functioning in India. NDMA, as the apex body, is mandated to lay down the policies, plans and guidelines for Disaster Management to ensure timely and effective response to disasters. Towards this, it has the following responsibilities:^[7]

- Lay down policies on disaster management;
- Approve the National Plan;
- Approve plans prepared by the Ministries or Departments of the Government of India in accordance with the National Plan;
- Lay down guidelines to be followed by the State Authorities in drawing up the State Plan;
- Lay down guidelines to be followed by the different Ministries or Departments of the Government of India for the Purpose of integrating

the measures for prevention of disaster or the mitigation of its effects in their development plans and projects;

- Coordinate the enforcement and implementation of the policy and plans for disaster management;
- Recommend provision of funds for the purpose of mitigation;
- Provide such support to other countries affected by major disasters as may be determined by the Central Government;
- Take such other measures for the prevention of disaster, or the mitigation, or preparedness and capacity building for dealing with threatening disaster situations or disasters as it may consider necessary;
- Lay down broad policies and guidelines for the functioning of the National Institute of Disaster Management

Apart from government organizations, many

NGOs (Non-governmental Organizations), medical associations have also played major role in recent earth quakes of India. However disaster management is not only the responsibility of government but also of general community.

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