

## **Public health impact of earthquakes**

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Over the past few decades, the incidence and magnitude of natural disasters including earthquakes has grown significantly, resulting in substantial economic damages and affecting or killing millions of people. Globally, more than one million earthquakes occur each year globally, an average of about two every minute. There is no doubt that we have achieved a remarkable scientific progress in earthquake engineering during the past several years. However, achieving a high standard of health and safety against earthquakes is still a challenge for both developing and developed countries.

On April 25, 2015, Nepal was struck by a 7.8 magnitude earthquake which, according to Government of Nepal, killed over 6000 people (as of writing of this piece). For the purpose of early planning, United Nations has estimated that 8 million people (which is about one third of the country's total population) in 39 districts have been affected including 1.4 million in need of food. We still do not have detailed information about socio-economic and environmental impact caused by the earthquake. Many government and private health care centers of the earthquake-affected areas such as Kathmandu, Kavrepalanchowk, Gorkha, Dhading, Sindhupalchock, Lamjung are affected with health workers among the victims.

Indeed, health consequences to population after earthquake are very complex. There are evidences that massive earthquakes have the ability to cause casualty rates of 1% to 8% amongst the endangered population. The number of casualties caused by an earthquake, however, is generally depend on its magnitude, its proximity to highly populated areas, soil type, time of the earthquake, degree of disaster preparedness implemented at the earthquake affected area. Although there are a large number of factors associated with the impact of earthquakes on population health, key factors associated with fatal injuries in earthquakes is houses and commercial building collapse. In most cases, deaths resulting from major earthquakes can be instantaneous (due to severe crushing injuries to the head or chest, external or internal haemorrhage) or delayed (occurs within days and can be due to dust inhalation of collapsed building, dehydration, hypothermia, hyperthermia, crush syndrome, wound infections, or postoperative sepsis).

Although it is not possible to predict with accuracy which diseases will occur following certain types of disasters including earthquakes, generally, diseases can be distinguished as either water-borne, air-borne/droplet or vector-borne, and contamination from wounded injuries. The most documented and commonly occurring diseases are water-borne diseases, i.e. diarrhoeal diseases. In our current context, earthquake affected individuals are staying in overcrowded areas/camps. Thus, there is a probability of transmission of respiratory diseases like typhoid, tuberculosis and swine flu. The number of tuberculosis patient is significant in Nepal and recently number of people has died from swine flu signalling its present in Nepal. Use of face mask is imperative among health professionals and affected individuals.

We have already seen the shortage of water in Kathmandu valley. It may lead to the supply of contaminated water which in turn may result into diarrhoeal diseases like cholera, dysentery. During Iran earthquake of 2003, 1.6% of 75 thousands displaced suffered from diarrhoeal diseases. Similarly, following the 2005 earthquake in Pakistan, an estimated 42% increase in

diarrhoeal infections was reported. The main causes of morbidities in Haiti earthquake of 2010 (7 RS magnitude) were acute respiratory infections, diarrhoeal disease and malaria/fever of unknown origin. The preventive strategy for these air, water and food-borne diseases are availability of safe water, education on hygiene, hand washing, sanitation facilities and appropriate makeshift shelter. Disaster sufferers should be encouraged to drink boiled or chlorinated water, to eat cooked food or sealed packet food item only. Relevant stakeholders should continuously monitor the risks of any potential communicable infections through the early warning of disease threats and the timely organisation of any necessary response.

The consequences of earthquakes on population health are not limited to physical injuries. There are evidences that earthquake results in an increase in adverse consequences of chronic illness such as heart attack. For example, the mortality rate from heart attack increased by 50% in the first three days of 1981 Athens earthquake. In the aftermath of 1995 Japan earthquake, glycemic control was found to be impaired in diabetic patients. Likewise, systolic blood pressure and diastolic blood pressure increased by 15-16 mmHg and 6-10 mmHg respectively for first two weeks in elderly patients. The anecdotal records suggest that diseases, whose risk factor include stress (such as heart attack, hypertension, diabetes, mental health problems) and require ongoing health care, are severely impacted by disaster events.

It is generally accepted that about 80% of older adults aged 65 years and more have at least one chronic condition that makes them more vulnerable than general people during and after earthquakes. Evidences from other settings also reveal that in natural disaster, people over 60 years of age are at increased risk for death and injury and can have a death rate five times higher than that of the rest of the population. Similarly, children between 5 and 9 years of age seem to be at an elevated risk for injury and death. Considering the many health service centres have been affected by this earthquake, pregnant women and new moms may also face receiving health care they need.

Earthquake effect on human health is not purely of a physical nature. There are reports of psychological and emotional effect of earthquakes. These effects tend to range from very minor emotional distress to clinically diagnosable psychological pathology. Some may even suffer from more severe forms of distress, especially anxiety and depression depending on their prior psychological condition and the impact of the earthquake on their immediate families or close friends. This is very common and understandable that many people may experience distress, including anxiety, distressing memories, sleep disturbance, nightmares, and restlessness in the initial weeks after an earthquake. However, the psychological effects on people which are caused by economic damage (e.g. damages of houses, loss of jobs) by earthquakes can last for years as people become unable to continue earning enough income and communities cannot rebuild. In this sense, the psychological effects of an earthquake can be felt for years afterwards. As we are in the social network era, we have observed that many individuals and media are posting or sharing devastating and very sensitive photos/videos of earthquake affected individuals in social network sites such as Facebook or Twitter. Considering the large number of internet and social network site users, its impacts, especially to the earthquakes victims may be very serious. Public health services should be able to provide evidence-based programs that can promote recovery.

We have often witnessed that earthquakes create a massive, unmet need for medical care (both basic and complex). Damages on road/air might interrupt medical chain supplies in some affected areas. Although reports of death and injury ratios vary, many previous studies have estimated it to be approximately 1: 3. In large earthquakes, damages to health facilities

could be massive and can lead to an interruption in basic health care services. This not only hampers high priority services during emergencies, but also creates overload of patient flow and increase waiting times in other fully functional health services centres. In such situation, individuals who have underlying medical conditions (e.g. suffering from chronic diseases, such as diabetes and heart conditions) could be at higher death risk as crucial medicines and care may be unavailable for them when needed.

In many earthquake-affected areas in Nepal, we observed that our health facilities are ill-prepared to respond to disaster. There seems to be very weak or virtually no emergency plan in hospitals. Reports are emerging that patients, including those in intensive care unit, were left in open ground without health care staffs for hours on the day of main earthquake. According to the media reports, maternity hospital of Thapathali in Kathmandu and District Hospital of Rasuwa suffered damage in their buildings. It can be easily predicted that other hospitals, primary health centres and mainly health posts at villages might have heavily suffered. In this situation, there may also be a practice that earthquake-related injuries are treated outside the health care service centres. This might invite further complication to the service users. Media should help promote message around available health facilities in the affected area so that services users can access health services through a skilled health care practitioner.

Finally, strong public health system is vital to reduce mortality and morbidity during and after earthquakes and other disaster events. Public health system should be prepared to tackle any future disaster. Infrastructure of health facilities should be highly earthquake resistance. In most developed countries, hospital buildings can withstand earthquake of 8 Richter scale or more. Primarily, training to health staffs on disaster handling, safety of the major equipment, strategy on patient evacuation during disaster, stocks of the medicines should be already in place. The primary role of population health in earthquake is to provide emergency medical services and help control potential communicable infections outbreak after the earthquakes. Provision of adequate food, water, and shelter should especially help people in vulnerable age groups and those with pre-existing diseases. In this critical situation, our focus should be in re-establishing and improving the delivery of health care in the affected areas. Aid agencies/workers should closely work with Government of Nepal to arrange medical, and further training of healthcare workers on appropriate case management. Public health responders should set up a rapid disease risk assessment in order to identify disaster impacts and health needs. We are very optimistic that we would be able to tackle this critical situation. Together we can re-build our Nepal soon.

*(Dr Regmi and Mr. Aryal are public health researchers)*

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