

# Priority public health interventions and research agendas in post-earthquake Nepal

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## Abstract

The occurrence of natural disasters including earthquake is becoming more frequent phenomena worldwide. All these disasters trigger huge damages to infrastructure, economies as well as population health. Nepal's earthquake in 2015 has multiple effects on population health and health services delivery. Many public health facilities, mostly health posts or sub-healthposts, were damaged or completely destroyed. Priority health services such as immunization and antenatal care were also seriously affected. The earthquake has prompted the need for a disaster-related population-health-research agenda as well as renewed disaster strategy in post-earthquake Nepal. Meanwhile, it also unveiled the gap in knowledge and practice regarding earthquake resilience in Nepal. There is an opportunity for school-based and community-based interventions in both disaster preparedness and resilience. Nepal can build on experiences from other countries as well as from its own. We have discussed possible impacts of the Nepal earthquake on population health and health system infrastructures. We have also suggested possible public health interventions bestowing active awareness among the population and a research agenda in this regard. We strongly urge for the translation of the National Health Policy (2014) into action, as it prioritizes the need of an earthquake resistant infrastructure as well as the implementation of a disaster response plan.

**Keywords:** Natural disasters, Earthquake, Public health interventions, Research agenda, Nepal.

## Introduction

The occurrence of natural disasters such as floods, mudslides, tsunamis, and earthquakes are becoming more frequent phenomenon triggering huge damages to infrastructures, economies as well as to population health. Naghii<sup>1</sup> reported that on average two earthquakes strike every minute, equivalent to more than one million earthquakes globally per year. There is no doubt that we have achieved an incredible scientific progress in our understanding of earthquakes, but achieving a high standard of health and safety to protect against the effects of earthquakes is still a major global challenge.

On 25<sup>th</sup> April 2015, a 7.8 magnitude earthquake with several major aftershocks struck Nepal killing approximately 9,000 people and directly affecting one-third of its 26 million people.<sup>2</sup> Stress accumulated between the Eurasian and the Indian Plates often cause frequent earthquakes<sup>3</sup> and there have been several major earthquakes in Nepal over the past century in 1934, 1980, 1988 and 2011.<sup>4</sup>

The recent earthquakes in Nepal have had a severe impact in 31 out of the countries' 75 districts, of which 14 were declared 'crisis-hit', and resulted enormous human and economic loss.<sup>5</sup> It has damaged public buildings, heritage

## Practice Points

- Achieving a high standard of health and safety to protect against the effects of natural disasters is still a major global challenge.
- We know little about people's coping with and resilience to natural disasters in Nepal.
- Health service provisions after disasters need a multi-disciplinary approach and professionals from a variety of specialities.
- Schools are the most appropriate place where children and adolescents can be easily accessed en masse.
- Nepal urgently needs a proper research agenda on disaster-related health issues.

sites, educational institutions, health facilities, and road networks. For example, the earthquake completely destroyed over 488,700 public buildings and damaged 267,477.<sup>2</sup> This has also affected tourism in Nepal which accounts for 3.9% of the national gross domestic product (GDP) and 3.2% of total employment.<sup>6</sup> The

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National Planning Commission estimated a loss of US\$ 7 billion (706 billion Nepalese Rupees)<sup>5</sup> which is equivalent to 86% of the budget allocated for the fiscal year 2015/2016.<sup>7</sup> Moreover, it has been estimated that this earthquake will push an additional 2.5 to 3.5% of the Nepalese population into poverty by 2016.<sup>5</sup> Similarly, a rapid assessment carried out after the earthquake also suggests that earthquake has instigated individuals in the crisis hit districts to consider migration for recovery.<sup>8</sup>

Earthquakes in low-income countries usually disproportionately affect more disadvantaged communities, as is the case in Nepal where the worst affected districts are remote and poor areas with already compromised health care, transportation, and infrastructure.<sup>9</sup> The earthquakes have an impact on both population health and health systems. Khanal and colleagues<sup>10</sup> speculated that gains achieved in the maternal and child health indicators in Nepal will be hard to maintain after the earthquake.

There is abundant literature on the impact of natural disasters. Particularly, the impacts on mental health during and post-natural disasters including earthquakes have been well discussed.<sup>11</sup> However, there is limited literature around consequences of natural disasters such as flood, and earthquake on public health and the health system. This paper, therefore, addresses the impact of earthquake on the population's health and health infrastructures in Nepal and recommends potential interventions and research priorities in the post-earthquake era.

## Impact of earthquakes on population health

Natural disasters including earthquake can have serious social and health consequences<sup>12,13</sup> and these consequences can be very complex. The immediate effect is on mortality and morbidity from collapsed buildings or structures. The number of casualties from natural disasters, however, depends on the magnitude, its proximity to densely populated areas, and the degree of disaster preparedness.<sup>1</sup> In most cases, deaths resulting from major earthquakes are instantaneous due to severe crushing injuries to the head or chest, external or internal hemorrhage or delayed, the latter occur in the immediate aftermath due to dust inhalation of collapsed building, dehydration, hypothermia, hyperthermia, crush syndrome, wound infections, or postoperative sepsis.<sup>14</sup> Older people (>60 years) and children between the ages five to nine in particular are at an increased risk of injury and/or death.<sup>15,16</sup> A further risk is outbreak of communicable diseases after the earthquake due to poor sanitation facilities and crowding.<sup>12</sup> Fortunately, there were no significant outbreaks of communicable diseases and infections after the 2015 earthquakes in Nepal. However, Basnyat and colleagues<sup>17</sup> argued that there may be a risk of epidemics of infectious diseases such as cholera, hepatitis E, typhoid, and typhus which is already endemic in Nepal, hence continued disease surveillance in post-earthquake Nepal is necessary.

The consequences of earthquake on population health

are not limited to physical injuries. They also include an increase in adverse consequences of chronic illness, for example, the mortality rate from heart attacks increased by 50% in the first three days of 1981 Athens earthquake.<sup>1</sup> In the aftermath of 1995 Japan earthquake, glycemic control was impaired in diabetic patients.<sup>18</sup> 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, suggesting a link between chronic, life-threatening stress and the worsening of metabolic control. Anecdotal records also suggest that people with conditions, whose risk factors include stress and requiring ongoing health care, are severely impacted by disasters.<sup>19</sup>

Several studies<sup>20-24</sup> report that natural disasters have a significant mental health impact, particularly on children and adolescents. There is evidence that elderly and women are also vulnerable to poor mental health following an earthquake. For example, a survey of survivors of the 2008 Sichuan earthquake showed that elderly survivors were more likely to develop post-traumatic stress disorder (PTSD) and general psychiatric morbidity.<sup>25</sup> Similarly, Chinese women were approximately twice as likely to develop PTSD and 60% were more likely to report anxiety and depression when experiencing a traumatic earthquake.<sup>26</sup> Mild mental distress usually affects 20-40% of the people in post-natural disaster areas<sup>27</sup> and the prevalence of PTSD in victims of earthquake ranges from 10% to 87%.<sup>22</sup> There are also reports that large-scale community trauma can result in: (a) a significant increase in psychological problems in the short-term; and (b) can have significant negative physical and mental health consequences for years after the disaster.<sup>28-30</sup>

This earthquake may impact on the nutritional status in affected areas, especially in children, pregnant and lactating women who constitute the primary vulnerable groups. Recent post-earthquake assessments in Nepal found poor food consumption in the affected districts compared to pre-earthquake assessment data.<sup>31</sup> Although there has been a reduction in under nutrition in Nepal, disparity between socio-economic groups, urban and rural areas, however, is growing. Anemia is high at 46% among children aged 6-59 months and the prevalence of stunting remains high at 40%<sup>32</sup> suggesting this is another priority area in post-earthquake Nepal.

## Impact on the health system and infrastructures

Nepal's earthquakes cause major setbacks in the health service, further inhibiting access to already poor rural health care and reducing its quality. The health infrastructure in the 14 severely affected districts was severely damaged, as 389 public health facilities, mostly sub/health posts were completely destroyed and 403 partly damaged including ten referral hospitals in the capital Kathmandu.<sup>2</sup> About 32% of facilities providing specialized maternal and neonatal services were also destroyed. Such destruction has a huge impact on health care delivery in the earthquake-affected areas because sub/health posts are the first point of access for basic

health services and a significant proportion of Nepali population use public health services. For example, during the fiscal year 2013/14, more than two-thirds of the population (70%) used these public health services.<sup>33</sup> This earthquake has also seriously affected priority health services such as immunization, family planning, antenatal care, safe delivery services, services to Tuberculosis (TB) patients and people living with Human Immunodeficiency Virus (HIV). The United Nations Population Fund (UNFPA) estimated 1.4 million women of reproductive age were affected, including an estimated 93,000 pregnant women (and up to 10,000 delivering each month).<sup>34</sup> The impact on health infrastructure destruction could further worsen the up-take of health facility deliveries which is already low in Nepal (35%).<sup>35</sup> Some have questioned whether the health infrastructures damage can be repaired with the available resources; hence they stress the need for financial supports from Nepal's development partners.<sup>3</sup>

The impact of 2015 earthquakes corroborated that Nepalese health institutions are ill prepared to cope with the earthquakes. Most of the hospitals and health facilities, for example, had little or no strategy on patient evacuation, continuation of medical support, or handling large number of injured people.<sup>36</sup> The mass media often reported that during the April 2015 earthquake, patients, including those at intensive care units, were left stranded on the floor without health care staff attending for hours in some of the major hospitals.<sup>37,38</sup> However, despite the damage in infrastructure and short supply of drugs and equipment, we observed that Nepal's health institutions along with international medical teams worked to treat the casualties round the clock.

## Population health responses in post-earthquake areas

There are few evidence-based interventions that could be implemented in post-earthquake or other post-disaster settings. Our narrative review suggests that interventions in previous disaster settings have mainly focused on educational institutions,<sup>39</sup> community level,<sup>40,41</sup> and primary health care centers.<sup>23</sup>

A systematic review showed that schools are key providers of mental health services for young people in post-disaster settings and indicated that teachers may be efficacious at administering general, school-based, mental health interventions.<sup>39</sup> Schools can offer a feasible setting to implement large-scale post-disaster interventions.<sup>42</sup> Sri Lanka's Happy/Sad Letter Box to minimize trauma in children resulting from the Indian Ocean tsunami is an example of a successful school-based intervention.<sup>43</sup> Schools are one of the appropriate places where children and adolescents can be easily accessed en masse. Some organizations have already initiated school-based interventions in Nepal such as incorporating disaster-related contents in the curriculum, practising 'duck, cover and hold drills'; their experiences can help to develop further school-based strategy to cope disasters effectively.<sup>44</sup>

Similarly, a controlled intervention administered

through primary health care in Iran improved disaster awareness and readiness at the community level.<sup>41</sup> In Nepal, female community health volunteers (FCHVs) are the backbone of primary health care programs,<sup>45</sup> thus, their involvement in the disaster awareness and preparedness activities will be much beneficial, particularly in rural areas. Community-based education interventions for disaster awareness and preparedness can be implemented by FCHVs targeting the general population.

There are various models for effective health service provisions in post-disasters and humanitarian settings. The dominant model for psychological intervention has been the medical model.<sup>23,46</sup> These models focus on clinic-based services by highly trained professionals. An approach based in Primary Health Care with preparedness and intervention activities is also reported to have a good efficiency.<sup>41</sup> Similarly, Psychological First Aid (PFA) is an 'old' approach but it lacks adequate scientific evidence of efficiency.<sup>47</sup> Kelley and Greenbaum,<sup>48</sup> for example, have presented a model of using local organizations as leverage for effective delivery of sexual and reproductive health care when responding to a disaster. Likewise, a stepped-care model provides graduated service response starting with a less intensive intervention.<sup>49</sup> Another helpful strategy to cope with the mental illness in post-natural disaster settings is 'mindfulness', but further research is still necessary.<sup>50</sup>

It is accepted that health service provisions after a disaster need a multi-disciplinary approach including professionals from a variety of specialties.<sup>51</sup> While some provide family therapy, others may include individual counseling, or psycho-pharmacological treatments. These models of health service provision may be more effective in reducing symptoms, impairment, and improving the quality of life of individuals, especially around mental health conditions.<sup>49</sup> Beside this, Narrative Exposure Therapy (NET) has been used in mental health services after disasters.<sup>52</sup> While implementing such interventions, local peculiarities have to be given ample consideration to decide on the provision of health services in post-disaster settings. It is also very important to understand the different stages in post-disasters settings while designing an intervention. The following five stages were developed by the American Red Cross:<sup>53</sup>

1. Initial impact phase-characterized by increased anxiety and fears.
2. Heroic phase-survivors help each other to deal with the catastrophe.
3. Honeymoon phase-experiences of joy and happiness at having survived and the feeling of being important
4. Disillusionment phase-increased resentment and frustration at officials and agencies for failing to provide assistance in a more timely fashion.
5. Reconstruction phase-characterized by thoughts and plans for reconstruction and ac-

ceptance of the need to assume responsibility for personal problems.

## Developing health research agenda for post-earthquake Nepal

A rapid database search using keywords 'Nepal or Kathmandu', and 'Earthquakes' (conducted in August 2015) resulted in 22,022 items. Surprisingly, there were 219 articles published in academic journals, indicating the growing global interest in Nepal's recent earthquakes. Based on this review and our post-earthquake observations, we summarized key messages important for the development of the research and intervention agenda in post-earthquake era. We suggest that Nepal should develop its disaster-related national health research agenda covering issues such as:

1. Mental health, psychosocial needs, post-traumatic stress disorders;
2. Neonatal and child health; nutritional intake, immunization coverage;
3. Cardio-pulmonary conditions;
4. Outbreak of communicable diseases;
5. Injuries/management of trauma;
6. Sexual and reproductive health: utilization of antenatal care, delivery care, post-natal care, availability of family planning, sexual abuses in make-shift shelters;
7. TB and HIV (service provision and adherence);
8. Disaster response plan and existing coping capacity and resilience among health care institutions.

## Final thoughts

Damaged health infrastructures in affected areas have not only impeded provision of basic and emergency health care services but also halted the continuous progress gained in maternal and child health and other important population health indicators. Thus, we suggest that Nepal should continue to provide health services through its transitional health centers until permanent infrastructures are fully rebuilt/restored and service provision resumed. Obviously this is very challenging and may take several years due to Nepal's difficult geographical settings. Moreover, we suggest enhancing the capabilities of Nepal's health care facilities to tackle to any future disasters. Similarly, mass media, volunteers and community-based organizations could have played an important role in disseminating health promotion and safety messages. Lesson learned from these practices can be implemented in other humanitarian settings. Rapid assessments and multiple consultations engaging stakeholders in the affected areas would help to make an as accurate as possible assessment of the local situation. This paper suggests that school-based interventions and community-based interventions, particularly on disaster preparedness or mental health issues would be the most efficient strategies as a starting point. School-based interventions may involve teachers, students and parents whereas FCHVs and NGOs (Non-Governmental Organizations) can be involved in community-based interventions. Experiences gained from the previous school-based disaster risk reduction programs and success stories

of FCHV mobilizations should be meticulously appraised. The local community knows its own vulnerabilities, local hazards and capacity best, thus, they can mobilize existing community resources to prepare for and mitigate the effects of disasters most effectively. Indeed, community empowerment and participation are imperative for disaster resilience. Coordination and support from locally based organizations would ease the implementation of such activities.

We also suggest few possible broader health research agendas for post-earthquake Nepal. These research agendas should be developed through multiple consultations and engagement of local stakeholders and experts as required. Development of a research agenda is a scientific process and is not new to Nepal. The Nepal Health Research Council (NHRC)<sup>54</sup> and the National Centre for AIDS and STI Control (NCASC)<sup>55</sup> have an experience of developing national research agenda in the past and there are literature available around research agenda priority setting.<sup>56</sup> Lessons from elsewhere can also be utilized while developing such agenda.<sup>57,58</sup> Ethics in health research and interventions; particularly in humanitarian setting is another important areas. Hunt *et al*<sup>59</sup> have recently proposed a set of important research questions for humanitarian health ethics. Given the current situation, it will be obvious that higher education academics, research agencies, government, NGOs and INGOs need to pay much attention to undertake research in earthquake settings. Thus, developing research agendas will help in reducing duplication and prioritize the highly needed research.

The recently implemented National Health Policy (2014) has underscored the need of earthquake resistant health buildings; retrofitting the existing ones and implementing disaster response plan.<sup>60</sup> This is indeed an opportune time for Nepalese health system to translate these policies into action. We also have a notion that health service motives have to be shifted to the management of long-term disabilities and preparation for similar future events.<sup>61</sup> Acquired learning during this earthquake has to be utilized to strengthen evidence-based public health practices in the country and to fill the loopholes in the post-disaster recovery strategies.<sup>4</sup> We suggest that community disaster reduction programs must be integrated into routine public health service delivery in order to ensure its sustainability.

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