



Healthcare Services Demand in Post-disaster Settings: The 2014 Earthquake in Ludian County, Yunnan Province, China

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Published online: 21 December 2016

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Abstract Healthcare relief teams dispatched to rural areas often face difficulties due to limited initial and ongoing health information in the affected community. The present study investigated patterns of healthcare service demand for a rural displaced population in a post-disaster situation. Three weeks after the 2014 Ludian County earthquake, the Institute for Disaster Management and Reconstruction (IDMR) at Sichuan University and Hong Kong Polytechnic University organized a disaster nursing team to support the rural community in Longtoushan, at the epicenter of the earthquake. A cross-sectional, records-based study of 2484 records obtained from a temporary hospital in Longtoushan (for the period of 14 September–1 October 2014) was conducted. The daily number of records by patients' sociodemographic characteristics and medical diagnoses were plotted on a time series graph to explore the temporal change during the study period. Findings indicate that healthcare service demand from younger age groups was higher than that of the older adult group. Three major health problems were observed: respiratory disease, skin problems, and ear, eye, and throat (EET) problems. All of these very real health problems are chronic issues that require long-term care. They are not health issues directly related to the disaster emergency itself. Yet disaster relief nursing teams were selected on the basis of their ability to

cope primarily with traumatic disaster-related injuries. The existing practice of teaming up disaster relief professions might not be optimal. To better understand the healthcare needs of a displaced population, short- and long-term planning is needed. Planning will allow disaster response professionals to better organize and deploy healthcare personnel to manage the above-listed problems in a post-disaster situation.

Keywords China · Earthquake disaster · Healthcare services demand · Post-disaster healthcare

1 Introduction

Earthquakes are among the most devastating disasters on earth. According to the international Emergency Events Database (EM-DAT), 10,519 natural hazards and disasters (792 earthquakes) were reported over the past 3 decades from 1986 to 2015 (Guha-Sapir et al. 2015a). These disasters claimed 1.91 million lives, an average of approximately 64,000 lives annually. In 2014, 341 natural hazards and disasters (26 earthquakes) were reported. Asia was the most affected continent in terms of disaster occurrence (43.4%), followed by the Americas (22.6%), Europe (15.0%), Africa (15.5%), and Oceania (3.5%). Among these disasters, earthquakes generally caused the greatest number of deaths (Centre for Research on the Epidemiology of Disasters 2015).

Between 1976 and 2014, China experienced 131 earthquakes, which created the highest mortality rate of any country worldwide (Guha-Sapir 2015b) (Table 1). The 3 August 2014 earthquake in Ludian County, Yunnan Province occurred at 4:03 pm., and measured 6.5 on the Richter scale. It was one of the two disasters that killed

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Table 1 Impacts of disasters related to earthquakes by continent, 1976 to 2014

Continent	No. of events	Deaths		Affected		Damage (USD $\times 10^3$)	
		Total	Average per event	Total	Average per event	Total	Average per event
Africa	53	7147	135	1,600,356	30,195	12,217,929	230,527
Americas	186	267,895	1440	23,322,418	125,389	95,302,696	512,380
Asia	556	861,133	1549	139,920,336	251,655	548,687,792	986,849
Europe	119	35,982	302	4,859,061	40,832	76,863,536	645,912
Oceania	44	2850	65	713,426	16,214	26,056,900	592,202

Source Guha-Sapir et al. (2015a)

more than 500 people in 2014 (Guha-Sapir 2015b). The Ludian earthquake left 731 people dead. In addition to the number of deaths, the earthquake affected nearly 1.1 million people and led to almost 5 billion US dollars in damage (Guha-Sapir et al. 2015a). According to Lin et al. (2015), 112 people were reported missing and 3143 were injured. Collapsed buildings and earthquake-induced mudslides caused a significant number of deaths and injuries. Lin et al. (2015) state that while the earthquake's magnitude was of a "moderate" level, it caused severe damage to the hospital in Longtoushan and the loss of healthcare services in the epicenter.

Earthquakes impact communities, cities, and countries, but none can adequately prepare for these events because earthquakes cannot be predicted. Due to the severity of damage, individuals and communities are affected by earthquakes for a long period after the actual event, which makes post-disaster recovery important. In the 2014 Ludian earthquake, the situation was severe because the local healthcare service infrastructure was damaged, and manpower, resources, and relief supplies were limited. Thus, a rapid and effective response from external healthcare resources was necessary. In general, doctors and nurses with surgical, emergency, and intensive care backgrounds teamed up and deployed from urban hospitals to the disaster zone. Hence, selecting medical relief team members to meet the health demands of disaster victims is crucial to improving the effectiveness of response and recovery.

The aim of this study was to investigate the demand for outpatient healthcare service among the displaced population. The specific objective was to examine the patterns of such service demands in the post-disaster period by studying the 2014 Ludian earthquake, Yunnan Province, China.

2 Methods

Four disaster nursing relief teams, composed of 23 Registered Nurses who had completed their Master's study in disaster nursing, and one senior faculty member who was

responsible for team support and coordination, volunteered to be deployed to the area. This work was organized by the Institute for Disaster Management and Reconstruction (IDMR) at Sichuan University and Hong Kong Polytechnic University. The nursing teams worked with local doctors and nurses to provide basic healthcare. A cross-sectional, records-based study was conducted; the study period was from 14 September to 1 October 2014 (18 days). Two thousand four hundred and eighty-four (2484) medical records were obtained from the temporary community hospital in Longtoushan. The main hospital collapsed when the earthquake hit. On 15 August 2014, the hospital was reestablished in 48 temporary buildings to deliver outpatient services. Medical records with various conditions were analyzed. The dataset contained patients' age, gender, and medical diagnosis. Medical diagnosis data were divided into groups based on the first level of the International Classification of Diseases (ICD-10) (WHO 2016). The daily number of diagnoses in each group was plotted on a time series graph to explore temporal change during the study period. This study was approved by the Human Ethics Committee of the Hong Kong Polytechnic University.

3 Results

Figure 1 shows that there was no gender difference in health services demand in the post-disaster period. In contrast, the demand for health services among age groups was significantly different. Figure 2 shows that the demand among the elderly group (age ≥ 65) remained at a stable level in the post-disaster period, while the demand among younger age groups (age ≤ 14 , 15–34, 35–64) was significantly higher in the study period. Referring to the time series graph by medical diagnosis (Fig. 3), it was observed that respiratory disease was ranked first, followed by skin problems and ear, eye, and throat (EET) problems, as well as other physical and mental symptoms, such as headache, shoulder pain, and insomnia. In contrast, patients diagnosed with reproductive disease, muscular disease, cardiovascular disease, or mental disease were fewer.

Fig. 1 Daily healthcare services demand by gender

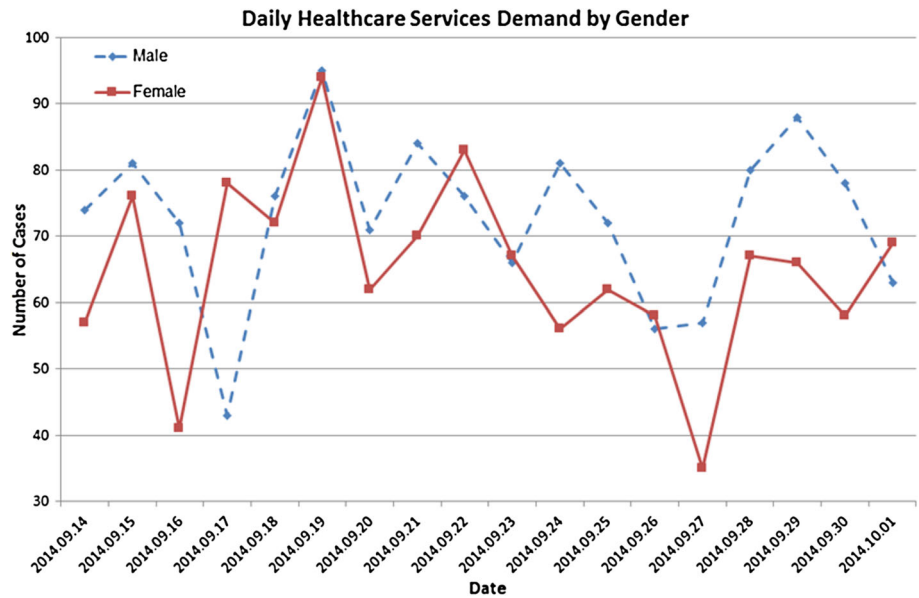
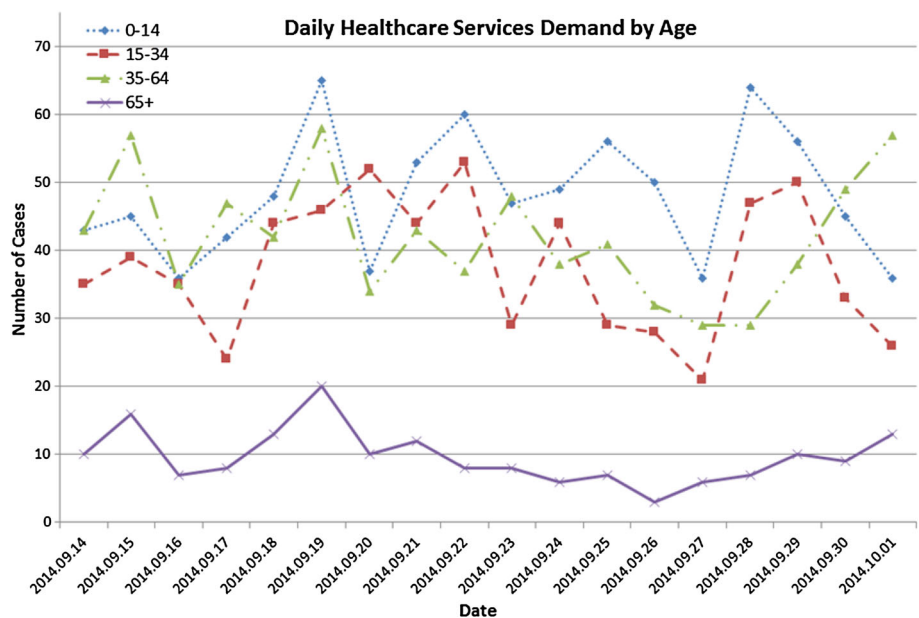


Fig. 2 Daily healthcare services demand by age



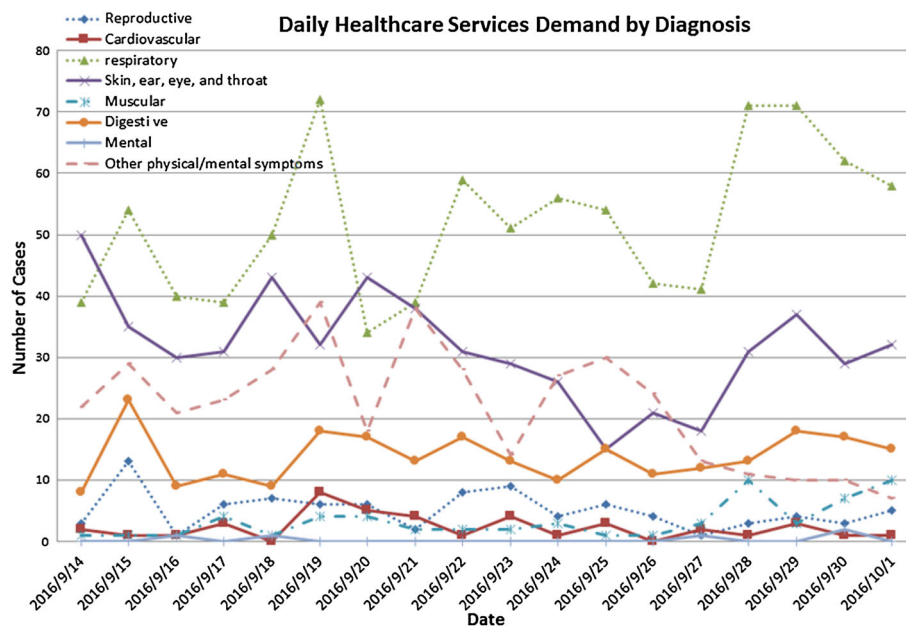
4 Discussion

This study focused on patterns of service demand and found that demand among younger age groups was higher than that of the older adult group, and that the majority of health problems in the whole study sample’s demographic were respiratory disease, skin problems, and EET symptoms. It was generally believed that older adults (over 65 years) were most vulnerable in post-disaster settings because of their preexisting chronic conditions (that is, hypertension and diabetes) and the medications needed to sustain their wellbeing (Mitani et al. 2014). A surprising

finding in the current study was that the time series plot showed health services demand among the elderly was significantly lower than that of the younger groups. It is possible that although elderly people with chronic conditions require long-term medications, their conditions were most likely left untreated (Hung et al. 2013) due to the issues of cost and accessibility. This might explain the lower utilization of healthcare services by elderly citizens.

In contrast, the majority of school children were “left-behind children,” whose parents worked elsewhere. Many of these children reside with grandparents or family friends. Because of the lack of family support, most of

Fig. 3 Daily healthcare services demand by diagnosis



these children are not well-cared-for and may have been more vulnerable (Kilic et al. 2003). Moreover, Li, et al. (2016) identified some children-specific public health and school building risks in the post-disaster period. The World Health Organization (WHO) stated that there is a need to develop an innovative disaster risk reduction measure for health and to reduce the negative effects of disaster on the health of children, as they are more vulnerable to the effect of disasters (WHO 2011).

Regarding the analysis by medical diagnosis, the results suggest that geriatric medicine specialists, gynaecologists, and psychiatrists did not have a significant role in the post-disaster period because of the low demand for services related to their specialties. Instead of having geriatric medicine specialists, it could be helpful to have more pediatricians to meet the significantly higher healthcare services demand from children aged 0–14. On the other hand, because of the low demand for psychiatric services, it is more cost-effective to consider using social workers instead of psychiatrists to respond to victims' psychological needs. There are reports of the success of collaborative work between social workers and nurses in a post-disaster context in managing mental health issues (Sim et al. 2016). Moreover, Chan (2008) stated the need to develop a primary healthcare service to meet individual physical and mental health care demands in post-disaster situations. Overall, the healthcare service demand pattern in Fig. 3 suggests that dermatologists, gastroenterologists, internists, and skin and EET specialists are needed to meet the short- and long-term health needs to support the process of community health recovery for the displaced population.

5 Conclusion

The existing practice of temporarily teaming up disaster relief professions as disaster management teams may not be optimal. By having a better understanding of the healthcare services need of the displaced population, disaster health management focusing on team allocation could be improved by making both a short-term and a long-term plan to deploy appropriate healthcare professionals who could effectively and efficiently support the immediate emergency and later post-disaster chronic health service needs of the affected community.

Acknowledgements This project is funded by the Hong Kong Jockey Club Disaster Management Research Centre. Special thanks are delivered to the 23 disaster nursing graduates for their active participation and dedication to serving the affected community.

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