Sefid Sang Earthquake Measuring 6 on the Richter Scale in Razavi Khorasan Province, Iran, 2017: Challenges and Operations

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Original Article

Abstract

INTRODUCTION: The present article aimed to study field observations of the 2017 Sefid Sang earthquake, Razavi Khorasan Province, Iran, measuring 6 on the Richter scale with the approach of assessing the behaviors and performing a short analysis on the rescue and relief operations.

METHODS: This qualitative study has followed the conceptual analysis approach to research. The sample population was selected with purposive sampling technique from the affected villages of Brashak, Karghash Olya, Drakht Bid, Kelate Menar, Kelate Hajikar, Kharzar, and Chah Mazar to study the behavior and knowledge of the affected people. A goal-based sampling was also applied among the operational managers who were directly engaged in the relief and rescue operations. This research benefited the focus group's viewpoints. The necessary data were gathered from the answers given to the open questions. The process of research data analysis was in the light of phases proposed by Granheim and Lanman.

FINDINGS: The results of this study showed that the disaster preparedness index coefficient among the residents of affected and surrounding villages was low which seriously required enhancement. It was also found out the affected people lacked necessary awareness about general training on the subject of disaster resiliency. Although Red Crescent's role of disaster response in the context of implementation had been effective, it was found that its other roles of advocacy and support could be more effective than its implementation role.

CONCLUSION: Observation also showed that cultural diversity was being observed and respected by rescue and relief workers; however, such a critical issue was not observed and respected the same by other organizations, consequently aggravating the cooperation and coordination atmosphere.

Keywords: Disaster Response; Lessons Learned; Razavi Khorasan; Sefid Sang Earthquake.

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Introduction

Iran is considered one of the most seismically active countries in the world since it is a part of the largest convergent deformation areas of the earth caused by the occurrence of a three-million kilometer deformation in continent plate This deformation was the result of the Red Sea Rift, which moved towards the northeastern portions of the Arabian Peninsula hitting Arabia and Eurasia plate. It is where the Indian Plate is moving to north and northwestern, towards the Iranian Plate. Crustal shortening and thickening in such areas have created high mountains along the Caucasus, Zagros, Alborz, and Kope Dagh

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mountain ranges and Turkish-Iranian plateau. While about 90% of kinetic energy occurs in shapes of shakes causing less deformation along the area, only 10% of the energy releases as an earthquake, leaving behind negative impacts.

Carrying out researches and studies on disasters are among positive consequences such as designing and developing guidelines and protocols since they lead to designing preventive measures and disaster reduction plans, as well as getting prepared to respond to disasters effectively (1, 2). Regarding this, it is required to have researchers carry out widespread research before and after the incidence of disasters. Among the different types of performing research, field research is the most effective and appropriate method to provide proper answers to questions about disasters, human behavior, role of aid agencies, and documentation of lessons learned (3, 4, 7). The present article was conducted to review field observations of the 2017 Sefid Sang earthquake, Razavi Khorasan Province, Iran, measuring 6 on the Richter scale to assess human behavior and present analysis on the rescue and relief operations.

As reported by the seismic networks of the seismographic center of the Institute of Geophysics, affiliated with the University of Tehran, Tehran, Iran, an earthquake measuring 6 on the Richter scale jolted the areas of Sefid Sang at 10:39 a.m. on Wednesday, April 5th, 2017. The epicenter of this earthquake was in the vicinity of Doghale village, 30 km to Sefid Sang, 45 km to Fariman, 75 km to Torbat-e-Jam, and 86 km to Mashhad, Razavi Khorasan Province. The focal depth of this earthquake was measured at 6 km. The Seismic Accelerator of this earthquake, registered as per cm/s^2 by 11 Accelerogram stations, namely Nasabad, Saleabad, Torbat-e-Jam, Mashah geophysics, Fariman, Mashhad Ferdowsi University, Farmad, Chaghmagh, Sarakhs, Sangan, Khowaf, and Zavieh Soflah. The maximum acceleration, recorded by Nasrabad station, was reported to be 120 cm/s^2. As reported by the Islamic Republic News Agency 1 person died and 34 people were injured in this earthquake. The quake of the earthquake was felt in Mashhad, Fariman, Khowaf, Sangan, Zabarkhan, Neyshabour, Salehabad, Torbat-e-Jam, and Kalat.

Villages of Doghale Berashk, Karghash Olya, Derakht Bid, Kelate Menar, Kelate Hajikar, Kharzar, and Chahmazar were 20-100% damaged. Moreover, telephone communication lines were cut off in the area affected by the earthquake. In Mashhad, some buildings had minor damages. Based on the report of the Governor of Fariman, some residential areas and business sites were damaged slightly in Sefid Sang and Ghalandar Abad.

Methods

This qualitative study has followed the conceptual analysis approach to research. The statistical population of the study was selected from villages, namely Doghale Berashk, Karghash Olya, Derakht Bid, Kelate Menar, Kelate Hajikar, Kharzar, and Chahmazar. These samples were entered into the study using the purposive sampling technique to review the people's behaviors, benefiting from goal-oriented sampling among operational managers who were involved directly in the operations. This research benefited the focus group's viewpoints. Data collection was carried out through open questions which were designed according to library studies and people's perceptions and experiences of disaster.

The process of data analysis was carried out using the steps proposed by Graneheim and Landman. The research team collected the answers and then reviewed them to achieve a general understanding. The answers were kept for entity analysis with the aim of giving them the code of analysis. In analysis of the entities, all of the words, sentences, and paragraphs collected from the field were regarded as meaning units which were consisted of related words and sentences. These units were summed up based on their contents and concepts. Afterward, based on their hidden concepts, these meaning units underwent conceptualization and received the codes. In this stage, some interviews were performed to test the quality of some of the answers. The codes were compared in the light of their differences and similarities and subsequently categorized and received the proper tags. Following this, the hidden content of the data was identified carefully, comparing with the categories. The validity and reliability of the research were tested using the criteria proposed by Lincoln and Guba.

The researchers enhanced the credibility of the research by interviewing more people and communicating with them several times. To this

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end, the researchers collected valid and practical data step by step and later reviewed them for the sake of collecting more credibility. Group interviews took about two and a half hours, using open related questions. Interviews with every affected people took half an hour in the presence of four experts specialized in geomorphology, research, behavior, and relief and rescue. Each expert performed their own terms of references of observing the technicality of the questions, directing the interview, monitoring the research and behavior aspects of the interviews, notes, data collecting, and documenting thoroughly. At the end of the interviews, all the findings were reviewed to achieve integrity and reliability.

The data analysis consisted of six steps: a) familiarity with the data, b) creating primary codes, c) searching for classes and subclasses, d) reviewing the classes and subclasses, e) defining and naming the classes and subcategories, and f) reporting (5). The Guba and Lincoln criteria (6) were applied to ensure the accuracy and precision of the qualitative data and examine their trustworthiness, transformability, dependability, and conformability. This procedure was accomplished by such measures as long-term engagement and direct observation, peer review, participant review, researcher review, triangulation technique, and researcher credibility.

Findings

Initial Data Collection

The earthquake jolted a vast area in the northeastern areas of Iran. It was felt in the center of the province where the relief and rescue division of Red Crescent Society in Razavi Khorasan Province immediately were informed and started collecting news and data of the situation. The division initiated responding to the impacts of the earthquake by dispatching disaster assessment and rapid response teams to the area of Sefid Sang and Fariman.

The quake happened at 10:39 a.m. local time (06:09 a.m. GMT). Rescue and relief workers of the Red Crescent branch of Fariman were first to arrive at the affected region. Some rescue and relief workers of the Red Crescent central branch joined them afterward. Some of the relief and rescue workers were dispatched to the affected areas of Torbat-e-Jam, while some of the others were sent to the areas covering from Mashhad to Sarakhs.

Initial Assessments

Following the occurrence of the quake, an initial aerial damage assessment was conducted by Red Crescent helicopter to determine the level of impacts. A ground assessment was also carried out by the dispatched teams. The findings were considerably useful and beneficial. The toll of the impacts, in terms of death cases and physical and financial damages, was not heavy. There were not special and technical rescue, relief, and documentation teams on the ground.

Recalling and mobilizing resources

The process of resource recalling and mobilizing progressed at an acceptable rate. There was no need for rescue operation teams since the quake did not claim any lives; however, the relief operations were conducted.

Eve of rescue and relief operation

Relief operation started immediately by the emergency settlement of 3-5 tents for family groups based on the needs identified in the course of initial rapid assessment. The affected people were settled in safe places far from the damaged constructions. Nevertheless, a camp settlement was not welcomed by the affected. Those families, whose houses had minor damage, received tenet for the fear of using their houses. Proper emergency food packages, supplied from the neighboring province, were distributed among the affected people. These packages contained date, raisins, packed water, biscuits, utensils, and blankets. Hot meals were also distributed.

Based on the observations and interviews with the affected people and field managers, hygiene kits were identified to be of basic necessities; however, they were not already distributed. In the course of the interviews with the managers, it was recognized that stored food items were not enough to meet the needs and some of them were not appropriate.

Challenges of logistic operations

Scattered villages and gravel roads of the affected areas made the situation challenging for full-scale logistic operations. Therefore, part of the logistic operations was handled by helicopters. Some of the other challenges that the disaster management section of the province faced were

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the shortage of skilled heavy-vehicle drivers and provincial managers' lack of proper familiarity with and adequate knowledge of disaster management in disaster situations, highlighting the necessity of training managers regarding appropriate measures in such conditions.

People

Field observations indicated that most people with different education levels were only aware of how to shelter at the corners of the house and under the tables to save their lives. This knowledge is normally transferred to students at schools and adults through radio and TV programs. However, village residents did not have any familiarity with first aid and cardiopulmonary resuscitation. Observations also revealed that people preferred to scape to open spaces when they started feeling the shakes. Regarding this, in Doghale village, one person was trapped under the debris and lost her life.

It was also found out assistance operations were dependent on the Government's help. Moreover, in successful communities, disaster response is dependent on local residents, since such people are more familiar with the culture, norms, and even the dangers of the region. It was also identified that the public believed that committing sins leads to the occurrence of such disasters. Such beliefs had negative psychological, social, and cultural impacts on the affected community. This issue should also be included in public training programs. In addition, people believed that mine exploration operations have made the earth spongy, and consequently prone to quakes.

The field visit also showed a high-traffic load on the communication system which caused its improper functioning. To resolve this issue, a substituted system is proposed. Another problem was related to the rumors used by people in virtual networks introducing numerous challenges. It is recommended that people be trained regarding the best way of using virtual networks in such situations. Field observations found that existing mud-brick structures of village buildings were completely inappropriate for that seismic region, resulting in being extremely vulnerable to earthquakes.

Discussion and Conclusion

According to interviews with local experts and residents, it was found that villages had a high level of vulnerability and limited capacity. The disaster preparedness index rate among the people of the affected villages was low which required to be enhanced. Such communities had not received public training on how to cope with the impacts of disasters, except for some students who used to attend schools in main towns and cities around and stay there for a week, far from their families. The results of field observations were indicative of their inadequate knowledge of hazard preparedness. Red Crescent provincial branch had already identified such a basic need, and consequently, designed brochures and distributed them among the villages within the framework of a countrywide plan of hazard household preparedness.

The incidence of infectious diseases increases after the earthquake due to injuries, increased wastes, and poor environmental health status of the affected region. Such respiratory diseases were prevalent after the earthquakes of Haiti and Sichuan (7, 8). The experts of the contagious diseases should identify the patients as soon as possible in order to prevent epidemics and outbreaks (9, 11, 12, 13).

Many health-related services were provided in the Bam earthquake, which were highly similar to those provided in the Kermanshah earthquake. This issue indicates that 15 years after the Bam earthquake (10, 11, 12, 13), some problems and inefficiencies were still being repeated in the Kermanshah earthquake. Therefore, the assistance and health teams should be managed with better coordination to be able to respond to disasters desirably (9, 11, 13).

Based on the findings, it is necessary to inform people as well as the Red Crescent's human resources about the Red Crescent's roles of support, advocacy, and executiveness since focusing just on one role cannot entirely explain the capacity of overcoming disasters. It was identified that in some cases, the role of advocacy could help the situation more effectively.

The field observations also identified that providing the pieces of training which have the potential to cover the cultural aspects of assistance rendering and consider lessons learned and best practices are much more required than normal ones. Such pieces of training should be offered to rescue workers, relief workers, and field managers. It is essential to teach managers how to

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manage the operations properly and work with rescue and relief workers cooperatively while focusing on the objectives of the disaster response. Managers will be more efficient to control disaster response operations from the emergency operation center rather than committing partisan presence in the disaster operation fields by intervening in the process of implementation of planned response operations. Cooperation and coordination were identified to be maintained pragmatically following the adjusted training and exercises, indoor as well as outdoor, to bring in proper knowledge and common working literature.

Although humanitarian principles and values as well as respecting the human dignity of the affected were being observed by the relief workers, there is still the need for more training in this domain since Red Crescent activities are of the true quality when they are attached with humanitarian values.

Despite the existence of a friendly atmosphere among the rescue and relief workers, as the driving mechanism to facilitate maintaining field coordination and cooperation, the need is still felt to provide tailored pieces of training to develop such cooperation and coordination more pragmatically. Observations showed that true friendship took place where rescue and relief workers were concentrating on specific duties, such as saving lives or rendering assistance. Observation also showed that cultural diversity was being observed and respected by rescue and relief workers; however, such a critical issue was not observed and respected the same by other organizations, consequently aggravating the cooperation and coordination atmosphere.

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None

Conflict of Interests

The authors have no conflict of interest to declare.

Authors' Contribution

Mehrab Sharifi Sedeh, Navvab Shamspour, Aliasghar Hodaee, Milad Ahmadi Marzaleh, and Hossein Sharifara were responsible for the study conception and design. Mehrab Sharifi, Navvab Shamspour, and Milad Ahmadi Marzaleh supervised the whole study. Mehrab Sharifi Sedeh, Navvab Shamspour, Aliasghar Hodaee, Milad Ahmadi Marzaleh, and Hossein Sharifara prepared the first draft of the manuscript. Mehrab Sharifi Sedeh, Navvab Shamspour, Aliasghar Hodaee, Milad Ahmadi Marzaleh, and Hossein Sharifara analyzed the results and supervised the study. All authors read and approved the final manuscript.

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