

Crisis Management After Earthquake: How Do The Public Obtain Initial Information They Need

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Abstract—Although the methods used to inform the public from earthquake and to give them some initial information from earthquake is of importance to all, it is of greater importance to the residents of the cities and regions located in close proximity to the affected region. If the process of informing the public not to be monitored, social impacts are certainly caused. In 2013, the city of Isfahan experienced a weak earthquake only about a week after two quite strong and destructive earthquakes happened in two different regions of the country quite far from Isfahan. The Isfahan earthquake caused a great deal of public disquiet which caused lots of social impacts on the residents of the city due to lack of well-timed and sufficient informing the public. It then became a crisis in the city and about one million residents stayed in streets and parks all that night. After the 2013 earthquake in Isfahan, the effect of the communication of the authorities and the general public itself has been studied by means of a questionnaire survey among 200 residents and the results have been reported here. It is shown that in the absence of timely information to be provided by the authorities most of the people inform each other by several means, such as mobile phones. Using an "analytical-descriptive" approach, some of the social impacts and some other subject matters of interest are also noted.

Keywords—*Earthquake, social impacts, informing, urban residents, communication methods; Crisis management*

I. INTRODUCTION

On Tuesday, April 9th, 2013, an earthquake with a magnitude of 6.1 on the Richter scale happened near Kaki in the southern province of Bushehr and significant number of fatalities and injuries and damages was created [1]. Exactly a week later, on 16th, an earthquake with a magnitude of 7.5 happened in the southeastern part of the country near Saraavaan in the province of Sistan-and-Baluchestan [1]. But fortunately, due to its great depth (about 95 kilometers) and also because it happened far from residential regions, no significant casualties and damages were occurred. Following these two quite strong and destructive earthquakes news of the quakes was continuously being broadcast on all of Iran's national TV channels and Iranians were very worried about the occurrence of these two earthquakes. Although Iran is

located on the Alpide seismic belt and every some time a destructive earthquake happens, the occurrence of these two earthquakes, one shortly after the other, in two different regions of the country was very worrying.

Exactly four days after the second earthquake on April 19th, 2013, at 00:52 local time, an earthquake with a magnitude of 4.1 happened near Habib-Abad, about 15 kilometers from Isfahan, the second greatest city of Iran [1]. Its depth was 8 kilometers and the resulting ground movements were felt in all parts of Isfahan which have a population of over 3 million people. Isfahan is in the center of Iran and its distance from the two previously mentioned regions is over 700 kilometers. Isfahan hasn't experienced a destructive earthquake in the last century and the last earthquake happened in Isfahan return to 1977 at a location with 100 kilometers distance from Isfahan. Thus, it's not surprising that the generation currently living in this city considers the occurrence of an earthquake in the city very worrying and terrifying when they have only heard news about the occurrence of earthquakes in other parts of the country. Anyhow, because this weak earthquake happened a little after midnight most of the Isfahanian residents and other big and small neighboring towns were at home and many were asleep. After feeling the ground movements resulting from the earthquake a crisis started in the city.

By taking a look at the official website of the University of Tehran's Geophysics Institute (UTIG) it can be seen that almost every day earthquakes with a magnitude of around 3.5 to 4.5 happen in different parts of the country. Even after the Kaki and Saraavaan earthquakes (the first and second earthquakes mentioned in this paper) over 30 aftershocks with a magnitude between 4 and 5 happened in those regions which are something seismologists consider quite normal.

Before the residents obtain the necessary information via media such as national or local TV channels from authorities, in which none of whom were evidently at their jobs, people started to send text messages to each other and most of the people were in the streets in less than an hour and stayed awake till morning in the streets and parks and were constantly calling and contacting each other.

Although limited aspects of public informing from authorities and social impacts due to different disasters have been studied by different researchers [2,3], no official report on improper public informing from

authorities and corresponding social impacts from earthquake to residents in a large city available. For example, Slovic studied the objective of informing and educating the public about risk [4]. Covello et al. discussed on problems and opportunities for communicating scientific information about health and environmental risks from both social and behavioral perspective [5]. Weterings and Eijndhoven presented a new approach to risk communication and considered both the risk information presented by the authorities and the public reactions to this risk information [6]. Cvetkovich and Earle suggested that hazard managers and others are often perplexed by the diversity of people's conclusions about environmental hazards [7]. They concluded that the effective management of many environmental hazards depends on reconciliation of the objectivist and constructivist perspectives. Mileti and Peek reviewed the process of public response to warnings of an impending nuclear power plant emergency [8]. Stone et al. stated that lack of information and the absence of an adequate communications system posed considerable obstacles to the coordination of local, state, and federal public health assets [9]. Horsley and Barker studied approaches to crisis communication and the application of those approaches by organizations responding to a disaster [10]. They conducted a survey of 107 state government agencies to learn about government efforts in situations requiring crisis communication. Wray and Jupka studied the information needs and information-seeking strategies with general public audience segments in response to a hypothetical attack [11]. Reynolds and Seeger described a model of communication known as crisis and emergency risk communication as a merger of many traditional notions of health and risk communication with work in crisis and disaster communication [12]. Lowrey et al. identified solutions to problems facing public health public information center of communicating with the public during natural disasters [13].

There are many publications about the Iranian earthquakes, from technical as-well-as non-technical aspects, while limited numbers of them belong to crisis management and, especially, to the subject of informing the general public from earthquake. Nobahari recommended simple measures for increasing the general public knowledge from earthquake [14]. Ahmadi described some subject matters on necessity, importance and methods of informing the general public from earthquake [15]. Yousefi studied the effect of communication methods and information systems of the Iran Ministry of Road and Urban Development for possible application in crisis management cycle [16]. Hoseini and Pishnamazi investigated the public informing challenges and their effects on crisis management in earthquake events through case study of the Roodbar, Manjil and Bam earthquakes [17].

In this paper, the effect of the communication of the authorities and the general public after the 2013

earthquake in Isfahan has been studied by means of a simple questionnaire survey among 200 residents and the results have been reported. Indeed, there is a gap between the knowledge as well as the general information of the public from earthquake and the information expected to be released to the public from the authorities involved in crisis management. This paper attempts to find an answer to bridge this gap by providing a questionnaire survey in simple words. Also, some aspects of the social impacts of the public due to spreading the news from non-officials about the earthquake have been discussed and subject matters of interest have been reviewed. Finally, simple measures for controlling these impacts have been proposed.

II. SOCIAL IMPACTS CAUSED BY THE OCCURRENCE OF AN EARTHQUAKE

It is of no doubt that feeling the movement of the ground is very worrying for people who every some time hears the news about the occurrence of an earthquake which has caused loss of lives. In seismically active areas, usually the return period of the most destructive earthquakes is around or just over half the life expectancy of an average person (around 50 years) and in most cases it can be said that between two destructive earthquakes in a region generations change and the previous generation's children become the young and middle aged people. There are also children who have never experienced an earthquake and have only heard about them through media or read about them in books and may have seen pictures and videos of one. It is a fact that full understanding of an event or disaster is only possible for those who have actually experienced or involved a similar incident; Hearing about or seeing similar incidents through media does not lead to a full understanding.

Currently, the sole public training provided in Iran is training on how to take cover during an earthquake which is only provided to pupils in schools. An earthquake may cause the collapse or destruction of transportation infrastructures such as bridges and if a crisis, similar to that one occurred in Isfahan in which people took to the streets after the earthquake, be happened and access to earthquake stricken areas becomes cut, rescue and relief operations and providing emergency traffic flow may become impossible.

III. PEOPLE'S EXPECTATIONS FROM AUTHORITIES

In the incident in which a weak earthquake happened in Isfahan the head of the city's crisis management authority, who is responsible to inform the public from disasters, was appeared on the local TV channel and gave some explanations. However, people have not been previously informed that they should follow the news related to earthquakes on TV and most of the people were outside their homes with no access to television. Typically, it is relevant that people be warned through formal messages from authorities via all possible communication methods

inside or outside their homes and the public should be informed about the next activities that they should follow.

Generally, in similar situations, Incident Command Systems (ICS) are usually used in developed countries. ICSs, although are not the subject of this article, are designed to enable professional emergency responders to adopt and implement a standardized and integrated organizational structure to coordinate the response in the different phases of a disaster or an event [18,19]. This system has not been implemented in developing countries.

Currently, the organization responsible for recording and informing the occurrence of earthquakes and releasing its details in the country is known (UTIG). All earthquakes happened in part of the country are instantaneously announced through the UTIG's official website. Thus, it is more relevant that the organization be introduced to the public so that if they have access to the internet they can find out the earthquake's location, intensity and depth. The highest local authority responsible for informing the public on disasters is the governor who is the head of the province's crisis management council and his deputy, the head of the crisis management department, plays the role. If the earthquake happens in cities or towns adequately far away from the capital of the province, the county's governor is the highest authority in managing the crisis, but still information should be provided through the capital of the province.

Fortunately, no damage or casualties occurred on the 2013 Isfahan earthquake. If the earthquake was a little stronger and caused to damages and casualties in part of the city, the unrest of the public caused in that part and other parts of the city would have been uncontrollable and rescue teams would have faced serious problems in their rescue and relief operation.

IV. METHODOLOGY AND FIELD INVESTIGATIONS

After the first subsequent meeting of earthquake working group of the Isfahan Crisis Management Council, the author himself, as member of this working group, decided to conduct a quick and independent study about the public's opinions of the informing of the authorities. The main aim was defined to identify deficiencies in the informing system of the present crisis management authorities after the 2013 earthquake in Isfahan that could be equally expanded in many parts of the country. The results are written with an "analytical-descriptive" approach and address the initial information needs for the general public and explain the extent of related subjects to the authorities. In fact, it has been attempted here to point out some of these subjects, considering the information needs and shortages of this subject in Iran, for experts involved in crisis management profession as well as those responsible for teaching of crisis management at universities and professional training programs.

A questionnaire was prepared and 200 residents living in different parts of the city completed it. The

respondents were selected randomly from pedestrians in some populous streets and, mainly, some of the main bus stations of the city. The questions, as explained below, were designed in a way that short answers are sufficient. The survey was done one week after the earthquake. The questionnaire's questions and the analyzed results of each question are as follows:

- **Question 1:** How long after the earthquake you became aware of what happened?

Results: 60 percent of the respondents felt the ground motions caused by the earthquake and thus, became aware right away. 18 percent became aware between 1 and 2 hours after the earthquake and 22 percent became aware over 2 hours after the earthquake.

Conclusion: About 80 percent of people were worried and probably about 60 percent of them took to the streets.

- **Question 2:** After you became aware that an earthquake happened did you know about its location, magnitude and casualties?

Results: Over 90 percent of respondents announced they did not know about the location, magnitude and possible casualties of the earthquake up to an hour after it happened. A small percentage announced that about 2 hours after the earthquake happened they became aware of its location but did not know about its magnitude and casualties.

Conclusion: Information had not been provided in an appropriate way and people did not know how to obtain the necessary information.

- **Question 3:** How did you become aware that an earthquake happened?

Results: 60 percent of people felt the earthquake. 8 percent were told by their neighbors, 22 percent were told via a phone call they received from their friends and relatives and 10 percent became aware of the incident the next day when they heard about it from their friends or at work.

Conclusion: Other than the ones who felt the earthquake, no one was informed by the correct means.

- **Question 4:** Do you consider good performance and reaction of authorities?

Results: 76 percent gave a negative answer. 5 percent consider the occurrence of the earthquake surprising. 19 percent believe their performance was good, but with delay.

Conclusion: The reaction and performance of authorities must be reviewed and the public should be given the necessary training.

- **Question 5:** Do you know the University of Tehran's Institute of Geophysics and the province's Crisis Management Center?

Results: 93 percent did not know the University of Tehran's Geophysics Institute and its duties and 7 percent did. 88 percent of respondents did not fully know the province's Crisis Management Center and only 12 percent did.

Conclusion: The public should be given information and training.

- **Question 6:** Which method do you consider to be the best means for informing the public?

Results: 40 percent said by television, 27 percent said by radio, 23 percent said by sending text messages and 10 percent said other methods were suitable.

Conclusion: There should be plans for using the three mentioned methods.

- **Question 7:** After you became aware that an earthquake happened did you worriedly leave your home?

Results: 46 percent of people who felt the earthquake or became aware of the incident in less than an hour immediately left their homes and were worried. The rest remained at home or did not become aware of the incident.

Conclusion: If the public are not well trained and informed, even after weak or moderate earthquakes people will take to the streets and a crisis will start.

- **Question 8:** What was your main concern when the earthquake happened?

Results: People who felt the earthquake or became aware of its occurrence said their main concerns were: the possibility that stronger earthquakes may happen, safety of their building, possible casualties of the earthquake, the conditions of earthquake victims and what they should do.

Conclusion: In order to stop social anxiety, necessary measures should be taken and plans should be made.

In the 2013 earthquake in Isfahan, Iran, it became known that:

- It was not known how people should be informed and they were poorly informed; people almost did not know how they should receive the news.

- Despite the emphasis of texts and educational resources of crisis management on that during a crisis all relief bodies and responsible authorities should turn up at their workplace and members of the Crisis Management Council must turn up at the province's Crisis Office and wait for the orders of the province's

crisis manager, why did they not show up at their workplace? Some of these bodies weren't even aware until a few hours later that an earthquake had happened.

- It was unknown by what criteria the province's Crisis Management Council and other related groups in other responsible organizations and relief bodies should form. Is the magnitude of earthquake a criterion? An earthquake with a magnitude of 3, 4, 5 or 6 or higher?

- The specialist team which should immediately have been sent to the earthquake location was not previously defined.

In a clearly and simply plan and framework, minimum measures proposed to be taken in advance are recommended as follows:

- A. The University of Tehran's Geophysics Institute and the Iranian Seismological Center be introduced via national TV and radio channels to all.*
- B. The means by which people are to be informed be introduced to them in advance. One or more of the above mentioned methods can be used.*
- C. The first thing the public should do after an earthquake be immediately announced to them.*
- D. The magnitude criteria for which the Crisis Management Council and special relief groups must be formed be known in advance.*
- E. If by the primary information announced to the public it becomes clear that the earthquake meets the criteria mentioned in the previous number, the province's Crisis Management Council be formed and members immediately and without notification show up at the council's office.*
- F. Alike the previous number, rescue teams immediately show up at their workplace and wait for the orders of the Crisis Management Council.*
- G. Duties of each member in this respect be written and announced in advance.*
- H. In advance, a specialist team for field investigations of the earthquake location be established and the necessary equipment be prepared. The team should immediately gather at a previously determined location and then be sent to the earthquake location.*
- I. The entrance and exit routes of cities be recorded for controlling traffic and imposing possible detours or limitations in different earthquake scenarios in all four corners of cities.*

V. CONCLUSION

In a country located on a seismic belt in which every some time an earthquake happens in some part of it, it is expected that people have good knowledge of how to react to this phenomenon and even know its basic specifications such as its magnitude, depth and destructive power. After a weak earthquake in the surrounding area of the city of Isfahan in 2013, a crisis on social worries was formed. The most important cause of the crisis was found to be in improper informing the public during the early time after the earthquake. A survey has been done and a questionnaire was responded by 200 residents of the city and the results were analyzed. The main results are as follows:

- 1-A reliable and quick method for informing the public should be implemented.
- 2-The responsible of the events should be introduced and the communication methods should be trained periodically to the public.
- 3-The most important references for informing the public about both technical as well as non-technical issues of disaster (such as earthquakes) should be introduced.

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