

# A Community-based Intervention Study to Assess the Effectiveness of Awareness Imparted on Earthquake Preparedness among the Residents of South Delhi, India

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## Abstract

**Background:** New Delhi is located in seismic zone IV, and the occurrence of earthquake is fairly common. Previous disasters have shown that only sustained and timely action to reduce risk can prevent or mitigate the impact of a disaster. **Objectives:** The objective was to assess the knowledge and preparedness regarding earthquake among the residents of South Delhi and to impart the awareness and assess the effectiveness of the awareness imparted. **Methodology:** One group pretest–posttest quasi-experimental research was done among 300 respondents on earthquake preparedness. **Results:** As per the study, 89% of participants felt that earthquake is a concern for Delhi. It was observed that majority of the population are not prepared to handle large scale disaster. Significant association was found between pretest and posttest knowledge assessment scores of the study population. **Conclusion:** Disasters due to their unpredictable occurrence are difficult to tackle, but awareness and preparedness to face the calamity will help to reduce the burden of disaster.

**Keywords:** Awareness, community, disaster, earthquake, preparedness

## INTRODUCTION

A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, economic, and environmental losses that exceed the community's or society's ability to cope using its own resources.<sup>[1]</sup> Very often, the emergency response organization and various agencies that provides disaster relief cannot reach people immediately after the event. As per the Bureau of Indian Standards (IS-1893 [Part-1]: 2002), New Delhi, the capital city of India lies in seismic zone IV where the general occurrence of earthquakes is 5–6 magnitude and occasionally of higher magnitude.<sup>[2]</sup> The primary reason for frequent earthquakes in Delhi is due to the seismic threats from two different tectonic regimes, namely the Himalayan region and the Delhi region. Moreover, the city is densely populated, making it more vulnerable to severe damage during earthquakes. However, with proper measures of preparedness, mitigation of loss of life, and property can be achieved. Thus, we planned this study with the following objectives: to assess the knowledge and preparedness regarding earthquake among the residents

of Delhi, to create awareness among them on earthquake preparedness, and to assess the effectiveness of the awareness program on earthquake preparedness.

## METHODOLOGY

After approval of the Institute Ethics Committee, the study was conducted among the community dwellers of South Delhi, India, for a period of 6 months from July 2018 to December 2018. Respondents above 18 years of age who were residing in the area for the past 6 months and who gave consent were included in the study.

This was a one group pretest–posttest quasi-experimental research. Considering the prevalence of disaster unpreparedness

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as 60% from a previous study carried out by Sharma *et al.*<sup>[3]</sup> in Delhi, with a relative error of 15% at 95% confidence, the sample size came out to be 119. After considering a design effect of 2 (cluster design) and a nonresponse rate of 20%, the sample size calculated was 284. The sample size was rounded off, and 300 households were chosen from the community. From the ward list of Delhi,<sup>[4]</sup> 30 wards were selected, and from each ward, ten respondents were selected to meet the sample size. Each of the respondents was asked to gather in a common area like community park or hall. Days like Sunday or public holidays were selected for awareness activity so that equal representation from both the gender was ensured.

### Data collection

Baseline data and pretest information from the participants were collected before beginning the awareness program. It consisted of items such as demographic variables (age and gender), exposure of any training or classes regarding disaster preparedness and mitigation, and source (media and organization) of information or training regarding disaster preparedness. Leaflets and pamphlets depicting pictorial signs on do's and don'ts during an earthquake, and after an earthquake adapted from module prepared by the Ministry of Home Affairs, Government of India (GOI) were distributed and explained to the participants.<sup>[5]</sup> The information material was distributed in both Hindi and English languages. Demonstration of techniques such as drop, cover, and hold was done.<sup>[5]</sup> The disaster kit and its contents were displayed to the residents, and they were motivated to prepare a similar kit at home and keep it for their safety.<sup>[6]</sup>

After the awareness activity, the posttest assessment was done after 2 weeks. Reinforcement was done after the posttest assessment.

### Operational definitions

#### *Earthquake preparedness at the household level*

As no standard assessment technique was found for the assessment of household-level preparedness, respondents chose one or more appropriate responses from among the following basic preparedness activities to describe the household preparedness level as per the criteria adopted and modified from a study conducted by Tumio *et al.*<sup>[7]</sup> These criteria are (1) securing furniture, (2) stockpiling food and water, (3) locating the designated evacuation center, (4) preparing an emergency kit, (5) discussing disaster responses with family members, and (6) Seeking the help of neighborhood inhabitants and vice versa in times of disaster. Each of these questions was given 1 point. Those who had scored 0 and 1 were considered not prepared, 2–4 were considered to be somewhat prepared, and 5–6 were considered to be well prepared at the household level.

#### *Effectiveness*

Eight questions adopted and modified from GOI guidelines<sup>[5]</sup> were assessed for factors such as What should you do you when massive intensity earthquake occurs and you are inside and near the exit?, What should you do when massive intensity

earthquake occurs and you are inside and away from the exit?, Do you know which is the most important part of your body to protect from injury during an earthquake?, Do you know and can you demonstrate what drop, cover, and hold is?, Should you use elevators during earthquake to evacuate?, Should you use the staircase to run down during earthquake?, What should be done if earthquake occurs and you are outside?, What should be done if earthquake occurs and you are in a vehicle or driving? For each component, 1 point was assigned for each correct answer or demonstration of techniques such as drop, cover, and hold. After the awareness activity, the posttest assessment was done, and the scores were noted. Scores before and after the assessment were calculated and were analyzed for effectiveness.

### Statistical analysis

Data were entered in Epi-info version 7 (CDC, Atlanta, Georgia) and analyzed. Mean, percentage, standard deviation (SD), and paired *t*-test were used to assess the pretest and posttest scores.

## RESULTS

In the study, 300 participants were enrolled, of which 120 (40%) were males, and 180 (60%) were females. About 92% of the respondents in our study were found to be literate.

As per the study, 13% of the study population did not have any previous experience of earthquake, whereas 87% of the study population had previous experience of earthquake with frequency either being single or multiple episodes during their lifetime. Out of those 87%, only 10% had experience of damage due to earthquake, and majority of people, that is, 90% had never experienced any damage or injury in the past earthquakes. Overall, 171 (57%) and 96 (32%) respondents felt that earthquake as a disaster is of somewhat concern and high concern, respectively, whereas 33 (11%) respondents felt that earthquake as a disaster is not a concern at all.

On assessing the perception of people about the reason behind the occurrence of earthquake, 43% of respondents believed that it occurs due to movement of tectonic plates, 27% believed that it occurs due to wrath of God, and 30% gave other reasons (due to the horns of a bull or snake inside the earth). In this study, about 89% of the respondents had never been a part of the disaster drill. Again, 99% of the respondents had never heard of any disaster kit as well as did not know emergency phone numbers to call for help [Table 1]. On the assessment of the status of household-level earthquake preparedness, it was found that 23% of the respondents were not prepared, 73% were somewhat prepared, and only 4% of them were well prepared. Out of those who were not prepared and somewhat prepared, majority (68%) felt that nothing can be done during real-time earthquake, and as such, there is no point being prepared [Table 2].

Scores of eight questions as mentioned in methodology were assessed before and after the intervention to assess the effectiveness. As based on results, the pretest mean + SD was

**Table 1: Perception and knowledge regarding earthquake (n=300)**

Variable	n=300, n (%)
Previous experience of earthquake	261 (87)
Experienced any damage or injury in previous earthquake (n=267)	26 (10)
Earthquake as a disaster is a concern for Delhi	267 (89)
Severity of concern for earthquake among respondents in Delhi	
High	96 (32)
Somewhat	171 (57)
No	33 (11)
Why does earthquake occur?	
Movement of tectonic plate	129 (43)
Wrath of God	81 (27)
Others	90 (30)
Ever been a part of disaster drill?	33 (11)
Ever heard of earthquake/disaster readiness kit?	3 (1)
Disaster kit prepared at home	0
Do you know the emergency toll-free number to call for help in case disaster strikes?	3 (1)

**Table 2: Household-level preparedness for earthquake as per score**

Variable	n (%)
Preparedness level* (n=300)	
Not prepared	69 (23)
Somewhat	219 (73)
Well	12 (4)
Reasons for lack of preparedness (n=288)	
Do not know how to prepare	54 (19)
Nothing can be done during earthquake	196 (68)
It takes too much time	38 (13)
Total points (out of 6): 1-2 not prepared, 3-4 somewhat prepared, 5-6 well prepared	

5.45 + 1.19, and the posttest mean + SD was 7.84 + 0.81. The difference was found to be statistically significant ( $P < 0.0001$ ).

## DISCUSSION

In this study, about 87% of the study population had previous experience of earthquake, of which only 10% had experience of damage due to earthquake. However, in the study done by Najafi *et al.*, it was found that 41.6% of respondents had experienced at least one disaster (major damage) in the past 20 years, which could be attributed to the high seismicity of Iran and too frequent high Richter scale earthquakes.<sup>[8]</sup> Majority of the people, that is, 89% felt that earthquake as a disaster is a concern for Delhi. Similar results were found in the study done by Sharma *et al.* They also found that earthquake is a major concern as compared to other disasters. Their study was conducted in four residential areas in East Delhi.<sup>[3]</sup> The combined data of East Delhi and South Delhi point toward the fact that earthquake preparedness should be given a major and serious concern in Delhi. Unfortunately,

89% of our study population had never been exposed to drill. Only 11% of people had exposure to drill in their lifetime. Moreover, out of those 11%, it was found that 9% had got training at school, and only 2% of them had got training at home. Similar results were found in the study done by Sharma *et al.*<sup>[3]</sup> Even though the literacy percentage was high in our study, 57% of the study population could not explain the mechanism of origin of earthquake. Nevertheless, 73% of the population responded that they were somewhat prepared for earthquake similar to a previous study.<sup>[7]</sup> In contrast, only 31.5% of the study population were somewhat prepared in the study by Azim *et al.*<sup>[9]</sup> The major reason behind lack of full preparedness among the residents was the disbelief that nothing can be done during real-time earthquake, and as such, there is no point being prepared.

We observed that majority of the study population, that is, 99% had never heard of earthquake readiness kit, and none of them had disaster readiness kit at their home. In the study done by Chan *et al.*, only 10.7% of the respondents possessed a disaster readiness kit.<sup>[10]</sup> This shows that emergency preparedness at individual and family level after a major earthquake strikes is very minimal and community dwellers need to be encouraged to make them prepare for future disasters. Furthermore, majority of the population did not know whom to call in case a disaster strikes and similar findings were also observed by Chetry *et al.*<sup>[11]</sup>

The difference between the pretest and posttest score was found to be significant. This shows that awareness generation- and knowledge-based intervention plays a big role in preparing the community for appropriate response during disaster. Similar results were also found in studies, which assessed the level of preparedness after intervention in various other groups.<sup>[12,13]</sup>

## Limitations

This study has certain limitations: the sample size of the study is small, and the findings cannot be generalized as the different sections of Delhi city have not been covered. The participants self-reported their disaster preparation (items in stock in their homes), and this was not independently verified. Posttest assessment was done after 2 weeks, which was an arbitrary period. Similar studies are lacking in India, and therefore, not many studies could be included in discussion.

## CONCLUSION AND RECOMMENDATIONS

In this study, we observed that awareness and preparedness level of community for disaster was very unsatisfactory. The vision of a well-prepared community for disaster can be achieved by: providing knowledge and awareness program to community dwellers on a large scale, increasing the number of households with disaster kits/plans prepared at home, and a wide display of evacuation plans and emergency helpline numbers. In future, the emerging role of artificial intelligence can be a useful aid in increasing disaster awareness and thus mitigate the disaster impact.

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## Conflicts of interest

There are no conflicts of interest.

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