

# Peoples' awareness on earthquake vulnerabilities in Mymensingh district of Bangladesh

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**Abstract:** The main objective of the research was to measure the creativeness of people awareness about earthquake by the respondents of houses (single, double and multi-storied buildings). Eight characteristics were identified to accomplish the survey. These are age, education, family size of the respondents, causes of earthquake, knowledge about earthquake and vulnerability of earthquake, awareness of earthquake and after effects of earthquake. The results presented that majority (55.5%) of the respondents had medium earthquake awareness, compared to (16.70%) having high earthquake awareness, and (27.8%) having medium earthquake awareness. Though most of the respondents had medium (43.10%) knowledge about earthquake compared to (15.30%) having high knowledge about earthquake (41.10%) having low knowledge about earthquake. Moreover the percentage of earthquake vulnerability was high 38.90 compared to 25.00 percent of low and (36.10%) of medium earthquake vulnerability. Above the statement we clear that most of the respondents did not take any suggestions from engineers before building a house. The result is due to lack of proper training by the Govt. or NGOs as they were not so much aware about earthquake. For this reason, during & after earthquake most of the respondents affected in vulnerable condition.

**Key words:** Peoples; awareness; earthquake, vulnerabilities; mymensingh.

## Introduction

Earthquake is a disastrous natural phenomenon since the inception of this world as well as the universe. Human being is almost helpless to this deadly natural disaster. A strong earthquake not only destroys lives, but also might change the geography of a region. Although earthquake may affect rural as well as urban areas, damage due to earthquake is maximum when urban areas are affected. Bangladesh is one of the most earthquake prone countries in the world. Specialists are expecting a severe earthquake in this area in near future, which will cause a serious human casualty, damages of infrastructure and other losses. According to Bangladesh National Building Code (BNBC, 1993), the country is divided into three seismic zones and the most severe zone is zone no. 3, which includes the north and northeastern areas of Bangladesh (Ali, 1993). Mymensingh is the north-east region of Bangladesh and probability of earthquake in Mymensingh is higher than other areas of this zone. Consequently, a severe destruction may take place due to earthquake in this region. But most of the population and policy makers do not perceive seismic risk to be important. The loss of life and property can be reduced to a considerable degree by the adaptation and implementation of proper planning, improved structural design and construction procedures. But there are a lot of buildings in Mymensingh, which have been constructed without any consultation, or supervision of engineers. According to Ali and Chowdhury (2001), 70% of multistoried building owners of Mymensingh city have no idea about BNBC and 7% of multistoried building owners constructed their buildings without taking permission from Municipality.

On the basis of the depth of focus, an earthquake may be termed as shallow focus (0-70 km), intermediate focus (70-300 km), and deep focus (> 300 km). The most common measure of earthquake size is the Richter's magnitude (M). The Richter scale uses the maximum surface wave amplitude in the seismogram and the difference in the arrival times of primary (P) and secondary (S) waves for determining magnitude (M). The magnitude is related to roughly logarithm of energy (Hossain, 1988). There are many earthquake occurs in Mymensingh region in Bangladesh. The first recorded

earthquake was terrible one in 1548. Besides in 1662, 1812, 1809, 1889, 1897, 1970, 2000 and 2009 Mymensingh were violently shaken, the earth opened in many places and threw up water and mud of a sulphurous smell (Islam, *et al.*, 2011). Therefore, this work was done to know the peoples' awareness on earthquake vulnerabilities in Mymensingh district of Bangladesh.

## Materials and Methods

The study was carried out at 6 wards of Mymensingh municipality on the peoples' awareness on earthquake vulnerabilities. Micro-data from a farm-level survey conducted by the first author was the main source of data. Data were collected from a sample of randomly selected 72 families out of 700 families (Figs. 1-2). The data were collected through personal interview by using a pre-tested structured interview schedule during the period from April 2014 to June 2014. SPSS and MS-Excel computer soft wares were used to aid the data analysis and presentation.

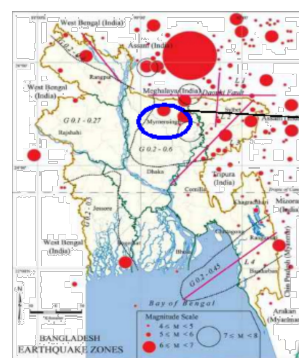


Fig. 1. Map of Bangladesh showing earthquake zones



Fig. 2. Administrative Map of Mymensingh district

## Measurement of Characteristics of the Respondents

Factors	Assigned score	Sources
Age of the household head	Actual years from his birth to the time of interview	Kurukulasuriya & Ajwad 2007
Education	Years of schooling of the household head	Kurukulasuriya & Ajwad 2007
Family size	Number of people in his/her family.	Kurukulasuriya & Ajwad 2007;

**Measurement of Causes of Earthquake:** Causes of earthquake were measured on the basis of respondents' opinion. Five causes of earthquake were selected through

focus group discussion with local people for the present study. A 3-point Likert type scale was used for computing the causes of earthquake. Causes of earthquake which were assigned in the following way:

Option	Scoring system
Disagree	0
Moderately agree	1
Agree	2

**Measurement of Knowledge of Earthquake:** Knowledge of earthquake was measured in scores by asking questions if the respondent answer the each question he/she was get 1 and no answer the question she/he was get zero.

**Measurement of vulnerable situation of Earthquake:** It was measured by using six questions in closed form which could be answered of the respondents. Any respondent answering a question correctly could obtain a full score (4), 3 for partially correct answer, 2 Birds eye view answer and for each wrong answer he could obtain a score of zero.

**Hazards and damages of Earthquake:** Damages of earthquake were measured on the basis of respondents' opinion. A 3point Likert type scale was used for computing the damages of earthquake. Hazards and damages of earthquake which were assigned in the following way:

Option	Scoring system
Disagree	0
Moderately agree	1
Agree	2

**Measurement of Earthquake awareness:** It was measured by using six questions in closed form which could be answered of the respondents. Any respondent answering a question correctly could obtain a full score (2), 1 for partially correct answer and for each wrong answer he could obtain a score of zero.

### Results and Discussion

The distributions of the respondents according to their characteristics are presented in Table 1.

**Causes of Earthquake:** The different causes of earthquake occurrence have been presented in Table 2 which revealed that the observed mean score of the causes of earthquake ranged from 1.37 to 0.23 with standard deviation of 0.88 to 0.56. From this present study it was found that "sudden movement of earth" ranked first position and "volcanic eruption" ranked the last position among the causes of earthquake.

**Table 1.** Distribution of the respondents according to their characteristics

Variables	Measurement	Categories	Respondents Number (N=72)	Respondents %	Mean	Standard Deviation
Age	Years	Young (<35)	36	50	37.597	11.623
		Middle (36-50)	17	23.6		
		Old (>50)	19	26.4		
Education	Year of schooling	Illiterate but can sign only(0-0.5)	21	29.18	3.49	1.34
		Primary (1-5)	8	11.10		
		Secondary (6-10)	23	31.9		
		Higher secondary (>10)	20	27.8		
Family Size	Number of peoples	Small (2-4)	17	23.6	6.43	2.034
		Medium (5-6)	38	52.8		
		Large (>6 above)	17	23.6		

**Table 2.** Causes of earthquake

Sl No	Causes	Observed Mean Score (0-10)	SD	Rank
1	Sudden movement of earth	1.37	0.88	1
2	Heat releasing from earth surface	0.46	0.76	2
3	Breaking and shifting rocks in earth surface	0.30	0.67	3
4	Movement of tectonic plate	0.28	0.61	4
5	Volcanic eruption	0.23	0.56	5

**Table 3.** Distribution of the respondents according to their knowledge

Sl.No	Categories	Respondent (N=72)		Mean	SD
		Number	Percent		
1	Low knowledge (<12 )	30	41.60	13.07	2.26
2	Medium knowledge (12-15)	31	43.10		
3	High knowledge (above 15)	11	15.30		

**Knowledge of earthquake:** The distribution of the respondent according to their earthquake knowledge is shown in Table 3. Knowledge of earthquake scores of the respondent ranged from 2-18 against the possible range of 0 to 18. The average being 13.07 with a standard deviation of 2.26. Based on the observed knowledge about earthquake scores the respondents were classified into the

following three categories; low knowledge (<12), medium knowledge (12-15) and high knowledge (above 15). Data presented in the Table 3 indicated that 43.10 percent of the respondents had medium knowledge compared to 41.60 percent of them having low knowledge and only 15.30 percent had high knowledge about earthquake knowledge.

**Vulnerable Situation of Earthquake:** The vulnerability of earthquake is shown in Table 4. Vulnerability possible range of 0 to 24, where 0 indicating the no vulnerability and 24 indicating high vulnerability of earthquake. The average being 13.43 with a standard deviation of 2.06. Based on the observed vulnerability of earthquake scores the buildings were classified into the following three

categories; „poor vulnerability“ (up to 15), „medium vulnerability“ (15-20) and „high vulnerability“ (above 20). Data presented in the Table4 indicated that 38.90 percent of the respondents had high vulnerable compared to 25.00 percent of them having poor vulnerable and 36.10 percent of medium earthquake vulnerable.

**Table 4.** Distribution of the situation according to earthquake vulnerability

Categories	Respondent (N=72)		Mean	SD
	Number	Percent		
Poor vulnerable (<15)	18	25.00	13.43	2.06
Medium vulnerable (15-20)	26	39.10		
High vulnerable (above 20)	28	38.90		

**The hazards and damages of earthquake:** The hazards and damages due to occurrence of earthquake has been presented in Table 5. The hazards and damages of earthquake were ranked from 1 to 9 on the basis of observed mean score. Table 5 presented that the observed mean score of the damaging situation of earthquake

ranged from 1 percent to 22 percent with rank order of 1 to 9. From this study it was found that “Breaking down of houses” ranked first position and “Causes of Tsunamis” ranked the last position among the damaging situation of earthquake.

**Table 5.** Hazards and Damages of earthquake

Types of hazards and Damages	Percent (%)	Rank order
Death of people and other animals	22	2
Breaking down of houses	23	1
Collapses in the houses	19	3
Collapses in the soil	15	4
Creation of big whole in soil	10	5
River changes their ways	5	6
Collapse bridges disrupts gas, electric and telephone service	2	7
Causes of Tsunamis	1	9
Triggered landslides	3	8

**Earthquake awareness of the respondents:** The distribution of the respondent according to their earthquake awareness is shown in Table 6. Awareness possible range of 0 to 30 where 0 indicating the no awareness and 30 indicating high awareness. The average being 18.26 with a standard deviation of 3.44. Based on the observed awareness of earthquake scores the

respondents were classified into the following three categories; „poor awareness“ (up to 15), „medium awareness“ (15-25) and „high awareness“ (above 25). Data presented in the Table 6 indicated that 27.8 percent of the respondents had poor awareness compared to 55.6 percent of them having medium awareness and only 16.70 percent of high earthquake awareness.

**Table 6.** Distribution of the respondents according to their earthquake awareness

Categories	Respondent (N=72)		Mean	SD
	Number	Percent		
Poor awareness (up to 15)	20	27.8	18.26	3.44
Medium awareness (15 -25)	40	55.6		
High awareness (above 25)	12	16.70		

There were many reasons of earthquake which were identified in this survey. Sudden movement of the earth was considered the principle cause of earthquake. Heat releasing from earth surface, movement of tectonic plate, breaking and shifting rocks on earth surface and volcanic eruption were other causes of earthquake. Besides there were many human made causes were responsible for earthquake vulnerabilities. The earthquake vulnerability of the study area was high. Most of the respondents had medium knowledge of earthquake due to their literacy rate is medium. So, proper steps against earthquake management, such as different training programme, poster, booklet and to create public awareness for human welfare and sustainable development are necessary.

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