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High school students' seismic risk perception and preparedness in Savar, Dhaka

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People in Dhaka, where disaster risk of earthquake is the most due to its high population density and rapid urbanization, are in extreme danger of earthquake. However, the study on assessment of the real scenario of residents' perception of earthquake risk is very little. The purpose of this cross-sectional study is to assess the seismic risk perception and preparedness about earthquake among high school students in Savar, Dhaka. A questionnaire has been developed, and data collection has been done about a group of high school students in seven classrooms. The author uses a method of surveying students to identify and describe the factors that influence their knowledge and perception about earthquake. This study examines gender, grade and age differences in perceived risk and communication behavior in response to the earthquake. Female students' preparation, participation and communication with family are more frequent than those of male students. Female students are found to be more likely to learn about disaster than male ones. Higher grade students have more awareness but less preparedness about earthquake than the younger ones. Students' hazard awareness increases positively with increment of their age. This research concludes that, high school students are vulnerable to earthquake due to the lack of a seismic education program.

Key words: High school, awareness, earthquake, seismic risk perception, hazard, demographic characteristic.

INTRODUCTION

Bangladesh is one of the countries which are the most disaster prone (Ali and Choudhury, 1992; Paul and Bhuiyan, 2010). Its capital, Dhaka, is one among the most at-risk cities for earthquake in the world with its high population density and rapid urbanization (Asif et al. 2018). The earthquake disaster risk index has placed Dhaka among the 20 most vulnerable cities in the world (Davidson, 2000). This has created a growing interest in the issue of disaster risk reduction among the entire population of Dhaka city (Ansary, 2005; Alam et al., 2008). Preparedness is not just the obligation of a country's government or NGOs, yet in addition of each individual from the network (Shimazu et al., 2018; Ampaw-asiedu and Norton, (2018); Yilmaz and Çaglayan, 2017), including the vulnerable population of children (Santos-Reyes et al., 2014). Also, as a matter of fact,

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each time calamity happened, masses of school children are harmed and a lot of them never come back again. For example, the mass casualties of Armenia Spitak Earthquake in 1988 killed more than 17,000 students while being in schools (Chen, 2003; Companion and Chaiken, 2016). In 2001, during Bhuj earthquake in India, 31 teachers and 971 students died (Chen, 2003). During the 2005 Kashmir Earthquake, 17,000 students died and 50,000 were injured (Tankut and Odası, 2009). In 2006, an elementary school in the Philippines was covered in an avalanche and 245 children and educators were executed (Merchant, 2015). Also, in 2008, more than 10,000 children were killed in the Sichuwan Earthquake of China (Acharya et al., 2014; Tuladhar et al., 2014).

In Bangladesh, the main objective of the national curriculum as well as the textbook entitled as “Bangladesh and global studies” for 9 and 10th grade is to build up the citizens with the knowledge of history, tradition, and the cultural values of the country and enrich them with a comprehensive lessons of the global events. In this textbook, Chapter 5; The Configuration of Land and the Climate of Bangladesh, Section 5.2: The Climate and Natural Disaster of Bangladesh explains the influence of climate over the people's lives and their livelihood in Bangladesh; elucidates the surmise of earthquake and its reasons; narrates situations of some countries termed as earthquake-prone regions; describes why Bangladesh is called as an earthquake prone region and explains preparedness and necessary steps of the country in confronting the risk of earthquake. The target of the lesson is that the learners will be brought up developing a desired competence to face the problem of the society through the practice of the subject of the curriculum (Patwari et al., 2012).

The children’s conceptions about earthquake varies according to the different cultures of different countries. To the best of my knowledge, there are a very few studies about the conception of children on earthquake in Bangladesh. During an incredible earthquake happened in Nepal on 25th April 2015 where the range of tremor was from 6.6 to 7.9 on the Richter scale, the residents of other South East Asian Nations including India, Bangladesh and China also felt this one and consequent earth tremors. Bangladesh was shocked twice during these tremors. At one secondary school, students become frightened when their school building began to shake. At a primary school of Mymensingh, everyone attempted to leave the building during the earthquake and at least 12 school students were accounted for to be injured (Biswas et al., 2016). Therefore, providing children with disaster education along with implementation practice is the first step towards creating a culture of preparedness and fostering responsible citizens within the community.

The gendered dimensions of disaster have contribution to people’s risk perception and preparedness levels about earthquake. There are some studies that examined the differences of attitudes and perceptions about earthquake depending on gender and education (grades) (Santos-Reyes et al., 2014).

Among a lot of studies about the high school students’ risk perception worldwide, a very few studies dealt about Bangladesh (Cvetković et al., 2015). Cvetković et al. (2015) study investigated the perception and actual knowledge of secondary school students in the Belgrade region, Serbia regarding earthquake as a cataclysmic event and security danger and recognized the components that impact their knowledge and perceptions. Cvetković et al. (2015) utilized a method of surveying to recognize and describe the elements that impact secondary school students’ knowledge and perceptions about earthquake.

Moreover, several studies have shown that psychological aspects of awareness of seismic hazard fluctuate depending upon the demographic factors of the population, e.g., gender, education level and so on (Santos-Reyes et al., 2014). This quantitative research was done to examine the risk perception, actual knowledge and preparedness levels adapted by high school students in the Savar, Dhaka region with respect to earthquake as a natural disaster and to identify the factors that influence their knowledge and perceptions. To reach to the authentic decisions, the researcher applied a technique of surveying the high school students to inspect the impact of demographic characteristics, such as gender, education and age (Cvetković et al., 2015; Santos-Reyes et al., 2014) on their awareness and acquaintance about earthquakes.

METHODOLOGY

This research is intended to explore the knowledge of high school students on seismic risk perception and their preparedness level in Savar, Dhaka. The questionnaire survey was carried out within the seven classrooms of a high school. The schools are the places where we can learn from the ground up and in the right way about what earthquake is, how it occurs, how earthquakes affect the environment, what kind of needs to be done to protect against an earthquake (US Department of Education, 2010). Moreover, this is an impact study intended to examine the disaster knowledge depending on several aspects including risk perceptions, experiences about earthquake, preparedness, disaster-related knowledge (knowledge of turn off the gas, electricity and water, availability of first-aid kit, protection of themselves, risk of their home and city, and where to hide during earthquake, etc.), knowledge on available safety system (evacuation route or rescue map, etc.), behaviors of students, disaster preparedness of the families and communities. Independent sample t-tests, Chi-square statistical analysis, frequency analysis and correlation matrix were performed to examine the effects of gender, grade and age on the dependent variables. In the questionnaire, the answers of all questions were labeled as “Yes”, “Partially” and “No”. For the statistical analysis, author divided the answers in two groups; first group included only “Yes” whereas second group combined “Partially” and “No”.

Figure 1. Study area map of Savar, Dhaka.

Study area

In Bangladesh, primarily there are three categories of education system: primary, secondary and higher secondary education. The primary, secondary (high school) and higher secondary level is from grade 1 to 5, from grade 6 to 10, and from grade 11 to 12, respectively. In overall secondary education program, there are mainly three streams such as humanities, science and business, beginning from 9th grade. The third public examination, named as Secondary School Certificate (SSC) examination which is held at the end of the 10th grade, must be passed by all students looking for moving to the two-year higher secondary level.

Dhaka was chosen as a study area for several reasons. As the capital city of Bangladesh, Dhaka is facing the extraordinary level of urbanization because of higher population growth and migration of people from the rural areas. As a result, the urbanization rate is increasing without proper planning guidelines and regulations. Buildings are designed and constructed without proper enforcement, which may cause extensive damage in future earthquakes. Dhaka is vulnerable to earthquakes. The frequency of earthquake events is increasing and information from historical earthquake events suggests that Dhaka may be affected by a strong earthquake in the near future (Ansary, 2005; Alam et al., 2008; Hussain et al., 2010; Islam et al., 2011). For these reasons, Dhaka was chosen as an area to conduct the survey. A school near National Martyr's Monument, Nabinagar, Dhaka was chosen because it was accessible to get permission for doing the survey and this area is a rapidly growing industrial area (Figure 1).

Data collection

After selecting seven classrooms from selected school in Savar, questionnaires were distributed to the students and the survey was completed (Figure 1). The author visited each class room to provide all the necessary explanations for the questionnaire. The author visited seven class rooms, three of them were girl sections and four were boy sections. Out of seven class rooms, six were in 10th grade and one boy class was in 9th grade. Only the students who attended classes on the day of survey were included in this study and the sample size of the population was 307. The response rate was approximately 100%. The questionnaire survey was permitted from the governing body of the school.

Questionnaire

This survey was conducted in March of 2018. The questionnaire was as same as the previous survey which was conducted in the April-May, 2017. The questionnaire consists of three sections; the first section is the collected information about respondents' demographic characteristics, the second section gathers risk perception of earthquake as well as other hazards and the last section is about behavior analysis. In the questionnaire, there are 23 questions with the answers labeled as "yes" and "no" (Table 1). "Yes" is coded as one and "no" is coded as zero. Only Q16 has multiple-choice answers. The questionnaire was delivered to each class room and the researcher explained each question. Then the students provided answer of the questions naturally by themselves. If any student was unable to understand any question, the researcher explained it again to all students of that class.

RESULTS

Among participated 307 students, 159 (51.79%) students were male (boys) and 148 (48.21%) students were female (girls). The age range of students was from 15 to 17 years, mean ± standard deviation [SD]: 15.37 ± 0.58 years. Out of 307 students, 209, 82 and 16 students were 15, 16 and 17 years old, respectively. 263 students were in 10th grade and 44 students were in 9th grade (Figure 2).

Analysis of the data was done with quantitative examination of the contents. The obtained results are

Table 1. Questionnaire survey on the knowledge of high school students about earthquake as well as other hazards.

Q1. Do you know what earthquake is?
Q2. Have you ever experienced any earthquake?
Q3. Do you know how to be prepared for the earthquake?
Q4. Are you prepared for a major earthquake?
Q5. Do you know how to turn off the gas?
Q6. Do you know how to turn off the electric power?
Q7. Do you know how to turn off the water?
Q8. Do you have a first-aid kit available at your home?
Q9. Do you know what to do to protect yourself during an earthquake?
Q10. Are you considering your current home to be at risk of earthquake damage?
Q11. Do you know where the exit doors are at your home?
Q12. Do you talk with all of your family members about what kind of damage an earthquake can cause to your immediate surroundings?
Q13. Do you think the level of risk for an earthquake is high in your city?
Q14. Do you believe that, you live in seismic-resistant buildings, which can easily sustain in great earthquakes?
Q15. Do you think that you would be prepared if you participate in earthquake training sessions or workshops?
Q16. Where do you think you will hide at home when an earthquake occurs (tick one only)?
i. Under a table or chair or bed close to the window (near the pillar)
ii. In a corner in the narrow space (storage, kitchen or toilet)
iii. Behind the door on the balcony
iv. Over the bed
v. Run to outside, run to the elevator
vi. Jump from the building
About other hazards (cyclones, landslide, floods etc.)
Q17. Do you know/ do your area have evacuation route or rescue map?
Q18. Do the government or NGO conduct evacuation plans practicing program?
Q19. Do you ever join in any evacuation plans practicing program?
Q20. Do you know where the urban emergency shelters are?
About behavior analysis
Q21. My attitude is: "Oh well, if the earthquake comes there is nothing I can do - whatever happens, happens."
Q22. My attitude is: "I want peace of mind and want to do the best I can. So, I am willing to prepare in advance."
Q23. My attitude is: “I know that preparing for a major earthquake is the single most important thing I can do for the safety of my family and friends”
Q24. My attitude is: “I am aware of that I can survive during an earthquake with more ease if I prepare rather than do nothing at all”.

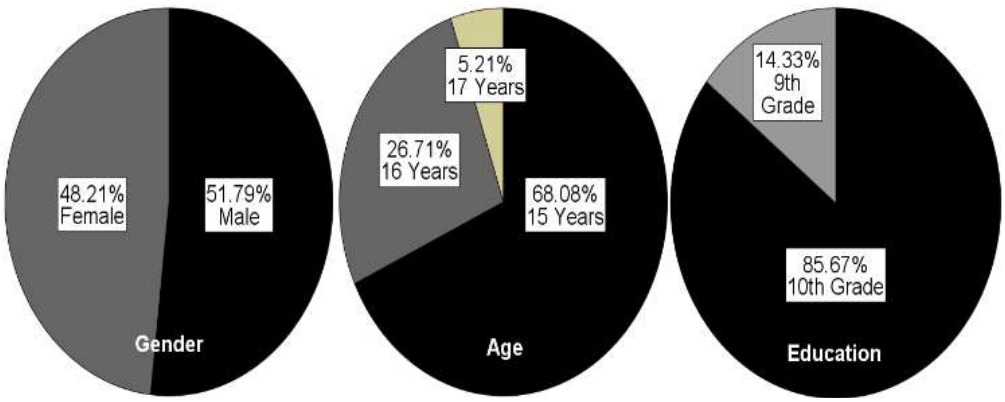

Figure 2. Analysis of category of high school students.

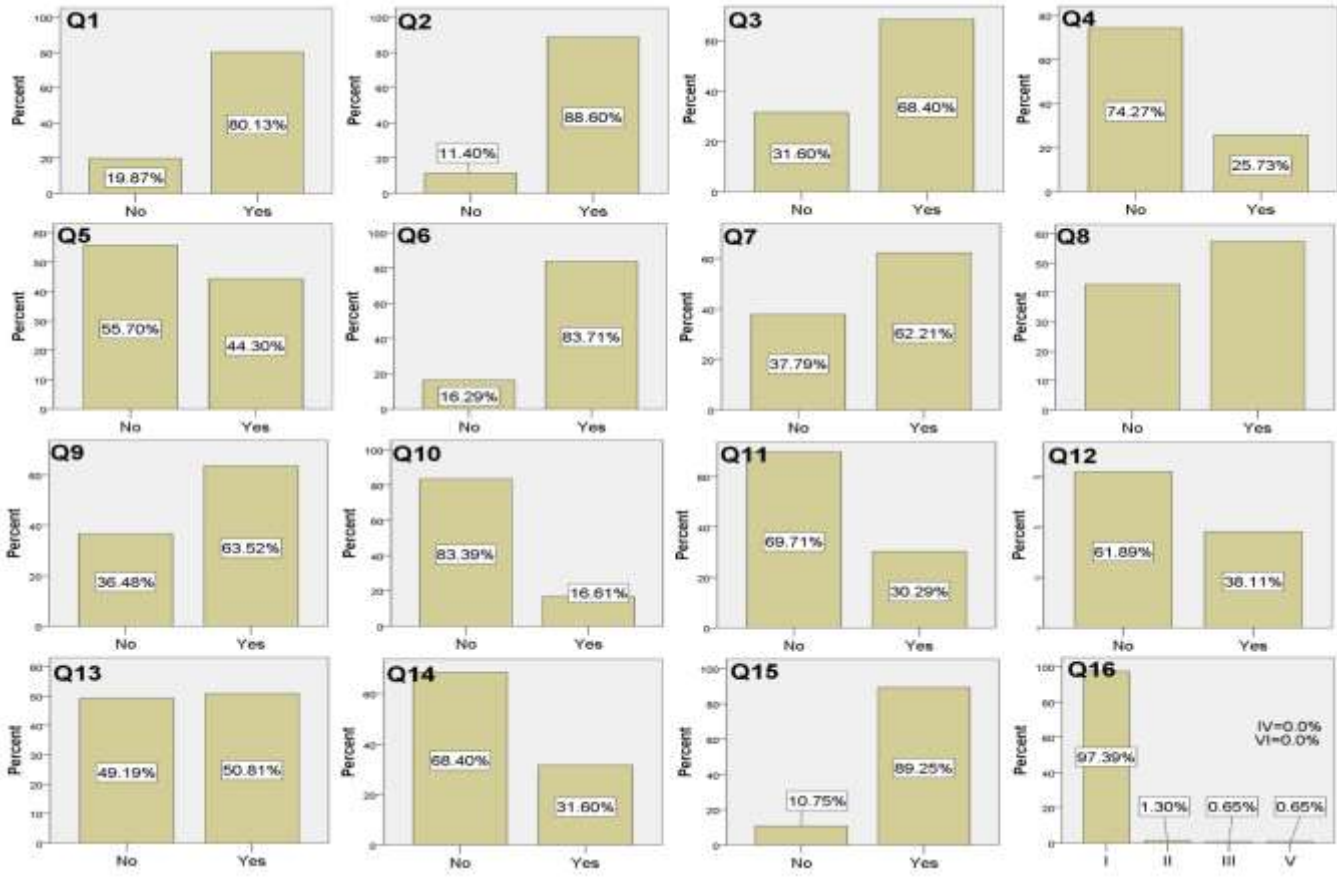

Figure 3. The influence of factors on the knowledge of high school students about earthquake.

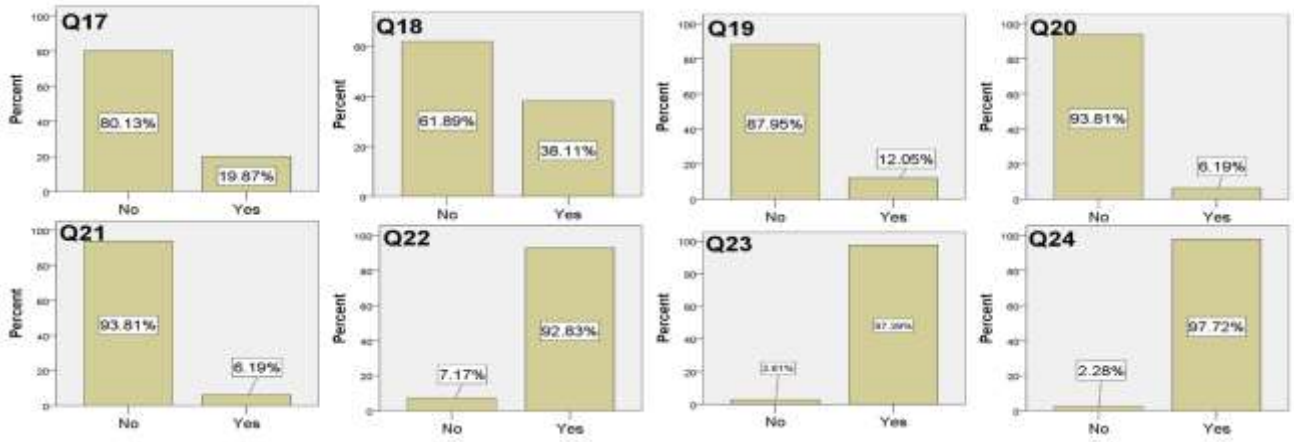

Figure 4. The influence of factors on the knowledge of high school students about other hazards and behavior analysis.

limited to only the students' responses who participated in the survey. The analysis of the data collected from the survey was based on the application of the method of descriptive statistics, namely the determination of frequency and calculation of percentages (Figures 3 and 4).

In Figure 3, Q1 and Q2 show that 80.1 and 88.6% students have known about and experienced earthquake, respectively. Majority percentage of the students have experienced earthquake. Regarding Q3 which is about knowledge on preparedness for the earthquake; 68.4% students responded as 'Yes' but about Q4 only 25.7% students are prepared for the earthquake whereas most of the students remain unprepared. Q5, Q6 and Q7 show that 44.3, 83.7 and 62.2% students know how to turn off the gas, electric power and water supply, respectively. Q8 shows that 42.7% students do not have the first-aid-kit available at their home. About Q9, only 63.5% students know how to protect themselves during an earthquake, whereas Q10 shows that majority (83.4%) of the students think that their current homes are at risk of the earthquake. As for Q11, most of the students (69.7%) do not know where the emergency exits door is or they do not have any emergency exits door. Regarding Q12, almost 70% students have never discussed with their family about kinds of damage after an earthquake to their immediate surroundings. About Q13, only 49.2% students think that the level of risk for an earthquake in Savar is high but the percentage of the students may be larger if they take the Dhaka city into account. In response to Q14, 31.6% students said 'yes' and they think that they live in seismic-resistant buildings but their positive response may be due to lack of knowledge about seismic-resistant. Q15 shows, 89.3% students would like to be prepared for earthquake if they have chance for training sessions or workshops.

As shown in Figure 3, regarding Q16 most of the students (97.4%) chose the right answer. From Q17 to Q20 are the questions about the other hazards (cyclones, landslide, floods, etc.) (Figure 4). Q17 shows that 80.1% students remark that they do not know or they have no evacuation route or rescue map in their area. About Q18, only 38.1% students agreed that the government or NGO conduct evacuation plans practicing program. Regarding Q19, 87.9% students have never joined in any evacuation plan practicing program. Q20 shows that 93.8% students do not know where the urban emergency shelters are. In Figure 4, from Q21 to Q24 are the questions about the behavior analysis of the students. Q21 shows that very few (6.2%) students' attitude is "Oh well, if the earthquake comes there is nothing I can do - whatever happens, happens." About Q22, 92.8% students' attitude is to be prepared in advance for earthquake. Q23 shows that most of the students (97.4%) know that preparing for a major earthquake is the single most important thing which they can do for the safety of their family and friends. Regarding Q24, 97.7% students are aware of that they can survive during an earthquake with more ease if they are prepared rather than do nothing at all. Q21 to Q24 show students' positive attitude and willingness to be prepared in advance for the earthquake.

Gender

For earthquake preparedness, it is important to learn how students from the high school take steps toward mitigation, preparedness and recovery of the earthquake. It is, therefore, important to understand their gender (male and female) dimensions about risk perception and emergency management.

Table 2 shows that about Q3, Q6, Q7, Q8, Q9, Q11, Q12, Q13, Q17, Q19 and Q20, the *F* values for Levene's test are with a significant (*p*) value of 0.000 ($p < 0.001$). Regarding Q3, Q8, Q9, Q11, Q12 and Q13, there are significant differences between males and females about the knowledge to be prepared for the earthquake ($t_{294.24}$= -5.36), to have a first-aid kit available at their home ($t_{304.8}$= -2.6), what to do to protect themselves during an earthquake ($t_{303.9}$= -3.89), acquaintance about where the exit doors are at their home ($t_{259.08}$= -6.89), discussion with all of their family members about what kind of damage an earthquake can cause to their immediate surroundings ($t_{297.24}$= -3.23) and their thinking concerning the high level of risk for an earthquake in their city ($t_{303.83}$= -3.68); $p < 0.001$. The mean values indicate that about earthquake, the preparation, participation and communication with family are more frequent for females (M =0.8243, M =0.6486, M =0.7432, M =0.4797, M =0.4730 and M = 0.6149) than the males (M =0.5535, M =0.5031, M =0.5346, M =0.1384, M =0.2956 and M =0.4088).

As for Q6, Q7, Q17, Q19 and Q20, there are significant differences between males and females about the knowledge on how to turn off the main switch of electric power ($t_{27.28}$= 2.75) and water supply ($t_{288.96}$= 5.67), have evacuation route or rescue map in their area ($t_{296.29}$=2.74), ever join in any evacuation plan practicing program ($t_{258.22}$=3.57) and information about where the urban emergency shelters are ($t_{250.38}$= 2.51); $p < 0.001$. The mean values indicate that awareness on and recovery from the earthquake as well as other hazards for females (M =0.7770, M =0.4662, M =0.1351, M =0.0541 and M =0.0270) are lower than the males (M =0.8931, M =0.7673, M =0.2579, M =0.1824 and M =0.0943). The remaining questions show no significant differences.

Grade

A Chi-square analysis was used to investigate whether there is any difference between 9 and 10th grade. Therefore, the researcher has discussed the results that indicate the current state and the impact of different grades on the knowledge and perceptions of high school students.

As for Q4, Q6 and Q7, there is a significant relationship between two grades about the preparation for earthquake;

Table 2. Impact of gender on risk perception of earthquake.

Question		Independent samples' test						
		Levene's test for equality of variances		t-test for equality of means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference
Q3	Equal variances assumed	103.440	0.000	-5.310	305.000	0.000	-0.270	0.050
	Equal variances not assumed			-5.360	294.240	0.000	-0.270	0.050
Q6	Equal variances assumed	32.780	0.000	2.780	305.000	0.010	0.120	0.040
	Equal variances not assumed			2.750	270.280	0.010	0.120	0.040
Q7	Equal variances assumed	55.810	0.000	5.700	305.000	0.000	0.300	0.050
	Equal variances not assumed			5.670	288.960	0.000	0.300	0.050
Q8	Equal variances assumed	15.290	0.000	-2.600	305.000	0.010	-0.150	0.060
	Equal variances not assumed			-2.600	304.800	0.010	-0.150	0.060
Q9	Equal variances assumed	45.720	0.000	-3.870	305.000	0.000	-0.210	0.050
	Equal variances not assumed			-3.890	303.900	0.000	-0.210	0.050
Q11	Equal variances assumed	159.310	0.000	-6.980	305.000	0.000	-0.340	0.050
	Equal variances not assumed			-6.890	259.080	0.000	-0.340	0.050
Q12	Equal variances assumed	27.940	0.000	-3.240	305.000	0.000	-0.180	0.050
	Equal variances not assumed			-3.230	297.240	0.000	-0.180	0.050
Q13	Equal variances assumed	0.710	0.400	-3.680	305.000	0.000	-0.210	0.060
	Equal variances not assumed			-3.680	303.830	0.000	-0.210	0.060
Q17	Equal variances assumed	31.750	0.000	2.720	305.000	0.010	0.120	0.050
	Equal variances not assumed			2.740	296.290	0.010	0.120	0.040
Q19	Equal variances assumed	57.610	0.000	3.510	305.000	0.000	0.130	0.040
	Equal variances not assumed			3.570	258.220	0.000	0.130	0.040
Q20	Equal variances assumed	26.330	0.000	2.460	305.000	0.010	0.070	0.030
	Equal variances not assumed			2.510	250.380	0.010	0.070	0.030

Table 3. Impact of grade on risk perception of earthquake.

Question	df	N	Value	10th grade (%)	9th grade (%)
Q4	1	307	6.190	23.1	40.9
Q6	1	307	9.992	81	100
Q7	1	307	4.954	59.7	77.3
Q15	1	307	5.043	90.9	79.5
Q17	1	307	11.361	83.3	61.4
Q19	1	307	8.124	90.1	75.0
Q20	1	307	4.907	95.1	86.4
Q21	1	307	4.907	95.1	86.4

Table 4. Correlation matrix of age among the variables.

Question	Age	Question	Age	Question	Age	Question	Age
Q1	-0.030	Q7	0.010	Q13	-0.060	Q19	-0.030
Q2	-0.050	Q8	-0.060	Q14	0.060	Q20	-0.050
Q3	-0.18**	Q9	-0.19**	Q15	-0.050	Q21	-0.16**
Q4	-0.12*	Q10	0.080	Q16	0.020	Q22	-0.040
Q5	-0.080	Q11	-0.17**	Q17	-0.050	Q23	-0.040
Q6	-0.040	Q12	-0.110	Q18	-.13*	Q24	-0.020

N=307; *p < 0.05; ** p < 0.01.

χ^2 (1, *N* =307) = 6.190, knowledge on how to turn off the electric power; χ^2 (1, *N* =307) = 9.992 and how to turn off the water supply; χ^2 (1, *N* =307) = 4.954, *p*=0.05. Compared to 10th grade, the 9th grade students are more likely to be prepared for the earthquake (23.1 and 40.9%), acknowledged about how to turn off the electric power (81 and 100%) and educated about how to turn off the water supply (59.7 and 77.3%) (Table 3). About Q15, Q17, Q19, Q20 and Q21, there are significant differences between the grades; χ^2 (1, *N* =307) = 5.043, χ^2 (1, *N* =307) = 11.361, χ^2 (1, *N* =307) = 8.124, χ^2 (1, *N* =307) = 4.907 and χ^2 (1, *N* =307) = 4.907, $p < 0.05$, respectively. Table 3 shows that, 10th grade students, in comparison with 9th grade, are more likely to be prepared if they have chance to participate in earthquake training sessions or workshops, less informed about evacuation route or rescue map, never join in any evacuation plan practicing program, less informed about urban emergency shelters and want to do something whenever there is earthquake (90.9 and 79.5%), (83.3 and 61.4%), (90.1 and 75.0%), (95.1 and 86.4%) and (95.1 and 86.4%), respectively.

Age

In Table 4, correlation matrix was computed among age and 24 questions. This correlation analysis was done to determine whether there is any influence of age on the seismic risk perception of students. There is a statistically significant negative correlation between age and Q3, Q4, Q9, Q11, Q18 and Q21 which indicates that as compared to the older (16 and 17 years) students, younger (15 years) students have less knowledge about how to be prepared for the earthquake, less preparedness for a major earthquake, less awareness regarding how to protect themselves during an earthquake, less information about the exit doors at their home, less information about the conduct of evacuation plans practicing program by the government or NGO and students' negative attitude towards being prepared for an earthquake, respectively. In general, the results suggest that seismic risk perception of the students increase gradually with increment of their age.

DISCUSSION

This quantitative research found that the risk perception, awareness and knowledge of high school students in the Dhaka region about earthquakes as well as other disasters are different on the basis of gender, grade, and age.

A prominent number of students imagine that disaster knowledge is essential, yet just a few of the students were found to have considered no importance of disaster knowledge. The investigation shows that the gender

(male and female) differences have some influences on their knowledge about the seismic risk perception and awareness. Male students have more seismic risk perception and recovery about the earthquake and other hazards. At the same time female students are ready for the preparation, participation and communication about the earthquake. The sources of disaster information to male and female students are clearly distinct from one another. Mostly, students learn about disasters awareness from the radio, newspaper or the television advertisements. A higher number of female students appear to have been utilizing television, social media and community information as the major source of disaster information, though the male students depend more on surfing internet and sports channel (Tuladhar et al., 2014). After school, female students pass most of their time at home with their mother from whom mostly they have gathered knowledge about the disasters. Also, most of the free time they watch television which can be one of the major source of gathering knowledge.

The investigation shows that most (74.3%) of the students remained unprepared about disaster and their mitigation strategies. Although, 88.6% of the students have encountered a disaster, their assessments towards calamity adjustment and availability practices are somewhat unexpectedly surprising. Students should recognize what makes their school or community unsafe, and how might they make these places safe from catastrophes. This study found that even though 97.4% students know that preparing for a major earthquake is the single most important thing that they can do for the safety of their family and friends, 87.9% of the students have never joined in any evacuation plans practicing program. These results suggest that in addition to be educated about natural disasters, students ought to be proficient on what to do before, during, and after earthquake by participating in evacuation plans practicing program.

The study was also concerned to find out the level of risk perception and awareness about the earthquake and other hazards between 9 and 10th grade students of high school in Dhaka. The study shows that 9th grade students are more prepared for the earthquake than the higher grade. For the higher grade (10th grade) students, they have more awareness than that of lower grade students. When the attitude scores of the 9 and 10th grade students of the high school are examined, it can be said that the attitudes of the students are generally positive.

Regarding Q3, Q9 and Q11, there are some influences of gender and age on the knowledge about how to be prepared for an earthquake, how to protect themselves during an earthquake and information about the exit doors at their home, respectively. Moreover, as for Q4, education and age have some influences on being prepared for a major earthquake.

However, there is no proper emergency management procedure in practice. Unlike countries like Japan, USA, etc., who have a specific department to work on earthquake preparedness for schools, there is no specific authority in Bangladesh to take forward earthquake preparedness for schools in the national context. While there is a large emphasis placed on education in emergencies focusing on flood prone and cyclone prone areas which are mostly in the rural areas, there is a little knowledge and impetus of any form of preparedness and risk assessment for schools in urban areas. The Government of Bangladesh should place more emphasis on earthquake specific school safety program to be specially implemented in risky areas. Schools should encourage the government for more inputs and support for the preparedness activities including access to proper training and other facilities. The earthquake drills should be made compulsory in all schools on a monthly basis so that it is ingrained into every student and staff of actions to be taken in case the tremor strikes.

Conclusion

A survey shows that school education is important in enhancing knowledge and perception of earthquake. At the same time, self-education and community education are essential for actions in preparedness, high contribution for perception and developing of earthquake awareness. Knowledge of the next generation is the key factor for future disaster preparedness and responses. Hazard knowledge is particularly important for vulnerable populations such as students. Though earthquakes affect the whole community, it is the children who are affected the most. Teaching the students about how to be prepared for a major earthquake is the single most important thing that can help to reduce disaster risk and it can be the safety for themselves as well as for their family members and friends. Through the classroom lessons on disaster reduction and awareness, students can reduce some of the physical, emotional and psychological risks. And they can be prepared by themselves for earthquake by participating in evacuation plans practicing program.

In this study, gender, grade and age comparisons have provided the evidence that risk perception, awareness, and recovery issues about earthquake may be effectively enhanced but limited in preparedness level. Actions should be taken by government, NGOs, teachers, policy-makers and other stakeholders to develop public education in schools focusing on changes in pre-paredness level. The evacuation plan practicing program should be conducted by stakeholders in all schools, so that it could be adapted as the basic guidelines of earthquake awareness. In the school education, active education should be promoted for earthquake through

discussion among students and teachers, watching TV programs and associated facilities. These kinds of activities may help students to understand about the awareness of earthquake and make a good relationship with the society.

Based on the findings of this study, the research confirmed that initiatives that have taken for disaster education in Bangladesh are not enough. Bangladesh government and NGOs should play more roles to provide disaster education and information to students. To accomplish this aim, school students can be motivated to gain basic knowledge on disaster reduction, adaptation, awareness, and risk perception techniques. School disaster education implies that the students learn calamity management effectively, it makes risk perception portion to the student's life, their key advancement is the way of life of disaster preparedness, which in the long term encourages the grown-ups to take successful decisions and actions. More examinations and studies should be completed to further recognize the risk factors to give helpful proposals to effective risk communication.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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REFERENCES

Acharya SP, Anderson JG, Ando M, Atakan K, Bevington J, Biasi GP, Bilham R, (2014). "Contributors." In Earthquake Hazard, Risk and Disasters, edited by John F Shroder and Max Wyss, xiii–xv. Boston: Academic Press. https://doi.org/https://doi.org/10.1016/B978-0-12-394848-9.01002-6.

Alam MJ, Khan MAR, Ajoy P (2008). Seismic vulnerability assessment of existing RC buildings in GIS environment. In Online Proc. of Fourteenth World Conference on Earthquake Engineering (WCEE), Beijing, China (http://www. nicee. org/wcee/index2. php).

Ali Md H, Jamilur RC (1992). Tectonics and Earthquake Occurrence in Bangladesh." In 36th Annual Convention of the Institute of Engineers, Bangladesh, Dhaka 1:4-8.

Ampaw-asiedu L, Terri RN (2018). The Design of Safe Spaces in Healthcare Facilities Vulnerable to Tornado Impact in Central US 12(3):324-35.

Ansary MA (2005). Recent Earthquake Related Activities in Bangladesh. In Seminar on Tsunami and Seismic Risk Action for Bangladesh.

Asif AM, Zahidul A, Raquib A (2018). "Performance Analysis of Ferrocement Retrofitted Masonry Wall Units Under" 12(2):81308.

Biswas A, Saidur RM, Koustuv D, Toity D (2016). "Response to an Earthquake in Bangladesh : Experiences and Lesson Learnt" pp. 1-6.

Chen WF (2003). Earthquake Engineering Handbook Fundamentals. Edited by Wai-Fah Chen Charles Scawthorn. 1st Editio. CRC Press. https://www.taylorfrancis.com/books/9781420042443 DOI: ISBN:1420042440.

Companion M, Miriam SC (2016). Responses to Disasters and Climate Change: Understanding Vulnerability and Fostering Resilience. CRC Press.

Cvetković VM, Slavoljub D, Marina P, Saša M, Vladimir J, Jasmina G (2015). "Knowledge and Perception of Secondary School Students in Belgrade about Earthquakes as Natural Disasters." Polish Journal of Environmental Studies. https://doi.org/10.15244/pjoes/39702.

Davidson R, Carlos V, Cynthia C, Brian T (2000). A project to study urban earthquake risk worldwide. In Proc., 12th World Conf. on Earthquake Engrg. http://www.iitk.ac.in/nicee/wcee/article/0791.pdf.

Hussain RR, Saiful Islam ABM, Syed IA (2010). Base Isolators as Earthquake Protection Devices in Buildings. VDM Publishing House Ltd. Benoit Novel, Simultaneously published in USA and U.K.

Islam A, Jameel M, Jumaat MZ (2011). "Seismic Isolation in Buildings to Be a Practical Reality: Behavior of Structure and Installation Technique." Journal of Engineering and Technology Research 3(4):99-117. www.academicjournals.org/JETR/PDF/pdf 2011/Apr/Islam.pdf.

Merchant A (2015). Children and Disaster Education: An Analysis of Disaster Risk Reduction within the School Curricula of Oregon, Texas, and the Philippines. MA IDS Thsis Projects, 103. https://doi.org/10.1128/IAI.69.8.4759.

Patwari MS Husain SMA, Begum RZD, Das UK (2012). "Bangladesh and Global Studies." In National Curriculum and Textbook Board, edited by Rahhid Harun-or, 1st Editio, 73–89. National curriculum and textbook board. http://sitestree.com/download-text-book-of-class-ix-x-all-pdf-national-curriculum-textbook-board-bangladesh/.

Paul BK, Rejuan HB (2010). Urban Earthquake Hazard: Perceived Seismic Risk and Preparedness in Dhaka City, Bangladesh." Disasters 34(2):337-59. https://doi.org/10.1111/j.1467-7717.2009.01132.x.

Santos-Reyes J, Gouzeva T, Santos-Reyes G (2014). "Earthquake Risk Perception and Mexico City's Public Safety." Procedia Engineering 84: 662–71. https://doi.org/10.1016/j.proeng.2014.10.484.

Shimazu K, Yasuhiro M, Tetsuya S, Daisuke T, Kenji M, Haruki S (2018). "A Challenge to Acquire Serious Victims 'Locations during Acute Period of Giant Disasters" 12(7): 483-487.

Tankut T, İnşaat Mühendisleri Odası. 2009. Earthquakes and Tsunamis : Civil Engineering Disaster Mitigation Activities Implementing Millennium Development Goals. Edited by Tuğrul. Tankut and İnşaat Mühendisleri Odası. Springer. doi: ISBN: 9048123992.

Tuladhar G, Ryuichi Y, Ranjan KD, Netra PB (2014). "Knowledge of Disaster Risk Reduction among School Students in Nepal." Geomatics, Natural Hazards and Risk 5(3):190-207. https://doi.org/10.1080/19475705.2013.809556.

US Department of Education (2010). A Blueprint for Reform: The Reauthorization of the Elementary and Secondary Education Act. Office of Planning, Evaluation and Policy Development. https://doi.org/10.1080/03071840701472281.

Yilmaz MF, Çaglayan BÖ (2017). "Selection of Intensity Measure in Probabilistic Seismic Risk Assessment of a Turkish Railway." International Journal of Civil and Environmental Engineering 11(7):964-968.