

ORIGINAL ARTICLE

KNOWLEDGE REGARDING EARTHQUAKE PREPAREDNESS AMONG SECONDARY LEVEL STUDENTS IN A GOVERNMENT SCHOOL

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**ABSTRACT**

Introduction: An earthquake is the perceptible shaking of the earth's surface caused by the sudden release of energy within the earth's crust. Severe earthquakes can result in the collapse of buildings, causing substantial loss of life and property. Earthquake preparedness encompasses measures undertaken at the individual, organizational, and community levels to reduce the adverse effects of earthquakes. These measures include emergency planning, preparedness training, and regular earthquake drills designed to minimize injuries, fatalities, and property damage. Although natural disasters are unpredictable and unavoidable, their impacts can be reduced through adequate knowledge and preparedness practices. The objective of this study was to assess the level of knowledge regarding earthquake preparedness and its association with selected sociodemographic variables among secondary-level students in a government school.

Materials and Methods: A descriptive cross-sectional study was conducted at Shivapuri Secondary School in Kathmandu Metropolitan City. Ethical approval was obtained from the Institutional Review Committee (IRC) of the Tribhuvan University Institute of Medicine (TU IOM) in February 2025 (IRC approval no. 539/2081-082). A single government school was purposively selected because it met the study criteria and provided an adequate number of eligible participants. A total enumerative sampling technique was used to include all eligible Grade 11 students. Of the 150 enrolled students, 20 were absent during data collection; therefore, data were collected from 130 participants. Complete enumeration was feasible because the study population was manageable. Data were collected using a self-administered, structured, and pretested questionnaire. The respondents' level of knowledge was assessed based on the total score obtained. Each correct response was assigned a score of 1, whereas each incorrect response was assigned a score of 0. The maximum possible score was 35. Knowledge levels were categorized using statistical percentiles as adequate (>75.0%), moderate (50.0%–75.0%), and inadequate (<50.0%). Data were analyzed using SPSS version 20. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize the data, while the Chi-square test was used to examine the association between the level of knowledge and selected variables, including age and sex.

Results: This study reveals that while most of the students demonstrated a good understanding of earthquake basics, such as general safe actions like taking cover indoors (70%), drop, cover, and hold on (6.9%). Specifically, very few students knew to stay away from windows/glass (13.1%) inside, during an earthquake. Post-earthquake, knowledge was low for checking for aftershocks (20.0%) and carrying an ID card (9.2%). The results of the study showed that more than half (56.9%) of the respondents had inadequate knowledge and only (10.0%) had adequate knowledge regarding earthquake preparedness. There was no any statistically significant association ($p \geq 0.05$) between the level of knowledge with age, sex and parental education.

Conclusions: In this study, only a small proportion of students demonstrated adequate knowledge regarding earthquake preparedness. These findings highlight the need for school-based awareness-raising programs to improve students' knowledge and preparedness for earthquakes.

Keywords: Earthquake Preparedness, Knowledge, School Children

INTRODUCTION

An earthquake is the perceptible shaking of the Earth's surface caused by the sudden release of energy beneath the Earth's surface.¹ Earthquake-related injuries and deaths result from a variety of factors, including poverty, the collapse of buildings, poor construction practices, secondary hazards such as landslides and tsunamis, people's behavior during an earthquake, and the effectiveness of emergency response.² Most earthquake-related fatalities occur because of the collapse of poorly constructed buildings. In Nepal, many buildings have historically been constructed without adequate seismic design considerations. Schools remain an important focus for earthquake preparedness because they serve as both emergency shelters during earthquakes and effective settings for promoting disaster preparedness and awareness.³

Earthquake preparedness comprises actions undertaken at the individual, organizational, and community levels to reduce the adverse consequences of earthquakes. Although natural disasters are unpredictable and unavoidable, their impacts can be minimized through adequate knowledge and appropriate preparedness practices. Research indicates that increasing public awareness and preparedness for future earthquakes can reduce fatalities and property damage. Therefore, assessing people's knowledge and preparedness is essential for identifying gaps and improving disaster preparedness strategies.⁴ In addition, resilient physical infrastructure plays a critical role in reducing the impact of earthquakes and protecting communities from disaster-related losses.⁵ In a 2021 study conducted in Dhaka, Bangladesh, among higher-level students, 13.0% of the 115 respondents had poor knowledge, 69.6% had average knowledge, and 17.4% had good knowledge regarding earthquake preparedness.⁶

A study conducted in the Bhaktapur district of Nepal found that 91.7% of respondents had heard about earthquake preparedness, 16.9% had prepared a Go bag, and 2.1% had practiced the "duck, cover, and hold" technique during an earthquake. The study also reported

that approximately 50% of the students had adequate knowledge regarding earthquake preparedness, although their preparedness practices remained limited.⁷

Similarly, a descriptive cross-sectional study conducted in Kathmandu in 2023 among 97 secondary-level students identified a gap between knowledge and practice regarding earthquake preparedness. The findings indicated that participants demonstrated better preparedness in the mental and family domains, whereas physical preparedness remained limited. Overall, 50% of the respondents demonstrated adequate knowledge regarding earthquake preparedness.⁸

In a study conducted in Biratnagar, Nepal, to assess knowledge regarding earthquake preparedness, only 23.6% of the 110 participants had a knowledge score above 75%, 24.6% had a score below 50%, and 51.8% had a score between 51% and 75%. According to the study, knowledge was significantly correlated with age, marital status, educational attainment, occupation, and monthly income. Participants aged 20 to 39 scored higher on knowledge assessments than those aged 40 to 60. The knowledge score increased with educational status. The higher the educational status, the higher the knowledge score.⁹

In 2020, 22 schools in Nepal implemented a seismology teaching program to raise awareness of earthquakes and enhance preparedness. To promote both teaching and awareness, educational activities were carried out in each school by providing teacher training, teaching earthquake-related subjects in the classroom, and establishing an affordable seismometer network. Two surveys involving several hundred schoolchildren were conducted before and after the implementation of the program to evaluate its effects. The study demonstrated that school-based educational initiatives were successful in increasing children's awareness and promoting social learning within the community, thereby enhancing the community's capacity to adapt to and prepare for future earthquakes. However, perceptions of danger remained relatively unchanged.¹⁰

Earthquake preparedness consists of the strategies and actions implemented before an earthquake to reduce morbidity and mortality. Knowledge of earthquake preparedness is essential for school students because it helps minimize casualties, prevents panic during unexpected earthquakes, and equips them with life-saving skills that enable them to protect themselves, assist their peers, and ultimately help their families respond safely during disasters. Before implementing earthquake preparedness awareness programs, it is essential to assess students' existing knowledge; therefore, this study was conducted. The reviewed literature indicates that studies conducted in Nepal and other countries have reported varying degrees of knowledge regarding earthquake preparedness. However, awareness of several important aspects of earthquake preparedness remains low. Despite Nepal's high vulnerability to earthquakes, evidence regarding earthquake preparedness knowledge among secondary-level students remains limited. Therefore, this study aimed to assess the level of knowledge and identify knowledge gaps regarding earthquake preparedness among students studying in a government school in Kathmandu.

RESULTS

Table 1: Respondents' Socio-demographic Characteristics (n=130)

Characteristics	Number	Percent
Mean Age $\pm$ SD	17.65 $\pm$ 1.34	
(Age in completed years)		
15-18	105	80.8
19-22	25	19.2
Sex		
Male	70	53.8
Female	60	46.2
Educational status of fathers		
Can read and write	33	25.4
Cannot read and write	24	18.5
Basic level	41	31.5
Secondary level	22	16.9
Bachelor level and above	10	7.7
Educational status of Mothers		
Can read and write	54	41.5
Cannot read and write	30	23.1
Basic level	31	23.8
Secondary level	13	10.0
Bachelor level and above	2	1.5

Table 1 reveals the respondent's sociodemographic characteristics, which shows that minimum age of respondents was 15 years while maximum was 22 years. Similarly, 46.2% respondents are female and 53.8% are male. Regarding the respondent's father's educational status 25.4% can read and write, 18.5% cannot read and write, 31.5% had got basic level education, 16.9% had got secondary level education and 7.7 % had got education of bachelor level and above. Regarding the respondent's mother's educational status 41.5% can read and write, 23.1% cannot read and write, 23.8% had got basic level education, 10% had got secondary level education and 1.5% had got education of bachelor level and above.

Table 2: Respondents' Knowledge and Experience Regarding Earthquake

Variables	Number	Percent
Meaning of earthquake		
collapse of building and landslide	14	10.8
The earth spinning too fast and wobbling	6	4.6
Sudden shaking of earth's crust due to tectonic plane movement#	103	79.2
The eruption of a volcano due to land's movement	7	5.4
Causes of Earthquake		
Heavy rainfall over a long period of time	4	3.0
Sudden change in temperature due to global warming	10	7.8
Movement of tectonic plates beneath earth's surface#	100	76.9
Large construction activities and explosion	16	12.3
Experienced Earthquake	121	93.1
..#Correct response		

Table 2 shows that 79.2% of respondents had correct knowledge regarding the meaning of an earthquake. 76.9% of respondents had correct knowledge regarding the cause of an earthquake. Out of 130 respondents, 93.1% had experienced an earthquake.

Table 3: Respondents' Knowledge Regarding Earthquake Preparedness (n=130)

Variables	Number	Percent
Preparation for earthquake*		
Understanding the safety measures to be taken during earthquake	94	72.3
Safety measures to be taken for earthquake preparation (n=94)		
Collecting the necessary things in a jhatpat-jhola	40	42.6
By preparing first aid safety measures	32	34.0
Developing family emergency plan.	22	23.4
Item to be kept in Jhatpat jhola* (n=40)		
Food	35	87.5
Flashlight, Extra batteries First aid kit	20	50.0
Medications (7day supply) and medical items	15	37.5
Sanitation and personal hygiene items	12	30.0
Copies of personal documents, Cell phone with Chargers	15	37.5
Family and emergency contact information	17	42.5
Extra cash, emergency blanket	13	32.5

#Correct response, *Multiple responses

Table 3 presents the respondents' knowledge regarding earthquake preparedness. The findings indicate that most students lack comprehensive knowledge, which suggests persistent gaps in their understanding of earthquake prepare

Table 4: Respondents' Knowledge Regarding Safety Actions during an Earthquake (n=130)

Variables	Number	Percent
Action to be taken during earthquake if you are inside building*		
Follow the instruction given by teachers#	85	65.4
Stay near heavy objects and table and count for 60 seconds#	4	3.1
Stay under desk and table and count for 60 seconds#	76	58.5
Drop, cover, and hold on	9	6.9
Safe place inside the school building during an earthquake*		
Sit Under a strong table, desk or bed#	92	70.8
Near heavy objects	4	3.1
Away from windows, glass#	17	13.1
Designated safe zones#	61	46.9

Safe place outside the school building during an earthquake*		
Any open places away from tall buildings	69	53.1
Any open places away from tree	30	23.1
Any open places away from electric poles	20	16.4
Open field or playground	84	64.6
Action to be taken if you are inside vehicles*		
Stop the vehicle and search for safe place#	106	81.5
Stopping vehicles above or below the bridge	8	6.2
Keep vehicle away from electric poles and trees#	38	29.2
Immediately run out of vehicle	37	28.5

*Multiple response #Correct response

Table 4 illustrates the respondents' knowledge regarding actions to be taken during an earthquake. Most respondents indicated they would follow teacher instructions if they were inside a school building. Similarly, regarding safe locations, most respondents correctly identified open areas away from buildings. Concerning actions to be taken if inside a vehicle, most respondents identified stopping the vehicle and searching for a safe place, which are considered appropriate safety measures.

Table 5: Respondents' Knowledge Regarding Actions after Earthquake (n=130)

Variables	Number	Percent
Action to be taken if you are inside school building*		
Inspect your surrounding#	55	42.3
Follow the teacher's instruction#	82	63.1
Have your identity card with you#	12	9.2
Ignore emergency alert	13	9.5
Checked immediately*		
Inspect your surrounding and Check for fallen object	70	53.8
Check for after shock	26	20.0
Identify danger and extinguish small fires	32	24.6
Listen to emergency alert	51	39.2

#Correct response*Multiple response

Table 5 illustrates the respondents' knowledge regarding actions to be taken after an earthquake. Regarding actions to be taken while inside a school building, only a

small percentage of students demonstrated knowledge; however, of those responses, 63.1% indicated they would follow teacher instructions.

Table 6: Respondents' Knowledge Regarding Importance of Earthquake Preparedness (n=130)

Variables	Number	Percent
Importance to have knowledge regarding earthquake Preparedness		
Yes		
Important of earthquake preparedness*	120	92.3
To prevent from injuries	45	34.6
To save our life	79	60.8
To reduce damage to property	18	13.8
To create awareness about surviving way during earthquake	59	45.4

Multiple responses*

Table 6 illustrates the respondents' knowledge regarding the importance of earthquake preparedness. The majority of students identified saving lives as the primary reason for such preparedness.

Table 7: Respondents' Level of Knowledge Regarding Earthquake Preparedness

Knowledge level	Number	Percentage
Adequate knowledge (>75%)	13	10.0
Moderately Adequate knowledge Between (50-75%)	43	33.1
Inadequate knowledge (<50%)	74	56.9
Total	130	100

Table 7 presents the respondents' level of knowledge regarding earthquake preparedness. Only 10.0% of the participants demonstrated adequate knowledge. This limited level of proficiency may be attributed to a lack of comprehensive disaster preparedness programs.

Table 8: Association between the Respondents' Level of Knowledge Regarding Earthquake Preparedness and Selected Variables (n=130)

Sociodemographic characteristics	Level of Knowledge			P value
	Adequate Knowledge n (%)	Moderately Adequate n(%)	Inadequate Knowledge n (%)	
Age in completed years				
15-18	12(11.4)	36(34.3)	57(54.3)	0.40
19-22	1(4.0)	7(28.0)		
Gender				
Male	7(11.7)	22(36.7)	31(51.7)	0.52*
Female	6(8.6)	21(30.0)	43(61.4)	
Father's Educational				
Status				
Can read and write	11(10.4)	32(30.2)	63(59.4)	
cannot read and write	2(8.4)	11(45.8)	11(45.8)	0.35
Mother's Educational status				
Can read and write	7(6.7)	35(33.3)	63 (60.0)	
Cannot read and write	6(24.0)	8(32.0)	11(44.0)	0.10*
Experience of Earthquake				
Yes	10(8.3)	40(33.1)	71(58.6)	0.80
No	3(33.4)	3(33.3)	3(33.3)	

Chi-square*

Table 8 demonstrates that there is no statistically significant association between the independent and dependent variables ($p > 0.05$). This suggests that the observed relationships may be attributed to random variation, and there is no statistical evidence to support the existence of a true association within the study population.

DISCUSSION

In this study, only 10.0% of respondents possessed adequate knowledge regarding earthquake preparedness, which aligns with findings from Rahman et al. in Dhaka,

Bangladesh, where 17.4% of participants demonstrated adequate knowledge. This result differs from the study conducted by Devi & Sharma in the Tanahun district of Nepal, where 58.0% of respondents reported adequate knowledge regarding earthquake preparedness. Regarding indoor safety, 70.8% of respondents in the present study identified taking cover under a strong table or desk as the safest action, followed by moving to a designated safe zone (46.9%) and staying away from windows and glass (13.1%). In contrast, Mandal et al. reported that 75.0% of respondents identified staying under a strong table, desk, or bed as the safest measure. These discrepancies may be attributed to variations in disaster preparedness programs and limited practical training at Shivapuri Secondary School.

Regarding earthquake preparedness, 72.3% of respondents in this study reported preparing by understanding necessary safety measures, followed by collecting essential items in a Jhatpat Jhola (42.6%), preparing first-aid supplies (34.0%), and developing a family emergency plan (23.4%). This aligns with the findings of Devi & Sharma, where 80.2% of respondents reported preparing for earthquakes by understanding appropriate safety measures. Regarding initial actions to take if trapped in a room during an earthquake, the majority of respondents (60.0%) identified staying under a desk or table and counting for 60 seconds. This is consistent with the findings of Mandal et al., where 75.0% of respondents reported that they would stay under a strong table, desk, or bed.

In this study, regarding the importance of earthquake preparedness, 60.8% of respondents identified saving lives as the primary objective, followed by creating awareness regarding survival strategies (46.0%). This finding is consistent with the study conducted by Pokhrel, in which 52.1% of respondents identified saving lives as a priority. Regarding post-earthquake actions, 53.8% of respondents indicated the importance of inspecting their surroundings for fallen objects, followed by listening for emergency alerts (39.2%), identifying hazards and extinguishing small fires (24.6%), and checking for aftershocks (20.0%). This result differs from the study conducted by Devi & Sharma, where 95.7% of participants

prioritized identifying dangers and extinguishing small fires. This discrepancy may be attributed to differences in sample size.

In this study, 53.1% of respondents identified open spaces away from tall buildings as the safest outdoor locations during an earthquake, followed by open spaces away from trees (23.1%). This finding differs from the study conducted by Mandal et al. in a government school in Bhaktapur, where 70.0% of respondents were aware of appropriate safe areas. This discrepancy may stem from differences in disaster preparedness training, regional exposure to earthquakes, or survey design. The low percentage in the current study suggests a critical gap in public awareness, highlighting the need for targeted educational programs concerning outdoor earthquake safety measures.

Regarding the association between the level of knowledge regarding earthquake preparedness and selected variables—specifically age, sex, and parental educational status—no statistically significant relationships were identified. The association between the level of knowledge and the father's education ($p = 0.35$) and mother's education ($p = 0.10$) was not statistically significant. These results align with the study conducted by Pokhrel et al., which similarly found no significant relationship between knowledge and sex. Furthermore, the level of knowledge was not statistically associated with the respondent's past earthquake experience ($p = 0.80$). This result is supported by Rahman et al., who found no association between knowledge and previous earthquake experience in their study conducted in Bangladesh.

CONCLUSION

This study reveals that while most students understand basic earthquake concepts and are familiar with emergency tools like the Jhatpat Jhola, practical preparedness remains limited in key areas. A majority of respondents correctly identified safe actions during an earthquake, such as taking cover indoors or moving to open fields. However, significant knowledge gaps persist. For example, less than one-third of participants knew to avoid windows and glass, or to stay away from

electric poles while outdoors. Similarly, there was limited awareness regarding post-earthquake safety, such as checking for aftershocks or keeping identification cards on hand. Ultimately, since only a small minority of students demonstrated an overall adequate level of knowledge regarding earthquake preparedness, there is a clear need for more comprehensive, hands-on safety training in schools.

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Data availability: data are not publicly available, but can be available upon request.

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