Sigma Journal of Engineering and Natural Sciences
Web page info: https://sigma.yildiz.edu.tr
DOI: 10.14744/sigma.2026.1979

Research Article

Investigation of civil engineering students' general disaster preparedness beliefs

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ARTICLE INFO

Article history
Received: 16 July 2024
Revised: 04 September 2024
Accepted: 07 December 2024

Keywords:
Civil Engineering Students; Disaster Preparedness; Health Belief Model

ABSTRACT

In response to the increasing number of natural disasters worldwide, understanding the disaster preparedness of civil engineering students becomes essential for societal resilience. This study investigates the relationships between socio-demographic factors, disaster awareness and preparedness levels among civil engineering students. It also aims to provide insights that could potentially inform and improve disaster response strategies, thereby contributing to the development of a more resilient society. This cross-sectional study, conducted from September 25, 2023, to January 5, 2024, involved civil engineering students at Ankara Yildirim Beyazit University. Data were collected via an online survey on Google Forms, which included socio-demographic questions and the General Disaster Preparedness Belief Scale. The collected data were analyzed to assess students' socio-demographic characteristics, their disaster preparedness levels, and the relationships between these variables. Lastly, a linear regression model was applied to evaluate the effect of independent variables on the General Disaster Preparedness score. The study included 220 participants, with 77.7% male and 22.3% female, and an average age of 22 years. Notably, 37.3% of participants reported prior experience with disasters. The participants exhibited an average total score of 110.59 (±15.38), with scores ranging from 67 to 151. The key factors affecting disaster preparedness score were found to be gender ($p<0.001$), maternal education level ($p=0.026$), type of residence ($p=0.007$), prior disaster experience ($p=0.007$), experiencing the 6 February 2023 Kahramanmaraş earthquakes ($p=0.020$), feeling prepared for a disaster ($p=0.033$), having a disaster/emergency kit ($p<0.001$), receiving emergency/disaster education ($p=0.046$), and knowledge of the emergency assembly points in the participants' area ($p=0.005$). This study represents the first comprehensive investigation into the general disaster preparedness beliefs of civil engineering students, specifically examining the impact of socio-demographic factors and prior disaster experiences on their preparedness perceptions. The results of the study reveal that, despite being above average, the students' General Disaster Preparedness Belief level is still considered inadequate. These results underscore the importance of targeted educational interventions for disaster preparedness, particularly in university settings, and the critical role of students in disaster preparedness and mitigation strategies, which is crucial for building future resilience.

Cite this article as: Biçer Özdemir EZ, Cesur Akın Ö, Ünal E, Mollahalıloğlu S. Investigation of civil engineering students' general disaster preparedness beliefs. Sigma J Eng Nat Sci 2026;44(1):222–233.

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This paper was recommended for publication in revised form by Editor-in-Chief Ahmet Selim Dalkilic

INTRODUCTION

Disasters are defined as events that can occur naturally, technologically, or be caused by human actions. Throughout history, the world and humanity have encountered various disasters and a range of challenges caused by these events. Nonetheless, the capacity of societies to adequately manage and mitigate the repercussions of such events frequently proves inadequate [1].

Pre-disaster strategies encompass the phases of mitigation and preparedness, which are executed through proactive assessments of anticipated impacts associated with a potential disaster. Strategic decisions taken during the mitigation and preparedness phases determine the timing and effectiveness of the response and recovery processes. Therefore, holistic disaster management can only be successful if actions taken at each stage are planned and implemented in a coordinated manner [2–4].

Disaster preparedness encompasses all action plans and efforts designed before a disaster occurs, as well as activities carried out to establish a disaster response system [5]. As a crucial component, disaster preparedness mitigates the adverse impacts of disasters [6,7]. Additionally, it is well-documented that individuals unprepared for emergencies are more likely to experience severe harm or fatality.[8].

A review of the literature identifies various factors that account for differences in disaster preparedness. It has been demonstrated that socio-demographic factors, including age, education and income [9–11] significantly influence preparedness, as well as behavioural factors such as individuals' awareness of disasters [12], risk perceptions [13], feeling prepared for disaster [14], past disaster experiences [15,16] and disaster/first aid training [17,18].

A number of behavioural change models in the literature that can be used to examine how perception can influence behavioural responses regarding health risks [19–21]. Disasters are recognized as significant public health threats, and theoretical frameworks such as the Health Belief Model (HBM) can be effectively employed to predict individuals' behaviours regarding disaster preparedness. HBM is a widely used theoretical framework to predict whether individuals will engage in risk reduction/disease prevention [22]. In addition, the model is based on a value expectancy framework, which suggests that human behaviour is largely driven by the value an individual places on a desired outcome and their assessment of the likelihood that a particular action will achieve that outcome [20,23].

Previous studies utilizing the HBM in assessing disaster preparedness behaviours have highlighted factors such as age, gender, monthly income, occupational status, home ownership, marital status, educational status, and disaster experience as key factors influencing preparedness behaviours. In addition, these studies have found that over half of the participants had not received disaster/emergency and basic first aid training [24–26].

As the incidence of disasters has increased recently, awareness of these catastrophic events has heightened across societies. Nonetheless, the strategies for disaster preparedness, response, and mitigation in educational institutions such as universities and schools remain inadequate [26]. Tanner and Doberstein have highlighted that students are often the least considered group in the development of emergency preparedness plans [27]. In addition, studies have shown that they are more vulnerable to disasters than the general public [28–30].

Although extensive research has addressed the broader aspects of disaster preparedness, the specific role of civil engineering education in fostering disaster response capabilities remains largely unexplored. This study seeks to bridge this gap by applying the HBM to assess how civil engineering students perceive and prepare for disasters. Since the HBM's basic constructs of risk and threat perceptions are well-suited for measuring individuals' levels of disaster preparedness and their perceptions of disasters, this study used the General Disaster Belief Preparedness Scale. Developed on the Health Belief Model and subsequently adapted by Inal, Altintas, and Dogan, this scale is suitable for assessing the preparedness beliefs of individuals [18]. The findings from this study are expected to not only fill a critical gap in current literature but also contribute substantially to enhancing both educational and disaster readiness strategies, thereby improving the overall efficacy of disaster response and mitigation efforts among future engineers.

MATERIAL AND METHODS

Study Design, Data Collection and Sample Size

This cross-sectional study was conducted between 25.09.2023 and 05.01.2024 involving 1st, 2nd, 3rd and 4th grade students who were actively studying at Ankara Yildirim Beyazit University, Faculty of Engineering and Natural Sciences, Department of Civil Engineering. The population of the study consisted of 397 students. The minimum sample size was determined using the OpenEpi software, based on a projected 50% prevalence rate of disaster preparedness behaviours, a 5% margin of error, and a design effect of 1.0. This calculation indicated that a sample size of 196 was necessary to achieve statistically reliable results [31,32].

The research data were collected using an online survey method via Google Forms. Participation in the study was voluntary, emphasizing ethical considerations, and anonymity was strictly maintained as no personal identifiers were collected. Eligibility for the study required participants to be an active undergraduate students enrolled in Ankara Yildirim Beyazit University, Faculty Engineering and Natural Sciences, of Department of Civil Engineering. Exclusion criteria were not being in target undergraduate groups (e.g., graduate or preparatory year students) or not completing the survey fully.

Questionnaire

The General Disaster Preparedness Belief (GDPB) scale, developed by Inal et al. in 2018, is utilized to assess participants' beliefs regarding their disaster preparedness. Additionally, the model proposes that the likelihood of individuals engaging in protective health behaviours is determined by their perceptions regarding: (a) their susceptibility to a particular threat, (b) the severity of the potential consequences of the threat, (c) the availability of preventative measures, and (d) the perceived benefits of these measures outweighing the associated costs.

Within the framework of the HBM, disaster preparedness is determined by a set of critical factors: perceived susceptibility to a disaster, perceived severity of potential disaster impacts, perceived benefits of taking preparedness measures, perceived barriers to implementing these measures, cues to action for preparedness actions, and self-efficacy regarding one's capability to handle disaster scenarios [18]. The cronbach alpha coefficient of the scale is 0.93. The scale has no cut-off point.

The survey is structured into two sections. The first section consists of 19 questions that collect socio-demographic data and information related to disaster experiences of the participants. The second section employs the GDPB scale, which is derived from the Health Belief Model. This scale is divided into six dimensions with a total of 31 items: Self-efficacy (8 items), Cues to action (5 items), Perceived susceptibility (6 items), Perceived barriers (6 items), Perceived benefits (3 items), and Perceived severity (3 items).

In this study, the dependent variable is the GDPB score. Explanatory variables include age, gender, class, parental education level, family income, type of residence, previous experience with any disaster, experience of the 06.02.2024 Kahramanmaraş Earthquake, participation in any emergency/disaster education, possession of an emergency/disaster kit, and knowledge of the emergency assembly point at both the university and the residence.

The GDPB score is measured using a 5-point Likert scale. Evaluation for positive statements; (1) Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly agree. In negative expressions; (5) Strongly Disagree, (4) Disagree, (3) Undecided, (2) Agree, (1) Strongly Agree. This scoring system allows for a comprehensive evaluation of participants' disaster preparedness beliefs, with scores ranging from a minimum of 31 to a maximum of 155.

Statistical Analysis

The research data were initially collected and organized in Microsoft Excel, after which the necessary corrections were made. The data were then transferred to the SPSS 21.0 software package for analysis. The total GDPB score was found to follow a normal distribution based on the mean, median, percentage, standard deviation, and the Kolmogorov-Smirnov test. However, the sub-dimensions of the scale did not show a normal distribution. To examine the relationships between variables, the independent groups t-test and one-way ANOVA were applied to data with normal distribution, whereas the Mann Whitney U and Kruskal-Wallis tests were utilized for data that were not normally distributed. A linear regression model was applied to evaluate the effect of independent variables on the GDPB score. The statistical significance limit was set as $p<0.05$.

RESULTS

The study included 220 participants, consisting of 171 (77.7%) males and 49 (22.3%) females, with an average age of 22 years (min=18, max=32). Regarding the educational backgrounds of the participants' parents, 30.9% of mothers were high school graduates, while 39.1% held university degrees or higher. For fathers, 56.4% were university graduates. The majority of participants were mostly grade student (35%). Most of the participants live in a flat (77.3%) and more than half of them live with their families (62.3%). Family income levels were reported as below expenses by 25 participants (11.4%), equal to expenses by 109 (49.5%), and above expenses by 86 (39.1%) (Table 1).

Disaster experience was reported by 82 participants (37.3%), with 36 having experienced the recent Kahramanmaraş earthquakes (16.4%) and 9 the 1999 Marmara earthquake (4.1%). While 17.7% of the individuals feel adequately prepared for emergencies or disasters, 12.7% of them have an individual emergency or disaster kit. Of the sample, 91 participants (41.4%) had received training on emergencies and disasters, yet only 14 (6.4%) were aware of their university's emergency plan. Knowledge of emergency assembly locations was also limited, with only 33 participants (15%) familiar with the location at their school and 91 (41.4%) at their place of residence (Table 1).

Figure 1 illustrates the maximum, minimum, mean and standard deviation values of the scores obtained from the subcategories of the GDPB scale. The participants achieved a mean total score of 110.59 (±15.38), with a range of scores between 67 and 151 (Fig. 1).

The total score of the GDPB scale was affected by gender ($p=0.038$), with females exhibiting a higher mean total score. The relationship between the educational level of participants' mothers and the total score was statistically significant ($p=0.026$), with the highest scores observed in children of mothers who had graduated from secondary school. Additionally, the type of residence significantly impacted the total scores ($p=0.007$); participants residing in state dormitories demonstrated higher mean total scores. Besides, prior disaster experience ($p=0.007$) and experiencing the Kahramanmaraş earthquakes ($p=0.020$) also had higher total scores. Participants who felt adequately prepared for a disaster ($p=0.033$), have a disaster kit ($p<0.001$), or had received emergency/disaster education ($p=0.046$) have statistically impacted the total score. Additionally, awareness of the emergency assembly location in both university and residency had a higher mean total score (Table 2).

Table 1. Sociodemographic characteristics of participants and distribution of disaster-related variables (n=220)

		n	(%)
Sex	Female	49	22.3
	Male	171	77.7
Mother's Educational Level	Uneducated	5	2.3
	Primary School	35	15.9
	Secondary School	26	11.8
	High School	68	30.9
	Higher Education	86	39.1
Father's Educational Level	Uneducated	0	0.0
	Primary School	20	9.1
	Secondary School	22	10.0
	High School	54	24.5
	Higher Education	124	56.4
Year of Study	1st Year	43	19.6
	2nd Year	57	25.9
	3rd Year	43	19.5
	4th Year	77	35.0
Type of Residence	Flat	170	77.3
	Public Dorm	26	11.8
	Private Dorm	24	10.9
The people live with	Single	30	13.6
	Friend/Friends	48	21.8
	Family	137	62.3
	Relative	5	2.3
Family income status	Income<Expense	25	11.4
	Income=Expense	109	49.5
	Income>Expense	86	39.1
Have you ever experienced a disaster (earthquake, flood, avalanche, landslide, etc.)?	Yes	82	37.3
	No	138	62.7
Have you experienced the Kahramanmaras Earthquakes on February 6, 2023?	Yes	36	16.4
	No	184	83.6
Have you experienced the Marmara Earthquake of 17 August 1999?	Yes	9	4.1
	No	211	95.9
Are you adequately prepared for emergencies/disasters?	Yes	39	17.7
	No	181	82.3
Do you have an individual emergency/disaster kit?	Yes	28	12.7
	No	192	87.3
Have you received any training on emergencies/disasters?	Yes	91	41.4
	No	129	58.6
What educations have you received on emergencies/ disasters?	First Aid	54	24.5
	Community Disaster Volunteer	2	0.9
	Basic Disaster Awareness	33	15.0
	Other	2	0.9
Are you aware of your university's emergency/disaster preparedness plan?	Yes	14	6.4
	No	206	93.6
Do you know the emergency/disaster assembly location in your school?	Yes	33	15.0
	No	187	85.0
Do you know the emergency/disaster assembly location where you live?	Yes	91	41.4
	No	129	58.6

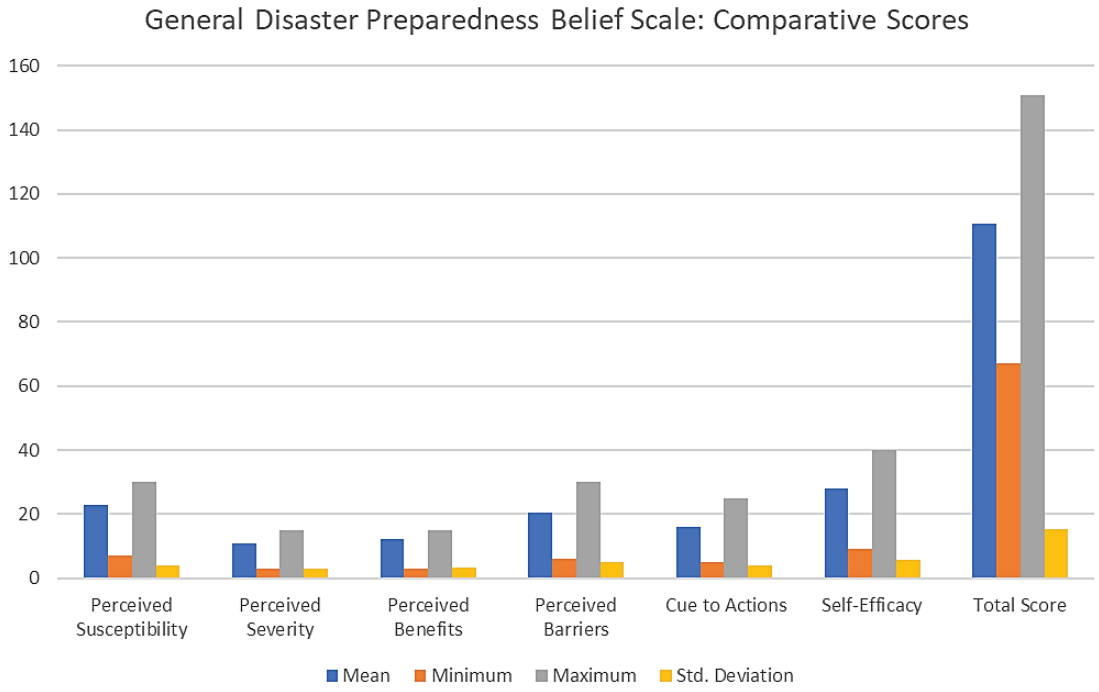

Figure 1. Comparative scores of the general disaster preparedness belief scale factors.

The relationship between "perceived susceptibility", one of the subcategories of the GDPB scale, and the participants' type of residence (p=0.008), previous disaster history (p=0.005), experience of the Kahramanmaraş earthquakes (p=0.002), having a disaster/emergency kit (p=0.004), and knowledge of the emergency assembly point in the region where they live (p=0.046) is statistically significant. The perceived susceptibility scores of those who lived in a state dormitory, had a previous disaster history, had a history of the 6 February 2023 Kahramanmaraş earthquake, had a disaster bag, and knew the emergency assembly point in their region were higher (Table 3).

Gender (p<0.001), experiencing the Kahramanmaraş earthquakes (p=0.009) and feeling adequately prepared for disasters (p=0.021) affect the scores of "perceived severity", one of the subcategories of the GDPB scale. The female gender, having experienced the Kahramanmaraş earthquakes, and participants who felt inadequately prepared for disasters exhibited higher perceived severity medians (Table 3).

There was a statistically significant difference between the self-efficacy subcategory and disaster experience (p=0.001), feeling prepared for a disaster (p<0.001), having a disaster/emergency kit (p=0.001), having received disaster/emergency (p<0.001) and having knowledge of the emergency assembly point in the region where they live (p=0.005) (Table 3).

The independent variables included in the model during the linear regression analysis were gender, mother's education level, type of residence, disaster history, experiencing the Kahramanmaraş earthquakes, disaster preparedness, receiving disaster/emergency education, and knowledge of the emergency assembly point in the region of residence, which had a statistically significant relationship with the total score. The correlation between the independent variables included in the model was examined: gender and experiencing the Kahramanmaraş earthquakes (p=0.041 and r=0.118), gender and disaster preparedness status (p=0.024 and r=-0.134), mother's education level and types of residence (p<0.001 and r=-0.222), mother's education status and disaster preparedness status (p=0.014 and r=-0.149), type of residence and disaster history (p<0.001 and r=-0.149), 346), type of residence and experiencing the Kahramanmaraş earthquakes (p<0.001 and r=-0.238), disaster experience and experiencing the Kahramanmaraş earthquakes (p<0.001 and r=0.447), experiencing the Kahramanmaraş earthquakes earthquakes and receiving disaster/emergency education (p=0.035 and r=-0.122), disaster preparedness status and receiving disaster/emergency education (p=0.001 and r=0.214) were found to be statistically significant.

While the total scores of the participants' GDPB were found to be significant in single analyses with mother's education level, knowledge of the emergency assembly point in residence, past disaster experience, experiencing Kahramanmaraş earthquakes and feeling prepared for a disaster/emergency, they were found not significant in linear regression analyses. The results of multiple analyses of total scores and related factors are given in Table 4.

Table 2. The relationship between the total score of the general disaster belief scale and independent variables

		Mean	Std. Deviation	p-value
Sex**	Female	114.61	17.80	**0.038***
	Male	109.44	14.47	
Mother's Educational Level * **	Uneducated	100.20	8.29	**0.026***
	Primary School	105.14	14.16	
	Secondary School	116.46	15.77	
	High School	111.92	15.39	
	Higher Education	110.58	15.36	
Father's Educational Level * **	Uneducated			0.340
	Primary School	107.25	11.29	
	Secondary School	107.32	17.21	
	High School	113.09	16.96	
	Higher Education	110.62	14.86	
Year of Study***	1st Year	111.55	14.48	0.156
	2nd Year	113.02	15.54	
	3rd Year	111.39	16.25	
	4th Year	107.80	14.97	
Type of Residence***	Flat	109.94	15.03	**0.007***
	Public Dorm	118.88	17.65	
	Private Dorm	106.20	12.38	
People live with***	Single	109.70	20.57	0.851
	Friend/Friends	109.70	14.66	
	Family	111.23	14.35	
	Relative	106.80	17.56	
Family Income Status***	Income<Expense	115.24	19.60	0.232
	Income=Expense	109.41	14.55	
	Income>Expense	110.73	14.96	
Ever experienced any Disaster**	Yes	114.20	15.43	**0.007***
	No	108.44	15.00	
Experienced 6 February 2023 Kahramanmaras Earthquakes**	Yes	116.02	16.96	**0.020***
	No	109.52	14.87	
Experienced 17 August 1999 Earthquake**	Yes	111.77	15.24	0.814
	No	110.54	15.42	
Feeling prepared for a disaster/emergency**	Yes	115.35	16.14	**0.033***
	No	109.56	15.06	
Having disaster/emergency kit**	Yes	120.35	13.10	**<0.001***
	No	109.16	15.20	
Had any emergency/disaster education**	Yes	113.05	16.47	**0.046***
	No	108.85	14.38	
Has knowledge of the University's Disaster Plan**	Yes	114.71	14.32	0.301
	No	110.31	15.44	
Has knowledge of the university's emergency assembly point**	Yes	113.69	12.10	0.209
	No	110.04	15.85	
Has knowledge of the emergency assembly point in the residence**	Yes	114.24	12.56	**0.002***
	No	108.01	16.67	

*p<0,05. **Two-sample t-test was performed. ***One-way ANOVA test was performed.

Table 3. The relationship between general disaster preparedness belief scale subcategories and independent variables

		Perceived susceptibility		Perceived severity		Perceived benefits		Perceived barriers		Cue to actions		Self-efficacy	
		Med. (max-min)	p	Med. (max-min)	p	Med. (max-min)	p	Med. (max-min)	p	Med. (max-min)	p	Med. (max-min)	p
Sex**	Female	24 (13-30)	0,348	13 (5-15)	**<0.001***	14 (3-15)	0,280	23 (12-30)	**0.005***	17 (7-25)	**0,034***	27 (12-40)	0.121
	Male	23 (7-30)		11 (3-15)		13 (3-15)		20 (6-30)		16 (5-25)		29 (9-39)	
Mother's Educational Level ***	Uneducated	22 (13-24)	0.200	10 (6-12)	0.180	11 (7-12)	0.074	18 (12-21)	**0.009***	16 (15-18)	0.387	25 (25-30)	0.821
	Primary School	22 (13-28)		11 (3-15)		12 (3-15)		18 (6-26)		15 (5-25)		28 (18-39)	
	Secondary School	23 (14-30)		13 (6-15)		14 (3-15)		22,5 (12-30)		17 (10-25)		29 (11-40)	
	High School	24 (7-30)		11,5 (3-15)		14 (3-15)		21 (11-30)		16 (7-25)		29 (9-39)	
	Higher Education	23 (13-30)		11 (5-15)		14 (3-15)		22 (6-30)		16,5 (6-25)		28 (14-38)	
Father's Educational Level ***	Uneducated		0.784		0.557		0.707		0.187		0.366		0.245
	Primary School	23 (17-28)		10,5 (6-15)		12,5 (8-15)		19 (6-27)		15,5 (9-21)		28 (17-39)	
	Secondary School	23 (13-30)		12 (5-15)		14 (3-15)		18.5 (10-30)		14 (7-25)		27 (11-40)	
	High School	23 (12-30)		12 (3-15)		13.5 (3-15)		21.5 (13-30)		16.5 (5-25)		28.5 (17-40)	
	Higher Education	23.5 (7-30)		11 (3-15)		13 (3-15)		21 (6-30)		16 (6-25)		29 (9-39)	
Year of Study***	1st Year	24 (13-30)	0.213	12 (3-15)	0.590	12.5 (3-15)	0.528	22 (6-30)	0,687	16 (5-25)	0,214	28.5 (12-38)	0.755
	2nd Year	24 (15-30)		12 (3-15)		14 (3-15)		22 (6-30)		17 (7-25)		29 (17-40)	
	3rd Year	23 (13-30)		11 (4-15)		14 (3-15)		20 (6-30)		17 (10-25)		28 (14-39)	
	4th Year	23 (7-29)		11 (5-15)		13 (3-15)		19 (6-30)		15 (7-24)		28 (9-37)	
Residency***	Flat	23 (7-30)	**0.008***	11 (3-15)	0.293	14 (3-15)	0.398	21 (6-30)	0.075	16 (5-25)	**0.042***	28 (9-39)	0.134
	Public Dorm	25 (16-30)		12 (6-15)		13 (6-15)		20,5 (6-30)		18,5 (6-25)		30 (20-40)	
	Private Dorm	23 (13-28)		11 (6-15)		13 (3-15)		18 (6-30)		15,5 (9-25)		28 (17-37)	
People live with***	Single	23 (7-30)	0.481	12.5 (6-15)	0.619	14 (3-15)	0.584	20 (6-30)	0.088	16 (6-25)	0.831	29 (9-40)	0.543
	Friend/Friends	24 (14-30)		12 (6-15)		13 (3-15)		19 (6-30)		16 (9-22)		28.5(14-39)	
	Family	23 (12-30)		11 (3-15)		14 (3-15)		21 (6-30)		16 (5-25)		28 (11-39)	
	Relative	21 (14-30)		12 (9-12)		12 (3-15)		24 (12-26)		18 (12-19)		26 (19-28)	
Family income status***	Income<Expense	24 (13-30)	0.841	12 (6-15)	0.843	15 (3-15)	0.557	22 (6-30)	0.729	18 (7-25)	0.226	31 (14-40)	0.085
	Income=Expense	23 (13-30)		12 (3-15)		13 (3-15)		20 (6-30)		16 (7-25)		28 (11-39)	
	Income>Expense	23 (7-30)		11 (3-15)		13 (3-15)		21 (6-30)		16 (5-25)		29 (9-39)	

Table 3. The relationship between general disaster preparedness belief scale subcategories and independent variables (continued)

		Perceived susceptibility		Perceived severity		Perceived benefits		Perceived barriers		Cue to actions		Self-efficacy	
		Med. (max-min)	p	Med. (max-min)	p	Med. (max-min)	p	Med. (max-min)	p	Med. (max-min)	p	Med. (max-min)	p
Ever experienced any Disaster**	Yes	24 (13-30)	**0.005***	11 (5-15)	0.174	14 (3-15)	0.066	20 (6-30)	0.520	15,5 (6-25)	0.692	29 (17-40)	**0.001***
	No	23 (7-30)		11 (3-15)		13 (3-15)		21 (6-30)		16 (5-25)		28 (9-38)	
Experienced 6 February 2023 Kahramanmaras Earthquakes**	Yes	25 (13-30)	**0.002***	13 (6-15)	**0.009***	14 (3-15)	0.586	22 (6-30)	0.105	15 (6-25)	0.989	29 (11-40)	0.291
	No	23 (7-30)		11 (3-15)		13 (3-15)		20 (6-30)		16 (5-25)		28 (9-39)	
Experienced 17 August 1999 Earthquake**	Yes	23 (13-25)	0.293	10 (5-15)	0.378	13 (7-15)	0.864	24 (6-28)	0.162	16 (12-22)	0.544	31 (25-36)	0.248
	No	23 (7-30)		11 (3-15)		13 (3-15)		20 (6-30)		16 (5-25)		28 (9-40)	
Feeling prepared for a disaster/ emergency**	Yes	24 (7-30)	0.300	11 (5-15)	**0.021***	14 (3-15)	0.610	23 (6-30)	**0.024***	17 (6-25)	0.056	31 (9-40)	**<0.001***
	No	23 (12-30)		12 (3-15)		13 (3-15)		20 (6-30)		16 (5-25)		28 (11-40)	
Having a disaster/ emergency kit**	Yes	25 (15-30)	**0.004***	11.5 (6-15)	0.883	13.5 (3-15)	0.722	23 (6-30)	**0.005***	18 (12-25)	**0.002***	31 (19-40)	**0.002***
	No	23 (7-30)		11 (3-15)		13 (3-15)		20 (6-30)		16 (5-25)		28 (9-40)	
Had any emergency/disaster education**	Yes	23 (7-30)	0.652	11 (3-15)	0.831	14 (3-15)	0.085	21 (6-30)	0.382	16 (6-25)	0.496	30 (9-40)	**<0.001***
	No	24 (13-30)		12 (3-15)		13 (3-15)		20 (6-30)		16 (5-25)		28 (11-40)	
Has knowledge of the University's Disaster Plan**	Yes	23.5 (15-27)	0.860	10 (7-15)	0.272	12.5 (3-15)	0.483	21 (10-30)	0.456	18 (15-25)	**0.002***	29 (22-39)	0.544
	No	23 (7-30)		11 (3-15)		13 (3-15)		20 (6-30)		16 (5-25)		28 (9-40)	
Has knowledge of the university's emergency assembly point**	Yes	24 (15-29)	0.452	11 (4-15)	0.192	14 (3-15)	0.794	21 (11-30)	0.331	17 (10-24)	0.297	30 (11-39)	0.063
	No	23 (7-30)		12 (3-15)		13 (3-15)		20 (6-30)		16 (5-25)		28 (9-40)	
Has knowledge of the emergency assembly point in the residence**	Yes	24 (14-30)	**0.046***	11 (3-15)	0.748	13 (3-15)	0.876	22 (11-30)	**0.002***	17 (5-25)	0.066	30 (11-39)	**0.005***
	No	23 (7-30)		11 (3-15)		13 (3-15)		19 (6-30)		15 (6-25)		28 (9-40)	

*p<0.05. **Mann-Whitney U test was performed. ***Kruskal-Wallis test was performed.

Table 4. Multiple Regression Analysis for the Factors Affecting the Total Score of the Participants on the General Disaster Preparedness Belief Scale

Variable	B	Std. Error	Beta	95% CI		p
				Lower	Upper	
Constant	155.506	10.796	-	134.223	176.789	<0.001*
Sex	-5.590	2.421	-0.152	-10.362	-0.818	0.022*
Type of residence	-0.843	1.648	-0.036	-4.092	2.406	0.609
Disaster experience	-4.496	2.407	-0.142	-9.241	0.250	0.063
Experience of the February 6 Kahramanmaraş earthquake	-3.778	3.073	-0.091	-9.836	2.280	0.220
Feeling prepared for a disaster	-3.654	2.723	-0.091	-9.022	1.715	0.181
Disaster/emergency training	-4.420	2.103	-0.142	-8.566	-0.274	0.037*
Knowledge of the emergency Assembly point (residential)	-6.066	2.021	-0.195	-10.051	-2.082	0.003*

*p<0.05

(Reference categories: Sex = Female; Type of residence = Home; Disaster experience = Yes; Experience of the February 6 Kahramanmaraş earthquake = Yes; Feeling prepared for a disaster = Yes; Disaster/emergency training = Yes; Knowledge of the emergency assembly point in the residential area = Yes)

DISCUSSION

In this study, the effects of socio-demographic characteristics and disaster-related factors on disaster preparedness beliefs of civil engineering students were investigated using the Health Belief Model.

In general, the disaster preparedness of the participants was above average. In comparison with other studies conducted to determine the level of belief in disaster preparedness, similar results were found in the studies by Inal et al., Ertugrul and Unal, and Arslanoglu et al. [24,25,32].

The results of the study showed that gender, mother's education level, previous disaster experience, type of residence, feeling of being prepared for a disaster/emergency, having a disaster kit, having received disaster/emergency education, and knowledge of the disaster/emergency assembly point had a statistically significant effect on the level of disaster preparedness beliefs.

The results indicate that gender has a significant impact on students' GDPB. In this study, the level of GDPB of female participants exhibited higher levels of GDPB than male participants. Our results align with many studies in the literature [24,32]. However, Inal et al. found no significant effect of gender in their study [25]. The higher scores of females in the perceived severity subcategory may suggest that women perceive disasters more seriously and are more sensitive to potential risks.

In this study, a statistically significant relationship was found between past disaster experience and disaster preparedness belief. Similarly, there are many studies in the literature demonstrating the effect of past disaster experience on disaster preparedness beliefs [24–26]. However, Ertugrul and Unal concluded in their study that past disaster experience had no statistical effect on disaster preparedness [32]. We believe that people with past disaster experience are more likely to be prepared than those without.

Besides, it was found that there was a statistically significant effect on the level of disaster preparedness belief among participants who had experienced the recent 6 February 2023 Kahramanmaraş Earthquakes. Additionally, a statistically significant effect of having experienced these earthquakes on perceived susceptibility and severity was observed. It is thought that the recent nature of the earthquake, the significant casualties and the devastating effect of the earthquake contributed to the high level of disaster awareness and belief in disaster preparedness among participants who had experienced these earthquakes.

Feeling adequately prepared for a disaster/emergency has a significant difference in the disaster preparedness belief level of participants. The disaster preparedness belief level of those who feel prepared was found to be higher in this study. A study conducted among students, demonstrated a significant effect of believing that one is prepared for a disaster/emergency was demonstrated at the level of disaster preparedness beliefs [32]. Additionally, in the Nafaji et al. study, participants were asked if they felt prepared for a disaster, and about four out of five individuals indicated that they did not feel prepared [33]. A similar result was obtained in this study.

The present study revealed a statistically significant correlation between the possession of a disaster/emergency kit and the level of disaster preparedness belief. Participants who had a disaster/emergency kit exhibited a higher level of disaster preparedness belief compared to those who do not. These findings are consistent with those reported in the studies conducted by Arslanoglu et al. and Ertugrul and Unal, which investigated the level of disaster preparedness beliefs [24,32]. It may be posited that individuals who have

a disaster kit are inherently more aware of the potential for disasters.

Furthermore, when the relationship between having a disaster kit and the subgroups of the scale was examined, a statistically significant correlation was found with perceived susceptibility, perceived barriers, cues of action and self-efficacy. Similarly, Arslanoglu et al. have identified the same relationships in their study [24].

The results demostrated a statistically significant effect of receiving basic disaster/emergency education on disaster preparedness belief level, and the disaster preparedness levels of those who received these educations were higher than those who did not receive these educations. This finding is consistent with many studies shows that receiving disaster education increases belief in disaster preparedness [25,32]. In addition, the self-efficacy scores of the participants who received the education were higher than those of the control group. In a study investigating the level of disaster preparedness beliefs of women in the city of Hamadan, Iran, before and after disaster education, it was concluded that the level of disaster preparedness beliefs and self-efficacy increased after the participants were educated [34]. In light of the aforementioned evidence, it can be posited that the provision of fundamental disaster and emergency training has a discernible effect on the levels of disaster preparedness belief and self-efficacy exhibited by those who have undergone such training.

The findings indicated a significant relationship between the level of disaster preparedness beliefs and the state of knowing the emergency assembly point in the region where the participants lived. It was observed that less than half of the students did not know the emergency assembly point in their neighbourhood, and the level of disaster preparedness beliefs of those who knew was higher than those who did not know. Ertugrul and Unal reached a similar result in their study [32].

In the last stage of this study, a regression model was constructed with the factors having a statistically significant relationship with the level of GDPB, which were gender, mother's education level, accommodation type, disaster history, experiencing the Kahramanmaraş Earthquakes, feeling prepared for disaster, disaster/emergency education and knowing the disaster assembly point in the region where they lived, and its relationship with the level of disaster preparedness belief was examined. The findings showed that there was a statistically significant relationship between the level of disaster preparedness beliefs and only gender, receiving disaster/emergency education and knowing the disaster assembly point in the region where they lived. The discrepancies between the initial correlations and the final regression model outcomes suggest that while certain factors appeared to be influential in isolation, their effects may be moderated by interactions with other variables not captured in the model. This could indicate that the direct impact of these factors on disaster preparedness beliefs is less significant when considered in the broader context of interrelated influences.

Limitations

This study is cross-sectional, and its results are specifically generalizable only to civil engineering students at the university where the research was conducted, not to civil engineering students at other institutions. Further studies may focus on a larger sample including different universities. Although we reached the minimum sample size in this study, a total of 55% of civil engineering students responded to the survey. Despite these limitations, measuring the level of disaster preparedness beliefs of civil engineering students, who will play an active role in the creation of disaster resilient cities and disaster preparedness strategies in the future, will contribute to the limited literature in this area.

CONCLUSION

This study investigated the General Disaster Preparedness Belief level of undergraduate students in the Department of Civil Engineering, Faculty of Engineering and Natural Sciences, Ankara Yildirim Beyazit University. This study is the first comprehensive exploration of disaster preparedness beliefs among civil engineering students, revealing how socio-demographic factors and prior disaster experiences shape their perceptions of preparedness. In general, the students' General Disaster Preparedness Belief level is above average but is considered to be inadequate.

The results of this study showed that the level of disaster preparedness beliefs was related to gender, mother's education level, previous disaster experience, type of residence, believing to be prepared for a disaster/emergency, having a disaster/emergency kit, being trained for a disaster/emergency and knowing the emergency assembly point in the region where they lived. These indicators can be the focus of further studies on the general disaster preparedness of civil engineering students.

Insufficient disaster preparedness, which is one of the pre-disaster processes, may cause great loss of life and property during a disaster. Therefore, universities and schools should take a more active role in raising disaster awareness among students and developing effective educational strategies on disaster preparedness. These actions can increase students' awareness of disasters and contribute to society's overall belief in disaster preparedness. In this context, it is important to more effectively direct awareness-raising policies, create unique and effective educational curricula, and develop more effective strategies to enhance students' disaster preparedness capacities.

The findings of this study offer valuable insights into integrating disaster preparedness training among civil engineering students. Future research should investigate how these training programs can be scaled and adapted across different educational levels and engineering disciplines. Additionally, longitudinal studies assessing the impact

of such trainings on students' abilities to respond to real-world disasters would be instrumental. This would provide a clearer understanding of the effectiveness of educational curricula in practical applications. Another significant area for future investigation could involve examining the psychological impacts of disaster preparedness training on students. Determining whether these trainings positively affect students' mental health could inform the development of educational strategies that consider psychological well-being alongside technical skills.

AUTHORSHIP CONTRIBUTIONS

Authors equally contributed to this work.

DATA AVAILABILITY STATEMENT

The authors confirm that the data that supports the findings of this study are available within the article. Raw data that support the finding of this study are available from the corresponding author, upon reasonable request.

CONFLICT OF INTEREST

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ETHICS

The necessary permission and ethical approval to conduct the study was obtained from Ankara Yıldırım Beyazıt University Health Sciences Ethics Committee (14.06.2023, decision number: 06-283). The purpose of the study was communicated to all students. Prior to commencing the study, both verbal and written consent were obtained from all willing students involved. No identifiers were recorded to maintain confidentiality.

STATEMENT ON THE USE OF ARTIFICIAL INTELLIGENCE

Artificial intelligence was not used in the preparation of the article.

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