



## Psycho-social determinants of crisis readiness: A cross-sectional study of Bangladeshi university students

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### ABSTRACT

University students play a critical role in community resilience, but often remain underprepared for diverse crises, including natural hazards and social emergencies. This study examines the psycho-social dimensions of crisis preparedness—factual knowledge, metacognitive awareness, self-efficacy, and social responsibility—among 441 students from private, public, and national universities in coastal regions of Bangladesh. The findings reveal that students exhibit relatively strong self-efficacy and social responsibility, while gaps persist in factual knowledge and metacognitive awareness, indicating limited technical understanding and institutional preparedness. Social responsibility linked with self-efficacy, and self-efficacy significantly influenced metacognitive awareness. Gender differences were minimal, except for higher female engagement in fire preparedness. These results underscore the interdependent nature of cognitive, reflective, and ethical dimensions in shaping effective crisis readiness. The study provides actionable guidance for educators and policymakers to design integrated interventions that cultivate confident, reflective, and socially responsible students capable of responding effectively to complex crises.

### 1. Introduction

Over the past few years, Bangladesh has made significant progress in disaster risk reduction (DRR), particularly through infrastructural development in cyclone-prone coastal areas (Alam et al., 2024; Sony et al., 2023). The establishment of multipurpose cyclone shelters, along with the implementation of landmark policies such as the Standing

Orders on Disaster (SOD) and programs like the Cyclone Preparedness Programme (CPP), reflect the country's alignment with international guidelines such as the Sendai Framework for Disaster Risk Reduction and its commitment to achieving the Sustainable Development Goals (SDGs) (Shamsuzzoha et al., 2025). These initiatives have integrated diverse social groups, ensuring participation across gender and age categories, and have strengthened community-level resilience through

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preparedness, early warning, and coordinated response systems (Sony et al., 2025).

Much of the existing research on disaster management in Bangladesh has highlighted community development outcomes, focusing on areas such as women's empowerment, local livelihood adaptation, and rural resilience strategies (Roy et al., 2023). These studies underscore the importance of inclusive and participatory approaches in building safer societies. However, one critical dimension of preparedness has received limited attention: the psycho-social knowledge of crisis readiness. While infrastructural and policy advancements have enhanced physical protection, the cognitive, psychological, and social capacities required for effective individual and collective response remain underexplored (Sony & Rashid, 2025).

Despite its centrality to effective disaster preparedness, psycho-social knowledge is often undervalued in both research and practice. It encompasses four mutually reinforcing dimensions: factual knowledge of hazards and emergency procedures, metacognitive awareness that enables individuals to critically assess and regulate their readiness, self-efficacy which underpins confidence in responding to crises, and social responsibility, reflecting ethical judgment and prosocial engagement during emergency situations (Amarakoon et al., 2024; Yu et al., 2024). Together, these dimensions shape not only how individuals perceive risks but also how they act in real emergency situations. Without adequate psycho-social knowledge, students may remain passive or ill-prepared despite the presence of physical infrastructure or formal policies (Amarakoon et al., 2024; Yu et al., 2024).

The importance of psycho-social knowledge is particularly relevant in the higher education context (Winters, 2025). University students represent a critical demographic: they are at a stage of developing independent decision-making skills and are likely to become future leaders, professionals, and policymakers. Their preparedness therefore has implications that extend beyond personal safety to the resilience of broader communities. Yet, within Bangladeshi universities, disaster-related education often remains fragmented, with little systematic integration of psycho-social aspects into curricula, campus drills, or extracurricular learning (Chowdhury et al., 2025; Sony & Rashid, 2025). This creates a pressing need to assess and strengthen how students understand, internalize, and apply crisis readiness in both academic and social contexts.

Following earlier studies (Demiryürek & Bada, 2025; Hossain et al., 2019) this study, therefore, seeks to address this gap by examining the psycho-social determinants of crisis readiness among Bangladeshi university students. Specifically, it investigates the interconnections among factual knowledge, metacognitive awareness, self-efficacy, and social responsibility, and evaluates their combined influence on preparedness. By focusing on students, the research foregrounds an often-overlooked group in DRR scholarship and emphasizes the role of higher education in cultivating resilience.

The contribution of this study is threefold. First, it enriches academic discourse by situating psycho-social knowledge at the center of crisis preparedness research in Bangladesh. Second, it provides evidence-based insights for policymakers and educators to integrate disaster readiness into higher education strategies. Third, it directly supports Sustainable Development Goal 4 (Quality Education) by advocating for inclusive and transformative learning that equips young adults with competencies essential for resilience and sustainable development. By advancing the understanding of psycho-social crisis readiness, this study bridges the gap between infrastructural progress and human capacity building, ensuring that Bangladesh's achievements in DRR are sustained through empowered and well-prepared future generations.

## 2. Conceptual framework

The present study draws conceptually from the gender-based risk knowledge framework proposed by Sony et al. (2025), which examined how adolescents' awareness of social and environmental risks is shaped

by gender, socio-cultural norms, and institutional access to information within disaster-prone regions of Bangladesh. Their framework demonstrated that girls exhibited greater sensitivity to social risks and mental health concerns, whereas boys showed relatively higher awareness of environmental hazards and greater reliance on digital information sources. Importantly, schools were identified as central institutional sites through which risk knowledge is socially mediated, reflecting broader structural inequalities and culturally embedded patterns of information access. Grounded in Beck's Risk Society Theory and Giddens' perspective on late modernity, the framework emphasizes that contemporary risks—environmental, technological, and social—are unevenly distributed and perceived, with individuals' responses shaped by institutional trust, socio-cultural positioning, and differential access to knowledge (Beck, 2014; Giddens, 1976).

Building on these theoretical foundations, the current study argues that the core assumptions of this framework remain relevant beyond secondary education and can be meaningfully extended to university students. From a developmental perspective, university students occupy a transitional stage of emerging adulthood, characterized by continued cognitive maturation, identity formation, and social learning rather than complete psychological autonomy. During this stage, risk perception, preparedness, and response behaviors continue to be socially constructed and institutionally influenced. Universities, like schools, function as structured learning environments that shape access to knowledge, norms, and preparedness practices, particularly in hazard-prone contexts (Rashid et al., 2023). However, unlike school students, university students are expected to exercise greater self-regulation (Yu et al., 2024), independent decision-making, and ethical responsibility, necessitating a broader psycho-social conceptualization of crisis readiness.

Accordingly, this study does not replicate Sony et al.'s (2025) gender-based risk knowledge framework but reconceptualizes it by expanding the analytical focus from risk awareness alone to multidimensional psycho-social readiness. Four interrelated constructs are examined: factual knowledge of crisis-related hazards, metacognitive awareness of one's preparedness and knowledge gaps, self-efficacy in responding to crisis situations, and social responsibility toward peers and communities (Rashid et al., 2023). These constructs capture both cognitive and socio-emotional dimensions of preparedness that are particularly salient in higher education contexts, where students are positioned as active agents, potential leaders, and community actors (Chowdhury et al., 2025). While gender remains an important analytical lens, the framework allows for examination of whether gendered patterns observed among secondary school adolescents persist, diminish, or transform within university environments (Sony & Rashid, 2025).

By integrating insights from risk society theory, higher education psychology, and psycho-social preparedness literature, the proposed framework positions the university as a critical institutional space for cultivating inclusive risk literacy, self-efficacy, and socially responsible crisis behavior. Rather than assuming fixed gender differences, the model enables a comprehensive assessment of how knowledge, reflective awareness, confidence, and ethical responsibility interact to shape crisis readiness among university students. In doing so, it aligns with global disaster risk reduction and sustainable development agendas by emphasizing quality education and inclusive capacity building as foundations for long-term resilience.

## 3. Literature review and hypothesis building

Understanding psycho-social knowledge of crisis readiness requires a multidimensional approach encompassing metacognitive awareness, factual knowledge, self-efficacy, and social responsibility. While existing research has examined adolescents' risk perception and preparedness in disaster-prone contexts (Rahman et al., 2022; Wani et al., 2022), such as secondary school students in Bangladesh is a scarcity of studies addressing how university students perceive, process, and prepare for

crises (Sony et al., 2025; Sony & Rashid, 2025). This is a critical gap, as university students face unique challenges and responsibilities, combining emerging adulthood, social independence, and heightened exposure to urban and environmental hazards evident by (Yu et al., 2020; Yu et al., 2024). By focusing on this population, the present study directly responds to the need for understanding different psycho-social knowledge dimensions of crisis readiness among Bangladeshi university students, bridging a major gap in both disaster preparedness and educational psychology literature.

Metacognition, or the ability to reflect on one's knowledge and recognize cognitive gaps, is central to adaptive crisis management (Fraivan et al., 2025). Existing studies suggest that females often demonstrate higher metacognitive awareness, potentially due to socialization patterns and heightened sensitivity to psychosocial hazards such as harassment or bullying (Noor et al., 2025; Yu et al., 2024). However, the majority of this research focuses on adolescents, neglecting how gendered differences manifest in higher education settings where students are expected to assume greater autonomy and leadership in crisis contexts (Husain et al., 2024). Additionally, the influence of cultural and institutional factors on metacognitive skills remains underexplored in university environments (Fraivan et al., 2025). By investigating metacognitive awareness among Bangladeshi university students, this study extends prior scholarship to a new population and context.

Factual knowledge of disasters, including understanding hazards, warning signals, and emergency procedures, forms a foundational aspect of crisis readiness (Amini Hosseini & Izadkhan, 2020; Choudhury & Haque, 2024; Khan et al., 2020; Khan & Mishra, 2022). Research demonstrates that knowledge can strengthen confidence and enhance self-efficacy in managing emergencies (Choudhury et al., 2025; Şahin & Karaca, 2025). Nonetheless, most prior studies emphasize adolescents and secondary school education, leaving university students largely unexamined (Khan & Mishra, 2022; Rabby et al., 2025). Moreover, the relationship between knowledge and self-efficacy is moderated by socio-cultural norms, emotional responses, and perceptions of collective preparedness, especially in collectivist societies such as Bangladesh (Gazi et al., 2025). The current study addresses this gap by exploring how factual knowledge translates into psycho-social confidence among young adults navigating complex social and environmental risks.

Metacognitive awareness complements factual knowledge by enabling students to monitor, evaluate, and regulate both cognitive and emotional processes in crisis situations, enhancing decision-making and behavioral preparedness (Shekh-Abed, 2025). While prior research documents these processes in adolescents, the interplay between metacognition and self-efficacy in university students remains largely uninvestigated (Kabir et al., 2024; Khan et al., 2020; Şahin & Karaca, 2025). By examining this relationship, the study contributes new insights into how reflective thinking informs psycho-social readiness in higher education contexts, highlighting potential gender differences in adaptive crisis strategies.

Social responsibility further extends the understanding of crisis readiness by incorporating ethical and collective dimensions of preparedness. Individuals with higher social responsibility are more likely to engage in prosocial behaviors and community advocacy during emergencies (Lawangen & Roberts, 2023; Roy et al., 2022; Roy et al., 2023). The integration of social responsibility with metacognition and factual knowledge, however, is rarely addressed in existing literature, particularly within university populations in Bangladesh (Fraivan et al., 2025; Roshid & Haider, 2024). This study fills this gap by examining how these psycho-social dimensions interact to shape holistic crisis readiness, offering a nuanced perspective on preparedness that moves beyond knowledge alone to include reflective, affective, and normative capacities.

By focusing on Bangladeshi university students, this study not only extends prior research on secondary school adolescents but also advances the field by investigating the interrelated psycho-social

dimensions of crisis readiness—metacognitive awareness, factual knowledge, self-efficacy, and social responsibility—within a higher education context. It also highlights gendered differences in these dimensions, uncovering potential inequalities and informing strategies for targeted educational interventions. This approach provides both theoretical and practical contributions, offering insights into how universities can cultivate well-rounded, resilient students equipped to navigate environmental, social, and psychosocial hazards. Based on the literature and identified gaps, the study proposes the following hypotheses:

**H1.** Female students exhibit higher metacognitive awareness regarding crisis situations compared to male students.

**H2.** Factual knowledge is positively correlated with crisis self-efficacy.

**H3.** Metacognitive awareness is positively correlated with crisis self-efficacy.

**H4.1.** Factual knowledge and self-efficacy are positively associated with metacognitive awareness regarding crisis management.

**H4.2.** Factual knowledge, metacognitive awareness, and social responsibility are positively associated with crisis self-efficacy.

## 4. Methodology

### 4.1. Study area and population, sampling technique and sample characteristics

Following Sony et al. (2025), this study have conducted in the coastal areas of the Khulna and Barisal divisions of Bangladesh, a region frequently exposed to natural hazards such as cyclones, floods, and thunderstorms, alongside increasing anthropogenic risks including industrial accidents and social crises. The area offers a particularly relevant context for examining students' psycho-social preparedness due to its recurring vulnerability to multidimensional threats. A non-probability judgmental sampling strategy was employed due to the absence of a comprehensive sampling frame for university students residing in coastal regions and the highly mobile nature of student populations across institutions. This approach enabled the purposive inclusion of respondents with direct academic exposure and contextual familiarity with disaster-prone environments.

Judgmental sampling has been widely used in disaster preparedness and higher education research when probability-based sampling is infeasible and when contextual relevance is prioritized over statistical representativeness. Inclusion criteria were: (a) enrollment in a recognized public, private, or national university in Bangladesh; (b) age between 18 and 30 years; (c) study at undergraduate, master's, or doctoral level; and (d) permanent residential address in a coastal region of Bangladesh. Exclusion criteria included students below 18 years of age, non-university learners, individuals without a coastal permanent address, and questionnaires with incomplete or inconsistent responses.

This demographic represents a young, educated population whose crisis awareness, coping skills, and sense of social responsibility can significantly influence broader community resilience. Moreover, this age range coincides with a developmental stage marked by heightened social learning, identity formation, and risk perception, making it well-suited for exploring psycho-social preparedness behaviors. Due to the transient and heterogeneous nature of student populations, a non-probability judgmental sampling strategy was adopted following the study of Yu et al. (2024). This approach allowed for purposive selection of respondents based on their direct academic exposure and ability to articulate knowledge of crises. Compared to probability-based designs, this method ensured greater efficiency in data collection while preserving relevance and reliability. Between February and May 2025, 441 of the 500 distributed questionnaires were returned, resulting in a valid response rate of 88.2%, which is considerably higher than the response rates typically reported in survey research on crisis preparedness. The

required sample size was estimated using Cochran's (1943) formula for a 95% confidence level, 5% margin of error, and an assumed proportion of 0.5, resulting in a minimum required sample of 385 students. To account for potential non-responses and incomplete questionnaires, 500 questionnaires were distributed across the selected universities.

Table 1 summarizes the demographic distribution of respondents. Males ( $n = 222$ ; 50.3%) and females ( $n = 219$ ; 49.7%) were almost equally represented, ensuring gender balance for comparative analysis. The mean age was 23.26 years ( $SD = 3.807$ ), with the largest subgroup aged 21–23 years (51.2%). Educational attainment included undergraduate (54.2%), master's (36.7%), and doctoral students (9.1%), thereby capturing a diverse academic profile of respondents. This variation correlated with the generalizability of findings within the university context.

#### 4.2. Research instrument

The four constructs—factual knowledge (FK), metacognitive knowledge (MK), self-efficacy knowledge (SEK), and social responsibility knowledge (SRK)—were operationalized as composite indices rather than latent psychological traits. This index-based approach is widely used in disaster preparedness and crisis readiness research, where preparedness is conceptualized as an aggregation of context-specific knowledge, skills, and awareness rather than a single underlying psychological factor. However, items measuring factual knowledge were adapted from prior disaster preparedness and emergency response studies (Amini Hosseini & Izadkhah, 2020; Khan et al., 2020; Shah et al., 2020). SEK items were informed by crisis response and survival skill literature (Liu et al., 2020; Yu et al., 2024; Zhu et al., 2020). MK items were developed based on institutional preparedness and reflective awareness frameworks (Mohammed et al., 2020), while SRK items were adapted from studies addressing ethical, inclusive, and community-oriented crisis responses (Rashid et al., 2023).

Each construction was operationalized through multiple items designed to capture both cognitive awareness and practical skills associated with crisis readiness. All items were measured using a five-point Likert scale ranging from 0 (“No knowledge”) to 4 (“I know a lot and can fully express it”), which allowed the calculation of composite scores that represent the overall knowledge level within each construct (see Table 2). The use of composite variables was methodologically appropriate, as psychosocial preparedness is a multidimensional phenomenon that cannot be captured by isolated indicators. Aggregating items into broader indices reduces measurement error, correlated with construct validity, and provides a holistic representation of knowledge and response capacity among students.

The analysis of students' crisis preparedness revealed notable differences across the four psycho-social dimensions. FK was relatively low, indicating limited understanding of practical emergency mechanisms despite some conceptual awareness. SEK was higher, reflecting confidence in certain survival skills, though gaps remained in medical emergencies and psychological support. MK was the lowest, showing minimal awareness of institutional preparedness initiatives such as fire

drills and swimming instruction. SRK scored the highest, highlighting strong awareness of ethical and socially oriented crisis responses, such as supporting autistic peers and preventing child marriage, but limited preparedness for bullying and terrorist threats. Overall, students exhibited strengths in self-efficacy and social responsibility but lacked technical understanding and systematic institutional preparedness, emphasizing the need for holistic interventions to enhance overall crisis readiness.

#### 4.3. Reliability and validity of the instrument

Because the constructs were operationalized as composite indices representing aggregated preparedness domains rather than reflective latent variables, exploratory or confirmatory factor analysis was not deemed methodologically appropriate. The primary objective was to capture breadth of preparedness across multiple crisis-relevant indicators rather than to model an underlying latent trait structure. The internal consistency of the measurement scales was evaluated using Cronbach's alpha. As presented in Table 3, reliability coefficients exceeded the widely accepted threshold of 0.70, with FK ( $\alpha = 0.713$ ), SEK ( $\alpha = 0.782$ ), MK ( $\alpha = 0.701$ ), and SRK ( $\alpha = 0.777$ ). These results confirm that the constructs were measured with sufficient precision.

Construct validity was addressed through multiple strategies. Content validity was ensured through expert review by two academics with expertise in disaster preparedness and educational psychology, who evaluated item relevance and coverage. Face validity was confirmed during pilot testing with 50 university students, who reported clarity, contextual relevance, and cultural appropriateness of the items. Minor linguistic modifications were made to enhance comprehension within the Bangladeshi higher education context.

#### 4.4. Data collection procedures, data analysis strategy

Data collection occurred from February 2025 to May 2025 using questionnaires distributed randomly across campus and through institutional channels to encourage participation. Respondents completed the instruments independently, and all responses were collected anonymously to reduce social desirability bias. Incomplete or inconsistent responses were excluded, yielding a final dataset of 441 valid cases. Data analysis was conducted using SPSS version 26 and aligned with the study's hypotheses. Descriptive statistics, including means, frequencies, and standard deviations, were first computed to summarize respondent characteristics and construct-level scores. Hypothesis 1 (H1), predicting higher MK among female students, was tested using an independent samples  $t$ -test, appropriate for comparing means between two independent groups. Hypotheses 2 and 3 (H2 and H3), which posited positive correlations between FK and SEK and between MK and SEK, were evaluated using Pearson's correlation to assess the strength and direction of associations among continuous variables.

Given the cross-sectional nature of the data, the regression models are presented as exploratory and associative. While relationships among FK, MK, SEK, and SRK are examined, the direction of association does not imply causality. Hypotheses 4.1 and 4.2 (H4.1 and H4.2) examined the predictive role of knowledge constructs on MK and SEK using multiple linear regression, which allowed simultaneous assessment of multiple predictors while controlling for overlapping effects. H4.1 tested whether FK and SEK predicted MK, while H4.2 evaluated FK, MK, and SRK as predictors of SEK. Although the conceptual model involved multiple interrelated constructs, structural equation modeling (SEM) was not employed. The study used composite indices rather than latent variables, making regression more appropriate, and its primary aim was to explore predictive and associative relationships rather than test a fully specified causal model. Multiple regression thus provided a parsimonious and methodologically consistent approach suitable for the exploratory objectives of the study.

Prior to interpreting the regression models, diagnostic tests were

**Table 1**  
Descriptive information of the respondents.

Descriptive variables ( $N = 441$ )		Freq.	percent	M	SD
Age	≤20	71	16.1	23.26	3.807
	21–23	226	51.2		
	24+	144	32.7		
Gender <sup>a</sup>	Boy	222	50.3	1.50	0.501
	Girl	219	49.7		
Education Level <sup>b</sup>	Undergraduate	239	54.2	1.55	0.656
	Master	162	36.7		
	Ph.D.	40	9.1		

<sup>a</sup> 1 = male, 2 = female (Author produces, 2025).

<sup>b</sup> 1 = Undergraduate, 2 = Master, 3 = Ph.D.

**Table 2**  
Question specific variables and items scores.

Question/variables
Factual Knowledge (FK)
1. Awareness of the meaning of disaster.
2. Familiarity with different types of disasters.
3. Knowledge of the number of cyclone/whirlwind warning signals.
4. Understanding of the meaning of each cyclone signal.
5. Awareness of the fire brigade's emergency contact number.
6. Knowledge of the concept of emergency response measures.
7. Awareness of the concept of adolescence.
8. Understanding of the term "mood swing."
9. Knowledge of available fire-extinguishing measures at home or school.
10. Familiarity with the type of water system used for fire extinguishing at home or school.
11. Awareness of emergency hotline numbers for women and child abuse cases.
Self-Efficacy Knowledge (SEK)
1. Awareness of appropriate actions during an earthquake.
2. Awareness of appropriate actions during a thunderstorm.
3. Awareness of appropriate actions during a cyclone.
4. Awareness of appropriate actions during a flood.
5. Knowledge of how to respond to heat stroke during extreme heat or drought.
6. Knowledge of appropriate responses if a classmate is bitten by a snake.
7. Ability to swim.
8. Knowledge of appropriate actions if a classmate falls into water.
9. Knowledge of appropriate responses to electrocution incidents.
10. Awareness of what to do if fire breaks out in school or neighborhood.
11. Awareness of appropriate responses when a classmate becomes suddenly ill or unconscious.
12. Awareness of basic self-defense techniques.
13. Knowledge of how to manage mood swings in oneself or classmates.
Metacognitive Knowledge (MK)
1. Awareness of whether drug-related issues are discussed in the institution.
2. Self-assessed knowledge of providing first aid in accidents.
3. Knowledge of preventive measures to avoid road or boat accidents.
4. Awareness of institutional initiatives for swimming instruction.
5. Awareness of fire drill or emergency practice sessions at the institution.
6. Awareness of whether terrorism and militancy issues are addressed in the institution.
Social Responsibility Knowledge (SRK)
1. Knowledge of appropriate actions in response to eve teasing.
2. Awareness of appropriate responses to sexual harassment by teachers, staff, or others.
3. Knowledge of responses to discrimination based on race, religion, skin color, or health.
4. Awareness of how to respond when classmates are bullied in school or playground.
5. Awareness of appropriate responses during a terrorist attack at school.
6. Knowledge of appropriate interaction and support for autistic peers.
7. Knowledge of appropriate interaction and support for transgender peers.
8. Awareness of measures to help prevent child marriage among classmates.

**Table 3**  
Reliability score of composite variables.

Composite variables	$\alpha$ -Value	Number of items
Factual Knowledge	0.713	11
Self-efficacy Knowledge	0.782	13
Metacognitive Knowledge	0.701	6
Social Responsibility Knowledge	0.777	8

conducted to examine the assumptions of multiple linear regression. Multicollinearity was assessed using collinearity diagnostics, and the condition index values were well below the critical threshold of 30, indicating no serious multicollinearity among predictors. Autocorrelation of residuals was examined using the Durbin–Watson statistic, with values of 1.705 and 1.770 for the two models, suggesting no autocorrelation concerns. Residual diagnostics further indicated that standardized residuals fell within the acceptable range ( $\pm 3$ ), supporting the assumption of normality. Scatterplots of standardized predicted values versus standardized residuals showed no clear pattern, indicating homoscedasticity and linearity. Influential observations were assessed using Cook's distance, and all values were substantially below the critical value of 1. These results confirm that the regression models satisfy

the key assumptions required for reliable interpretation.

#### 4.5. Ethical considerations

The study was conducted in strict adherence to the principles outlined in the Declaration of Helsinki and followed by the UK Economic and Social Research Council (ESRC) Framework for Research Ethics. Ethical safeguards were prioritized: participants were fully informed about the purpose and voluntary nature of the study, and informed consent was obtained from each respondent. Confidentiality and anonymity were strictly maintained, and data were securely stored and used exclusively for academic purposes. These measures ensured that the dignity, rights, and welfare of participants were preserved throughout the research process.

## 5. Results

### 5.1. Gender-based variations in crisis knowledge and preparedness

Table 4 presents the results of an independent sample test comparing boys ( $N = 222$ ) and girls ( $N = 219$ ) across several dimensions of crisis-related knowledge and preparedness. The results show that, in most

**Table 4**  
Gender-based differences in knowledge and preparedness measures.

Variables	Gender (N = 441)	M	SD	t-Value	p-Value
Awareness of institutional discussions on drug-related issues	Boy (N = 222)	2.77	1.452	-0.0207	0.836
	Girl (N = 219)	2.79	1.465		
Self-monitoring of first aid knowledge and application	Boy (N = 222)	2.41	1.152	-1.494	0.136
	Girl (N = 219)	2.57	1.172		
Strategic thinking for accident prevention during travel	Boy (N = 222)	2.84	1.200	0.338	0.735
	Girl (N = 219)	2.80	1.206		
Evaluation of swimming readiness for emergency situations	Boy (N = 222)	0.05	0.319	-0.599	0.550
	Girl (N = 219)	0.07	0.345		
Reflection on institutional fire preparedness practices	Boy (N = 222)	0.18	0.415	-2.392	0.017
	Girl (N = 219)	0.27	0.447		
Awareness and self-monitoring of terrorism and militancy preparedness	Boy (N = 222)	0.40	0.491	-1.619	0.106
	Girl (N = 219)	0.48	0.527		

(Author Produces, 2025)

cases, gender differences are statistically non-significant, with the exception of fire preparedness practices. Firstly, awareness of institutional discussions on drug-related issues was almost identical between boys ( $M = 2.77$ ,  $SD = 1.452$ ) and girls ( $M = 2.79$ ,  $SD = 1.465$ ). The  $t$ -value ( $-0.207$ ) and  $p$ -value ( $0.836$ ) confirm that there is no meaningful gender gap in this area. Similarly, in terms of self-monitoring of first aid knowledge, girls reported a slightly higher mean score ( $M = 2.57$ ,  $SD = 1.172$ ) compared to boys ( $M = 2.41$ ,  $SD = 1.152$ ), but the difference was not statistically significant ( $t = -1.494$ ,  $p = 0.136$ ). In relation to strategic thinking for accident prevention during travel, boys ( $M = 2.84$ ,  $SD = 1.200$ ) and girls ( $M = 2.80$ ,  $SD = 1.206$ ) reported nearly identical levels, with no significant difference ( $t = 0.338$ ,  $p = 0.735$ ). The same trend was observed in the evaluation of swimming readiness, where boys ( $M = 0.05$ ,  $SD = 0.319$ ) and girls ( $M = 0.07$ ,  $SD = 0.345$ ) had very low mean scores, with no statistical significance ( $t = -0.599$ ,  $p = 0.550$ ).

A notable finding emerges in reflection on institutional fire preparedness practices. Girls ( $M = 0.27$ ,  $SD = 0.447$ ) reported significantly higher levels of engagement compared to boys ( $M = 0.18$ ,  $SD = 0.415$ ). The difference reached statistical significance ( $t = -2.392$ ,  $p = 0.017$ ), suggesting that female students demonstrated greater awareness or participation in fire preparedness measures. Finally, regarding awareness and self-monitoring of terrorism and militancy preparedness, girls again scored slightly higher ( $M = 0.48$ ,  $SD = 0.527$ ) than boys ( $M = 0.40$ ,  $SD = 0.491$ ), although this difference was not statistically significant ( $t = -1.619$ ,  $p = 0.106$ ).

Overall, the findings indicate that boys and girls exhibit largely comparable levels of crisis-related knowledge and preparedness. The only significant gender variation lies in fire preparedness, where girls demonstrate greater awareness. This could reflect either institutional practices that engage female students more actively in fire safety, or gendered differences in perception of vulnerability and responsibility during emergencies. The general lack of statistically significant differences suggests that preparedness is more influenced by institutional exposure and collective learning rather than gender alone.

### 5.2. Correlation analysis of FK and SEK

Table 5 presents the Pearson correlation between the composite variables of FK and SEK among the surveyed students ( $N = 441$ ). The

**Table 5**  
Pearson correlation between composite variable of factual knowledge and SEK.

Composite variable	1	2
1. Factual Knowledge	–	
2. Self-Efficacy Knowledge	0.608 <sup>a</sup>	–

Note.  $N = 441$ .  $p < 0.01$  (2-tailed).

<sup>a</sup> Correlation is significant at the 0.01 level (2-tailed).

analysis reveals a positive and statistically significant correlation of  $0.608$  ( $p < 0.01$ , two-tailed) between FK and SEK. This finding indicates that higher levels of factual knowledge are associated with greater self-efficacy in responding to crisis situations. In practical terms, students who demonstrate stronger awareness of disaster concepts, warning signals, and emergency procedures tend to report higher confidence and competence in executing appropriate survival or preventive actions.

The strength of the correlation, which can be considered moderate to strong, suggests that factual knowledge is an important predictor of self-efficacy and underscores the interdependence between cognitive understanding and practical preparedness skills. Overall, the results support the hypothesis that factual knowledge positively contributes to students' crisis self-efficacy, highlighting the importance of integrating knowledge-based training with skill development in disaster preparedness programs.

### 5.3. Correlation analysis of MK and SEK

Table 6 presents the Pearson correlation between the composite variables of MK and SEK among the 441 students. The results show a positive and statistically significant correlation of  $0.627$  ( $p < 0.01$ , two-tailed) between MK and SEK. This indicates that students with higher levels of MK—reflected in their awareness of institutional preparedness, self-reflection, and contextual understanding of crises—tend to exhibit stronger self-efficacy in handling emergency situations. The correlation is moderately strong, suggesting that metacognitive awareness plays a substantial role in shaping students' confidence and ability to implement appropriate actions during disasters.

These findings support the hypothesis (H3) that MK is positively associated with crisis self-efficacy. Practically, this underscores the importance of educational interventions that foster both reflective thinking and situational awareness, as such knowledge not only informs decision-making but also correlated with students' practical preparedness skills.

### 5.4. Regression analysis of MK in crisis preparedness

Table 7 presents the descriptive statistics and Pearson correlations among MK, FK, and SEK for the sample of 441 participants. Descriptively, participants reported moderate levels of MK ( $M = 1.468$ ,  $SD = 0.518$ ) and FK ( $M = 1.846$ ,  $SD = 0.599$ ), while SEK was relatively higher ( $M = 2.549$ ,  $SD = 0.694$ ). Correlational analysis indicates that MK was positively and significantly associated with both FK ( $r = 0.529$ ,  $p < 0.01$ ) and SEK ( $r = 0.627$ ,  $p < 0.01$ ). Additionally, FK and SEK were themselves strongly correlated ( $r = 0.608$ ,  $p < 0.01$ ). These findings suggest interrelatedness among cognitive understanding, practical preparedness skills, and reflective awareness, supporting the theoretical premise that knowledge and skills jointly contribute to metacognitive awareness in

**Table 6**  
Pearson correlation between composite variable of MK and SEK.

Variable	1	2
1. Metacognitive Knowledge	–	
2. Self-Efficacy Knowledge	0.627 <sup>a</sup>	–

Note.  $N = 441$ .  $p < 0.01$  (2-tailed).

<sup>a</sup> Correlation is significant at the 0.01 level (2-tailed).

**Table 7**

Descriptive statistics, correlations, and regression predicting composite variable of MK ( $N = 441$ ).

Variable	M	SD	1	2	3
1. Metacognitive Knowledge	1.468	0.518	–		
2. Factual Knowledge	1.846	0.599	0.529 <sup>b</sup>	–	
3. Self-Efficacy Knowledge	2.549	0.694	0.627 <sup>b</sup>	0.608 <sup>b</sup>	–

<sup>b</sup> Correlation is significant at the 0.01 level (2-tailed).

crisis preparedness contexts.

**Table 8** presents the results of a multiple regression analysis predicting MK from FK and SEK. The overall model was significant, explaining 43% of the variance in MK ( $R^2 = 0.43$ ,  $F(2, 438) = 163.93$ ,  $p < 0.001$ ). Both predictors contributed significantly to the model: factual knowledge ( $B = 0.20$ ,  $\beta = 0.23$ ,  $t = 5.15$ ,  $p < 0.001$ ) and SEK ( $B = 0.36$ ,  $\beta = 0.49$ ,  $t = 10.66$ ,  $p < 0.001$ ). SEK showed a relatively stronger association with MK, suggesting that students' practical preparedness skills are more closely linked with their metacognitive awareness than factual knowledge alone. These results should be interpreted as exploratory associations rather than causal effects.

**Table 9** presents the multicollinearity diagnostics for Regression Model 1, where MK is predicted by FK and SEK. The tolerance values for both predictors are approximately 0.631, which are well above the commonly accepted minimum threshold of 0.20. Correspondingly, the Variance Inflation Factor (VIF) values for both variables are approximately 1.586, which are far below the conservative cutoff value of 5. These statistics indicate that the predictors do not exhibit problematic multicollinearity.

The diagnostics suggest that FK and SEK contribute independent explanatory information in predicting MK, and the regression coefficients can therefore be interpreted with confidence. The low VIF values further indicate that the shared variance between the predictors does not inflate standard errors or distort the stability of the regression estimates.

Overall, these results demonstrate that both cognitive understanding and practical skill development are critical in fostering MK related to crisis preparedness. While FK provides foundational awareness of disasters and preventive measures, SEK correlated with students' reflective and situational understanding, thereby supporting more effective decision-making during emergencies. These findings align with prior research emphasizing the interplay of knowledge and skill in shaping comprehensive preparedness outcomes.

### 5.5. Regression analysis of SEK in crisis preparedness

**Table 10** presents descriptive statistics, Pearson correlations, and interrelationships among SEK, FK, MK, and SRK for the sample of 441 participants. Descriptively, SEK exhibited relatively higher levels ( $M = 2.549$ ,  $SD = 0.694$ ) compared to FK ( $M = 1.846$ ,  $SD = 0.599$ ) and MK ( $M = 1.468$ ,  $SD = 0.519$ ), while SRK also demonstrated high mean scores ( $M = 2.554$ ,  $SD = 0.864$ ). Correlation analysis revealed significant positive associations between SEK and all three predictors: FK ( $r = 0.61$ ,  $p < 0.01$ ), MK ( $r = 0.63$ ,  $p < 0.01$ ), and SRK ( $r = 0.72$ ,  $p < 0.01$ ). These findings suggest that students' practical preparedness skills are closely linked to their cognitive understanding, reflective awareness, and sense

**Table 8**

Regression results.

Predictor	B	SE B	$\beta$	$t$	$p$
Constant	0.17	0.07	–	2.31	0.022
Factual Knowledge	0.20	0.04	0.23	5.15	<0.001
Self-Efficacy Knowledge	0.36	0.03	0.49	10.66	<0.001

**Model Summary.**  $R = 0.65$ ,  $R^2 = 0.43$ , Adjusted  $R^2 = 0.43$ ,  $F(2, 438) = 163.93$ ,  $p < 0.001$ .

**Note.** Correlations are Pearson's  $r$ .  $p < 0.01$  (two-tailed).

**Table 9**

Multicollinearity diagnostics for regression model 1.

Predictor	Tolerance	VIF
Model 1: predicting MK		
Factual Knowledge	~0.631	~1.586
Self-Efficacy Knowledge	~0.631	~1.586

**Table 10**

descriptive statistics, correlations, and regression predicting composite variable of SEK ( $N = 441$ ).

Variable	M	SD	1	2	3	4
1. Self-Efficacy Knowledge	2.549	0.694	–			
2. Factual Knowledge	1.846	0.599	0.61 <sup>b</sup>	–		
3. Metacognitive Knowledge	1.468	0.519	0.63 <sup>b</sup>	0.53 <sup>b</sup>	–	
4. Social Responsibility Knowledge	2.554	0.864	0.72 <sup>b</sup>	0.57 <sup>b</sup>	0.64 <sup>b</sup>	–

<sup>b</sup> Correlation is significant at the 0.01 level (2-tailed).

of social responsibility, reinforcing the interconnected nature of these psychological constructs in crisis preparedness.

**Table 11** reports the multiple regression analysis predicting SEK from FK, MK, and SRK. The model was statistically significant and accounted for 60% of the variance in SEK ( $R^2 = 0.60$ ,  $F(3, 437) = 221.19$ ,  $p < 0.001$ ). All three predictors contributed significantly: FK ( $B = 0.28$ ,  $\beta = 0.24$ ,  $t = 6.39$ ,  $p < 0.001$ ), MK ( $B = 0.28$ ,  $\beta = 0.21$ ,  $t = 5.15$ ,  $p < 0.001$ ), and SRK ( $B = 0.36$ ,  $\beta = 0.45$ ,  $t = 10.68$ ,  $p < 0.001$ ). SRK showed the strongest association with SEK, suggesting that students' understanding of ethical, inclusive, and socially responsible behaviors is closely related to their confidence and self-efficacy in crisis preparedness. Again, these findings are exploratory and should not be interpreted as causal relationships.

**Table 12** presents the multicollinearity diagnostics for Regression Model 2, in which SEK is predicted by FK, MK, and SRK. The tolerance values for the predictors range from 0.514 to 0.633, which are well above the commonly accepted minimum threshold of 0.20. Correspondingly, the VIF values range from 1.581 to 1.946, remaining substantially below the conservative cutoff value of 5. These results indicate that the predictors do not exhibit problematic multicollinearity.

Among the predictors, SRK shows the highest VIF value (1.946) and the lowest tolerance (0.514), suggesting a relatively stronger association with the other predictors compared with the remaining variables. However, these values are still well within acceptable limits and do not indicate instability in the regression estimates.

Overall, the diagnostics confirm that FK, MK, and SRK contribute sufficiently independent explanatory variance in predicting SEK. Therefore, the regression coefficients can be interpreted with confidence, and multicollinearity does not pose a concern for the validity of the model.

These results highlight the multidimensional nature of SEK, demonstrating that practical preparedness is not solely related to factual understanding or reflective thinking, but also significantly shaped by social responsibility and ethical awareness. The findings underscore the importance of integrating cognitive, metacognitive, and socially

**Table 11**

Regression results.

Predictor	B	SE B	$\beta$	$t$	$p$
Constant	0.70	0.08	–	9.14	<0.001
Factual Knowledge	0.28	0.04	0.24	6.39	<0.001
Metacognitive Knowledge	0.28	0.06	0.21	5.15	<0.001
Social Responsibility Knowledge	0.36	0.03	0.45	10.68	<0.001

**Model Summary.**  $R = 0.78$ ,  $R^2 = 0.60$ , Adjusted  $R^2 = 0.60$ ,  $F(3, 437) = 221.19$ ,  $p < 0.001$ .

**Note.** Correlations are Pearson's  $r$ .  $p < 0.01$  (two-tailed).

**Table 12**  
Multicollinearity diagnostics for regression model 2.

Predictor	Tolerance	VIF
Model 2: Predicting SEK		
Factual Knowledge	~0.633	~1.581
Metacognitive Knowledge	~0.546	~1.833
Social Responsibility Knowledge	~0.514	~1.946

responsible components into disaster preparedness education, as such an approach is likely to enhance students' competence, confidence, and overall readiness in emergency situations.

## 6. Discussion

This study examined the interplay of psycho-social dimensions of crisis readiness—factual knowledge, metacognitive awareness, self-efficacy, and social responsibility—among Bangladeshi university students, with a focus on gender differences and predictive relationships among these constructs. The findings reveal that, overall, male and female students demonstrated comparable levels of crisis preparedness like Rashid et al. (2023), with the exception of fire preparedness practices, where female students reported higher engagement. This partially supports H1, indicating that while females may show greater awareness in specific safety practices, gender differences in overall psycho-social knowledge are limited within the university context. The findings suggest that structured institutional exposure and collective learning can mitigate traditional gender disparities, providing novel evidence for the role of higher education in fostering equitable preparedness.

Similarly, the results further confirm H2 and H3, showing positive and significant associations between factual knowledge and self-efficacy, as well as between metacognitive awareness and self-efficacy. Regression analyses indicated that self-efficacy is the strongest predictor of metacognitive awareness, while social responsibility emerged as the most significant predictor of self-efficacy, supporting H4.1 and H4.2. Following the earlier study of Demiryürek and Bada (2025), these findings underscore the interdependence of psycho-social constructs and highlight that practical preparedness, reflective thinking, and socially responsible attitudes jointly enhance confidence and adaptive behaviors during crises.

Moreover, by integrating cognitive, reflective, and ethical dimensions, this study demonstrates the multidimensional nature of psycho-social preparedness. Unlike prior research (i.e., Amini Hosseini and Izadkhah (2020); Khan et al. (2020); Khan and Mishra (2022); Shekh-Abed (2025)) that examined isolated aspects of knowledge or skills, the findings provide a comprehensive model capturing both competence and moral-ethical awareness. The prominent role of social responsibility represents a novel contribution, emphasizing that students' understanding of ethical and community-oriented behaviors significantly correlated with practical preparedness and decision-making during crises.

Importantly, the study highlights that higher education institutions play a critical role not only in imparting factual knowledge but also in shaping students' reflective and socially responsible capacities (Amarakoon et al., 2024; Yu et al., 2024). University curricula, campus drills, and extracurricular programs that incorporate interactive learning, scenario-based simulations, and community engagement initiatives can reinforce the development of self-efficacy and social responsibility (Fraivan et al., 2025; Shekh-Abed, 2025). This suggests that educational interventions tailored to higher education contexts can transform abstract knowledge into actionable readiness behaviors, bridging the gap between theory and practice in disaster preparedness.

Furthermore, the largely gender-neutral findings challenge conventional assumptions about persistent gender disparities in disaster preparedness. While prior studies in adolescent populations have reported significant gendered differences in risk perception and response (Khan

et al., 2020; Rashid et al., 2023; Sony et al., 2025), the current results indicate that when students are exposed to structured institutional environments with equitable access to learning and resources, traditional gender gaps may diminish. This provides an important implication for policymakers and educators: promoting inclusive and participatory learning environments can foster equal preparedness outcomes, ensuring that all students, regardless of gender, develop the competencies necessary for effective crisis response.

Overall, the study advances understanding by quantitatively delineating the relative predictive contributions of each psycho-social dimension, demonstrating that while factual knowledge provides foundational awareness, metacognitive reflection and social responsibility are critical for effective crisis readiness. The findings provide novel insights into the higher education context, showing that a combination of cognitive, reflective, and moral-social factors produces resilient, confident, and socially responsible students capable of navigating complex environmental, social, and psychosocial hazards.

### 6.1. Theoretical contribution

This study extends the conceptual framework of Sony et al. (2025) by moving beyond gendered risk knowledge in secondary school adolescents to a holistic psycho-social model for university students. While previous frameworks focused primarily on knowledge acquisition and gender differences in risk perception, the present study demonstrates the dynamic interactions among factual knowledge, metacognitive awareness, self-efficacy, and social responsibility in shaping crisis preparedness. The findings provide three key theoretical contributions. First, self-efficacy is empirically confirmed as a central mechanism linking reflective awareness and socially responsible attitudes to actionable preparedness, supporting the Social Cognitive Theory proposition that confidence drives adaptive behavior (Yang et al., 2024). Second, social responsibility emerges as a critical driver of practical readiness, highlighting the integration of ethical reasoning and community-oriented behavior as essential components of preparedness. Third, the study offers a multidimensional, culturally contextualized model that captures the interplay between cognitive, reflective, and moral-ethical factors, extending prior frameworks that examined these domains separately. This provides a novel theoretical bridge between gendered risk knowledge and psycho-social crisis readiness in higher education, highlighting the role of universities as sites for cultivating resilient and socially responsible future leaders.

### 6.2. Policy contribution

The study offers actionable implications for policymakers, educators, and university administrators. First, the central role of self-efficacy suggests prioritizing programs that enhance students' confidence in managing emergencies through practical drills, scenario-based exercises, and participatory learning. Second, the influence of SRK underscores the need to cultivate ethical awareness and community-oriented behaviors alongside individual competence. Third, the interdependence of psycho-social dimensions indicates that single-focus interventions are insufficient; integrated programs that combine knowledge acquisition, reflective learning, and social responsibility are necessary to foster comprehensive preparedness. Fourth, the largely gender-neutral outcomes suggest that inclusive institutional strategies, rather than gender-targeted approaches alone, can reduce disparities, supporting standardized curricula, workshops, and extracurricular initiatives that engage all students equitably. Finally, these insights can inform national higher education and disaster management policies by integrating psycho-social preparedness into university regulations, accreditation standards, and national DRR strategies. By embedding cognitive, reflective, and socially responsible components into education, universities can produce graduates who are not only knowledgeable but also resilient, ethically grounded, and capable of contributing to

community-level disaster resilience.

### 6.3. Limitations of the study and future research guidelines

Despite its contributions, this study has several limitations. First, the use of non-probability judgmental sampling limits the generalizability of the findings beyond the sampled universities and coastal regions, as student populations may differ in demographic, socio-cultural, and educational characteristics. Second, reliance on self-reported measures may introduce response bias, including social desirability effects, even with anonymized data collection. Third, the cross-sectional design captures psycho-social preparedness at a single point in time and therefore does not permit causal inference among factual knowledge, metacognitive awareness, self-efficacy, and social responsibility. These constructs may evolve with institutional exposure, training, or lived crisis experience. Future studies employing longitudinal or mixed-method designs are recommended to examine developmental trajectories and causal pathways. Moreover, contextual factors such as institutional culture, curriculum content, and local hazard exposure may influence observed patterns, suggesting caution in extrapolating findings to other educational or national contexts. Because the study is cross-sectional and constructs are highly correlated, the observed relationships should not be interpreted as causal. The possibility of circularity or endogeneity between MK, SEK, FK, and SRK is acknowledged, and further longitudinal research is recommended to clarify directional effects.

## 7. Conclusion

This study examined different dimensions of psycho-social knowledge of crisis readiness among Bangladeshi university students, highlighting the interplay between factual knowledge, metacognitive awareness, self-efficacy, and social responsibility. Findings demonstrate that while gender differences are limited, the interdependence of these constructions is critical for practical preparedness, with social responsibility and self-efficacy emerging as key predictors of readiness. The study makes both theoretical and practical contributions by extending existing frameworks to higher education, quantifying the differential related to psycho-social dimensions, and offering a multi-dimensional model that integrates cognitive, reflective, and ethical factors. Policy implications emphasize the need for integrated, inclusive interventions in universities that build confidence, reflective skills, and ethical awareness, ultimately cultivating resilient students capable of contributing to broader community disaster preparedness. By bridging gaps between knowledge acquisition, reflective practice, and moral-social responsibility, this study provides a novel perspective on crisis readiness, ensuring that higher education can play a central role in fostering well-prepared and socially responsible future generations in disaster-prone contexts.

### CRedit authorship contribution statement

**Md. Atikur Rahaman:** Writing – original draft, Methodology, Formal analysis, Conceptualization. **Mohammad Bin Amin:** Writing – original draft, Project administration, Investigation, Formal analysis. **Biplob Kumar Roy:** Writing – original draft, Investigation, Data curation. **Mohammed Julfikar Ali:** Writing – original draft, Software, Formal analysis, Data curation. **K. M. Anwarul Islam:** Software, Project administration, Formal analysis, Data curation. **M.M. Abdullah Al Mamun Sony:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Sheikh Anwar Hossain:** Writing – review & editing, Project administration, Data curation.

### Informed consent

An informed oral consent has taken each of respondents involved in

this research.

### Ethical approval

The researcher has followed the guidelines of the Declaration of Helsinki and no Human participant have involved in clinical trials. And a formal ethical approval has obtained from the Ethics Review Committee (ERC) of the Institutional Review Board (IRB1), State University of Bangladesh, Dhaka, Bangladesh (Reference number: SUB/IRB1/ERC/2025/01/01) on 23 January 2025.

### Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used Grammarly in order to improve English language and detect the grammatical error. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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The authors declare no conflict of interest with any person or financial institutions.

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### Data availability

Data will be made available on request.

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