

Disaster Preparedness Among Junior High School Students: A Knowledge-Attitude-Practice (KAP)-Based Study in Volcanic Risk Areas

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Abstract: Volcanic eruptions pose a significant threat to communities in Indonesia, particularly in areas surrounding active volcanoes such as Mount Merapi. Despite increasing disaster education efforts, gaps remain in students' preparedness, and previous studies have reported inconsistent findings regarding the roles of knowledge and attitude in shaping preparedness behavior. The Knowledge-Attitude-Practice (KAP) model provides a useful framework to understand how knowledge and attitudes influence preparedness behavior. The purpose of this study was to examine the relationship between knowledge, attitudes, and disaster preparedness among junior high school students in volcanic risk areas using the Knowledge-Attitude-Practice (KAP) framework. This study employed a quantitative cross-sectional design involving 224 students from grades VII, VIII, and IX at Karangnongko 2 Junior High School. A proportionate stratified random sampling technique was used. Data were collected using structured questionnaires measuring knowledge, attitude, and preparedness. Data were analyzed using the Spearman rank correlation test with a significance level of $p < 0.05$. The results showed most students demonstrated good knowledge (92.86%), positive attitudes (95.98%), and were categorized as very ready for disaster preparedness (80.80%). Significant positive correlation were found between knowledge and preparedness ($\rho = 0.433$; $p < 0.001$) and between attitude and preparedness ($\rho = 0.449$; $p < 0.001$). Both relationships were of moderate strength, indicating that higher levels of knowledge and more positive attitudes were associated with better preparedness among students. In conclusion, knowledge and attitude are important factors associated with disaster preparedness among junior high school students in volcanic risk areas. School-based disaster education programs should strengthen both cognitive and affective components to enhance students' preparedness for volcanic eruptions.

Keywords: Attitude; Disaster Preparedness; Junior High School Students; KAP model; Knowledge; Practice; Volcanic Risk Areas

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INTRODUCTION

Indonesia, located at the convergence of major tectonic plates, has one of the highest concentrations of active volcanoes globally, making volcanic eruptions a persistent threat to communities, including school-aged children. The 2010 eruption of Mount Merapi illustrated the severe consequences of volcanic disasters, causing extensive physical damage, loss of life, and significant disruption to

education and the psychosocial well-being of affected populations.

Schools in volcanic risk areas occupy a dual position as both vulnerable institutions and strategic platforms for disaster risk reduction. Students are among the most affected groups during disasters; however, they also have the potential to act as agents of change by disseminating knowledge and promoting preparedness within their families and communities. Studies around Merapi and Gamalama show that while many junior and senior high school students report “good” or “ready” levels of preparedness, important gaps remain in their knowledge, planning, evacuation skills, and confidence in taking appropriate action during eruptions ([Pamungkasih & Atun, 2020](#); [Purnamawati & Afifah, 2022](#); [Sari et al., 2022](#); [Tyas & Pujiyanto, 2020](#)). In several junior high schools, preparedness indices for volcanic eruption are only in the “almost ready” category, especially for emergency planning, warning systems, and resource mobilization ([Nurvitasari et al., 2021](#); [Sari et al., 2022](#)). That is, these indicate insufficient preparation activities that lead to action.

Therefore, the Knowledge-Attitude-Practice (KAP) model provides a useful framework for understanding disaster preparedness among students. Within this framework, knowledge represents the cognitive domain, attitudes represent the affective domain, and disaster preparedness represents the practice domain. and attitude are consistently identified as key determinants of students’ behavior preparedness. Previous studies have demonstrated that the KAP framework is effective in understanding and predicting health-related behaviors, including disease prevention and risk reduction practices ([Bhandari & Takahashi, 2022](#); [Kang & Bagaoisan, 2024](#)). In the context of this study, disaster preparedness refers to students’ readiness and capacity to anticipate, respond to, and recover from volcanic disasters.

Research in volcanic-prone areas finds positive and significant relationships between students’ knowledge, attitudes, and their disaster preparedness levels ([Benardi et al., 2023](#); [Lukman et al., 2021](#); [Pamungkasih & Atun, 2020](#); [Tyas & Pujiyanto, 2020](#)). However, empirical findings remain inconsistent. Some studies report that students may exhibit positive attitudes toward disaster response while still lacking adequate knowledge and practical skills, including evacuation procedures. In addition, limited access to facilities, educational materials, and regular disaster simulations further constrains the translation of knowledge and attitudes into actual preparedness behavior ([Iannah et al., 2021](#); [Nurvitasari et al., 2021](#)). These inconsistencies suggest that knowledge alone may not be sufficient to ensure preparedness, and that the interaction between cognitive and affective factors requires further investigation.

The context of Mount Merapi provides a unique setting to examine these relationships. As one of the most active volcanoes in Indonesia, Merapi exposes nearby communities to recurrent eruptions, which may shape risk perception and behavioral responses in complex ways. Repeated exposure can enhance awareness and adaptive capacity; however, it may also lead to normalization of risk or reduced perceived urgency. Consequently, the relationship between knowledge, attitude, and preparedness in this context may differ from other disaster settings and cannot be assumed to be linear or consistent.

Despite increasing attention to disaster education, important gaps remain in understanding disaster preparedness among students in volcanic-risk areas. Previous studies have mainly described preparedness levels or evaluated disaster education programs, while limited research has examined how knowledge, and attitudes contribute to preparedness behavior among junior high school students. Furthermore, evidence remains insufficient regarding which aspects of preparedness should be prioritized in school-based disaster risk reduction programs. Mount Merapi provides a relevant context for addressing this gap because students living in volcanic-risk areas are repeatedly exposed to disaster threats and preparedness information. Understanding the relationship between knowledge, attitudes, and preparedness is essential for identifying areas that require strengthening.

International and national frameworks highlight schools as central to disaster risk reduction. Integrating volcanic disaster risk reduction into junior high school science and related subjects, and using structured instruments that assess knowledge, attitudes, emergency plans, warning systems, and

resource mobilization, are recommended to enhance student preparedness ([Anggaryani, 2021](#); [Jannah et al., 2021](#); [Tyas et al., 2021](#)). Empirical evidence from Merapi, Gamalama, and other high-risk contexts shows that targeted disaster education, drills, and ICT- or game-based interventions improve students' understanding, perceived self-capacity, and preparedness behaviours ([Anggaryani, 2021](#); [Nyandwi et al., 2024](#); [Purnamawati & Afifah, 2022](#); [Sapuntala et al., 2025](#)).

This study aimed to examine the relationships between knowledge, attitudes, and disaster preparedness among junior high school students living in a volcanic-risk area using the Knowledge-Attitude-Practice (KAP) framework. The findings are expected to provide evidence for improving school-based disaster preparedness programs. Based on the KAP framework, it was hypothesized that higher levels of knowledge and more positive attitudes would be associated with better disaster preparedness among junior high school students living in volcanic-risk areas.

METHODS

This study employed a quantitative approach using a cross-sectional design to examine the relationship between knowledge, attitude, and disaster preparedness among junior high school students in a volcanic risk area. The study was conducted at Karangnongko 2 Junior High School, which is located in close proximity to Mount Merapi. The study population consisted of 510 students enrolled in grades VII, VIII, and IX at Karangnongko 2 Junior High School. The minimum sample size was calculated using Slovin's formula with a 5% margin of error, resulting in a required sample of 224 students. Participants were selected using proportionate stratified random sampling. Students were first stratified according to grade level (VII, VIII, and IX). The number of participants selected from each grade was determined proportionally based on the size of each stratum relative to the total student population. A random selection procedure was then applied within each stratum using the school enrollment list as the sampling frame. A total of 224 questionnaires were distributed and returned. All questionnaires were checked for completeness, and no missing data were identified. Therefore, all 224 questionnaires were included in the final analysis.

The variables in this study consisted of independent variables and a dependent variable. Knowledge and attitude were treated as independent variables, while disaster preparedness was defined as the dependent variable.

Data were collected using a structured self-administered questionnaire comprising four sections: (1) respondent characteristics, (2) knowledge of volcanic disaster preparedness, (3) attitudes toward disaster preparedness, and (4) preparedness behavior. The knowledge section consisted of 25 items, with scores categorized as good (76–100%), fair (56–75%), and poor ($\leq 55\%$) (Arikunto, 2014). The attitude section included 15 items, categorized as positive ($\geq 50\%$) and negative ($< 50\%$) (Azwar, 2015). The preparedness section consisted of 20 items, categorized into five levels: very ready (80–100%), ready (65–79%), nearly ready (55–64%), less ready (40–54%), and not ready ($< 40\%$). These categories were adapted from the disaster preparedness index framework (LIPI-UNESCO/ISDR, 2006), which has been widely used in disaster preparedness studies in Indonesia (Apriyatno et al., 2020). The questionnaire was developed by the research team based on the study objectives and relevant literature on disaster preparedness. Prior to data collection, the instrument was pilot-tested among 32 students at Kemalang 1 Junior High School, who had characteristics similar to those of the study participants. Item validity was assessed using Pearson product-moment correlation. All 25 knowledge items were found to be valid, with item-total correlation coefficients ranging from 0.370 to 0.610, exceeding the critical value ($r = 0.349$). All 15 attitude items were also valid, with item-total correlation coefficients ranging from 0.515 to 0.830. Instrument reliability was evaluated using Cronbach's alpha, demonstrating good internal consistency for the knowledge ($\alpha = 0.858$), attitude ($\alpha = 0.886$), and preparedness ($\alpha = 0.927$) scales.

Data analysis was conducted in three stages. First, univariate analysis was performed to describe the characteristics of respondents and the distribution of knowledge, attitude, and preparedness levels. Second, bivariate analysis using the Spearman rank correlation test was conducted to examine the relationships between knowledge, attitude, and preparedness variables, as the data were ordinal in

nature. Third, the strength and direction of the relationships were interpreted based on correlation coefficients. A significance level of $p < 0.05$ was used to determine statistical significance. Data were analyzed using SPSS version 21. Multivariable analysis was not performed because the primary objective of this study was to examine bivariate relationships between knowledge, attitudes, and disaster preparedness within the Knowledge-Attitude-Practice (KAP) framework rather than to identify independent predictors of preparedness.

All research procedures were approved by the Research Ethics Committee of Universitas Muhammadiyah Surakarta (Approval No. 5744/B.2/KEPK-FKUMS/VI/2025). The study was conducted in accordance with ethical principles, including informed consent, confidentiality, and voluntary participation. Written informed consent was obtained from parents or guardians, and assent was obtained from all participating students before data collection.

RESULTS

A total of 224 complete questionnaires were analyzed. The results are presented in [Table 1](#), covering respondent characteristics, distributions of knowledge, attitude, and preparedness, as well as the relationships among variables.

[Table 1](#) shows that respondents were aged between 12 and 16 years, with a mean age of 14.11 ± 0.95 years. The gender distribution was relatively balanced, consisting of 113 male students (50.45%) and 111 female students (49.55%). Based on grade level, the largest proportion of respondents was from grade VIII (84 students; 37.50%), followed by grades VII and IX, each with 70 students (31.25%). This indicates that all grade levels were proportionally represented. In terms of parental occupation, the majority of respondents' parents were employed (221; 98.7%), while only a small proportion were not employed (3; 1.3%).

Table 1. Respondent characteristics

Characteristics	Min-Max	Mean $\pm$ SD	Frequency	Percentage (%)
Age	12-16	14.11 ± 0.95		
Gender				
Male			113	50.45
Female			111	49.55
Grade				
VII			70	31.25
VIII			84	37.50
IX			70	31.25
Parent's Occupation				
Employed			221	98.7
Not employed			3	1.3
Total			224	100

Distribution of Knowledge, Attitude, and Preparedness

As presented in [Table 2](#), most students demonstrated good knowledge of volcanic disaster preparedness (92.86%), positive attitudes toward disaster preparedness (95.98%), and very high preparedness levels (80.80%). These findings indicate a generally high level of disaster preparedness among students in this volcanic-risk area. Additional descriptive crosstab analyses were conducted to explore preparedness patterns across demographic subgroups. Both male and female students were predominantly categorized as "very ready" for volcanic disasters, accounting for 73.5% (83/113) and 88.3% (98/111), respectively. Similarly, students across grades VII, VIII, and IX were largely classified as "very ready," indicating relatively consistent preparedness levels across grade levels. These findings suggest that disaster preparedness was generally high regardless of demographic characteristics.

Table 2. Distribution of knowledge, attitude, and volcano disaster preparedness

Variable	Frequency	Percentage (%)
Knowledge		
Good	208	92.86
Fair	12	5.36
Poor	4	1.79
Attitude		
Positive	215	95.98
Negative	9	4.02
Preparedness		
Very ready	181	80.80
Ready	21	9.46
Nearly ready	7	3.23
Less ready	12	5.36
Not ready	3	1.34
Total	224	100

Relationship Between Knowledge and Preparedness

[Table 3](#) presents the relationship between knowledge and disaster preparedness. The Spearman rank test showed a statistically significant correlation between knowledge and preparedness ($\rho = 0.433$; $p < 0.001$), indicating a moderate positive relationship. Students with higher levels of knowledge tended to have higher levels of preparedness. Among students with good knowledge, the majority were categorized as “very ready” (177 out of 208 students). In contrast, students with fair and poor knowledge were more likely to fall into lower preparedness categories.

Table 3. Relationship between knowledge and volcano disaster preparedness

Knowledge	Preparedness					Total	ρ	p value
	Very ready	Ready	Nearly ready	Less ready	Not ready			
Good	177	19	5	6	1	208	0.433	< 0.001
Fair	4	2	1	4	1	12		
Poor	0	0	1	2	1	4		
Total	181	21	7	12	3	224		

Relationship Between Attitude and Preparedness

As shown in Table 4, the Spearman rank test also revealed a statistically significant relationship between attitude and preparedness ($\rho = 0.449$; $p < 0.001$), with a moderate positive correlation. Students with a positive attitude were predominantly categorized as “very ready” (181 out of 215 students). Meanwhile, students with a negative attitude were more frequently found in lower preparedness categories, such as “less ready” and “not ready.”

Table 4. Relationship between attitude and volcano disaster preparedness

Attitude	Preparedness					Total	ρ	p value
	Very ready	Ready	Nearly ready	Less ready	Not ready			
Positive	181	19	5	9	1	215	0.449	< 0.001
Negative	0	2	2	3	2	9		
Total	181	21	7	12	3	224		

DISCUSSION

The mean age of respondents in this study was 14.11 years, placing them in early adolescence, a critical period for identity formation and the development of abstract and risk-related thinking. At this stage, adolescents begin to understand consequences and are increasingly capable of engaging in preventive behaviours, including disaster preparedness ([Wibowo et al., 2018](#); [Yildiz et al., 2023](#)). Cross-country work with 11–14-year-old students in Nepal and Turkey similarly shows that children in this age range can perceive hazard risk and identify (at least some) correct protective actions, although important knowledge gaps remain ([Yildiz et al., 2023](#)). These characteristics support the selection of early adolescents as an appropriate target group for school-based disaster education and preparedness interventions ([Ronan et al., 2023](#); [Wibowo et al., 2018](#)).

The demographic characteristics described in this study provide contextual information regarding the participants, who were junior high school students living in a volcanic-risk area near Mount Merapi. These characteristics indicate that the respondents were regularly exposed to disaster-related information and preparedness activities. However, demographic variables were not included in the analytical model; therefore, their potential influence on disaster preparedness cannot be inferred from the present findings. Future studies should examine these factors using appropriate analytical approaches.

The findings of this study demonstrate that both knowledge and attitude are significantly associated with disaster preparedness among junior high school students. This finding is consistent with previous studies conducted in volcanic-prone areas, which reported significant relationships between knowledge, attitudes, and preparedness levels among students ([Lukman et al., 2021](#); [Pamungkasih & Atun, 2020](#); [Tyas & Pujiyanto, 2020](#)). The positive and moderate correlation between knowledge and preparedness ($r = 0.433$; $p < 0.001$) indicates that students with higher levels of knowledge tend to have better preparedness.

However, the moderate strength of the correlation suggests that knowledge alone is not sufficient to fully explain preparedness behavior ([Bhandari & Takahashi, 2022](#); [Yildiz et al., 2023](#)). This finding supports previous evidence describing a gap between knowledge and action, whereby individuals may understand disaster risks but do not consistently translate that understanding into preparedness practices. Disaster preparedness is likely influenced by multiple factors beyond knowledge, including previous disaster experience, participation in evacuation drills, family support, access to disaster information, school preparedness programs, and community disaster awareness ([Bhandari & Takahashi, 2022](#); [Ronan et al., 2023](#)). These factors were not assessed in the present study and may explain why knowledge accounted for only part of the variation in preparedness levels.

Similarly, attitude was found to have a significant and slightly stronger relationship with preparedness ($r = 0.449$; $p < 0.001$). This result is consistent with previous studies emphasizing the important role of positive attitudes in shaping disaster preparedness behavior among students ([Benardi et al., 2023](#); [Lukman et al., 2021](#); [Pamungkasih & Atun, 2020](#)). Students with positive attitudes were more likely to demonstrate higher levels of preparedness, indicating that affective factors play a crucial role in motivating appropriate responses to disaster risk.

The findings support the Knowledge–Attitude–Practice (KAP) framework, which proposes that knowledge contributes to the development of positive attitudes that subsequently influence preparedness-related behaviors ([Bhandari & Takahashi, 2022](#); [Kang & Bagaoisan, 2024](#)). Within this framework, disaster preparedness represents the practice component, reflecting students' readiness to anticipate, respond to, and recover from disaster events. Nevertheless, the moderate correlations observed in this study suggest that preparedness is a multifactorial construct and cannot be explained solely by knowledge and attitudes.

The context of Mount Merapi provides an important explanation for these findings. As one of the most active volcanoes in Indonesia, Merapi exposes communities to recurrent eruptions, which may enhance awareness and familiarity with disaster-related information. This repeated exposure may contribute to the high levels of knowledge, positive attitudes, and preparedness observed in this study.

Similar findings have been reported among students living in disaster-prone areas, where continuous exposure to disaster education and community preparedness activities was associated with higher preparedness levels ([Nurvitasari et al., 2021](#); [Wibowo et al., 2018](#)).

However, repeated exposure may also lead to risk normalization, whereby individuals perceive disasters as routine events and underestimate their potential severity. In such situations, positive attitudes become particularly important in maintaining vigilance and encouraging proactive preparedness behavior. Therefore, disaster education programs should not only focus on increasing knowledge but also on fostering positive attitudes and sustained risk awareness.

A notable finding was the high concentration of respondents in the upper categories of knowledge, attitude, and preparedness. More than 90% of students demonstrated good knowledge and positive attitudes, while more than 80% were categorized as very ready. This pattern suggests a possible ceiling effect, whereby limited variability in responses may reduce the ability to distinguish differences among highly prepared students. Consequently, the observed correlations should be interpreted with caution, as restricted variation in responses may have influenced the magnitude of the associations.

Another possible explanation for the moderate correlations relates to the measurement approach used in this study. Preparedness was assessed through self-reported questionnaires, which reflect perceived readiness rather than objectively demonstrated preparedness skills. Students may have overestimated their preparedness, and social desirability bias may have influenced responses because the survey was conducted in a school setting where students may have felt encouraged to provide socially acceptable answers regarding disaster preparedness.

These findings highlight the importance of integrating both cognitive and affective components into disaster education programs. School-based interventions should not only focus on increasing students' knowledge but also on strengthening positive attitudes through interactive learning approaches such as simulations, evacuation drills, and experiential learning activities ([Nurvitasari et al., 2021](#); [Ronan et al., 2023](#); [Wibowo et al., 2018](#)). Although the findings generally support the KAP framework, future studies should incorporate additional individual, social, and environmental factors to provide a more comprehensive understanding of disaster preparedness among adolescents.

This study has several limitations. First, the cross-sectional design limits the ability to establish causal relationships between knowledge, attitudes, and disaster preparedness. Second, the study was conducted in a single school located in a volcanic-risk area, which may limit the generalizability of the findings. Third, disaster preparedness was assessed using self-reported questionnaires, which may introduce subjective bias, social desirability bias, and potential overestimation of preparedness levels. The high proportion of respondents classified in the upper categories of knowledge, attitude, and preparedness may also indicate a ceiling effect, potentially reducing score variability and influencing the observed correlations. Furthermore, the survey did not include objective assessments of preparedness skills or actual disaster response performance. Confidence intervals for the correlation coefficients were not calculated, which may limit the precision of the reported association estimates.

Future studies should employ longitudinal or intervention-based designs, involve more diverse populations, and incorporate objective measures such as simulations or performance-based assessments. Examining additional factors, including disaster experience, family support, school preparedness programs, and access to disaster information, may also provide a more comprehensive understanding of disaster preparedness among adolescents.

CONCLUSION

This study demonstrates that knowledge and attitudes are significantly associated with disaster preparedness among junior high school students living in a volcanic-risk area. The findings support the Knowledge–Attitude–Practice (KAP) framework, indicating that both cognitive and affective factors contribute to preparedness behavior. However, the moderate correlations observed suggest that preparedness is influenced by additional factors beyond knowledge and attitudes alone.

These findings highlight the importance of strengthening school-based disaster risk reduction programs through integrated educational approaches that enhance both knowledge and positive

attitudes. Future research should incorporate broader populations, objective preparedness measures, and additional individual, family, and environmental factors to better understand disaster preparedness among adolescents.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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ETHICAL CONSIDERATIONS

Ethical approval was obtained from the Research Ethics Committee of Universitas Muhammadiyah Surakarta (Approval No. 5744/B.2/KEPK-FKUMS/VI/2025). Written informed consent was obtained from all participants before data collection. All procedures were conducted in accordance with relevant ethical guidelines and regulations.

INFORMED CONSENT

Written informed consent was obtained from all participant's parents or legal guardians, and assent was obtained from all participating students prior to data collection.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to ethical and institutional considerations.

AUTHOR CONTRIBUTIONS

Fitriana Noor Khayati conceived and designed the study, developed the methodology, performed the data analysis, drafted the manuscript, and completed the final version. Niken Indah Lestari contributed to data collection, data analysis, literature review, and manuscript drafting. Arlina Dhian Suliistyowati provided supervision, critically reviewed the manuscript, and contributed to manuscript refinement. Jun Fukuda contributed to language editing, manuscript review, and preparation for the peer-review process. Akiko Teranishi provided educational perspectives, reviewed the manuscript, and refined the content related to adolescent health education. Hiromi Kawasaki contributed to conceptual guidance, development of the theoretical framework, and critical revision of the manuscript. All authors have read and approved the final version of the manuscript.

DECLARATION OF GENERATIVE AI

The authors used generative artificial intelligence (ChatGPT, OpenAI) to assist with English language editing, improving sentence structure, and enhancing manuscript readability. All scientific content, data analysis, interpretation of results, and final editorial decisions were performed and verified by the authors, who take full responsibility for the content of this manuscript.

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