



The Relationship Between Knowledge and Attitude with Volcano Merapi Eruption Disaster Preparedness Among Household Heads in Turgo Hamlet, Purwobinangun

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ABSTRACT

Background: Indonesia lies at the convergence of the Eurasian, Pacific, and Indo-Australian tectonic plates, making it highly vulnerable to natural disasters such as volcanic eruptions, earthquakes, and tsunamis. Turgo Hamlet, Purwobinangun Village, is among the areas at high risk from a potential eruption of Mount Merapi. Disaster preparedness among household heads plays a crucial role in mitigating disaster impacts, and preparedness is influenced by factors including knowledge and attitude. This study aimed to examine the relationship of knowledge and attitude with the level of disaster preparedness among household heads facing a potential eruption of Mount Merapi in Turgo Hamlet, Purwobinangun Village. **Method:** This quantitative study used a cross-sectional design. The population comprised 311 household heads in Turgo Hamlet, from which 93 respondents were selected by proportionate stratified random sampling. Data were collected using a structured questionnaire and analyzed with Spearman's rank correlation test. **Results:** Knowledge was positively and significantly associated with disaster preparedness ($r_s = 0.622$; $p < 0.001$). Attitude was also positively and significantly associated with disaster preparedness ($r_s = 0.760$; $p < 0.001$). **Conclusion:** Knowledge and attitude are both significantly related to disaster preparedness among household heads in Turgo Hamlet. Higher levels of knowledge and more positive attitudes were associated with better preparedness for a potential eruption of Mount Merapi.



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1. Introduction

Natural disasters are events triggered by natural phenomena such as earthquakes, tsunamis, volcanic eruptions, floods, droughts, storms, and landslides [1]. Over the past five years the world has experienced a series of natural disasters that have destroyed infrastructure, economies, and ecosystems, and claimed lives. On the basis of fifteen recorded disaster events, data from the Centre for Research on the Epidemiology of Disasters place Indonesia fourth in the world, level with the Philippines. The World Risk Index likewise places Indonesia third among countries with the highest disaster risk, with a vulnerability score of 39.8, indicating high risk.

Indonesia lies within the Pacific Ring of Fire, a region of high seismic and volcanic activity extending from North America to the Pacific coast of South America [2]. Indonesia also sits at the meeting point of three continental plates: the Indo-Australian plate to the south, the Eurasian plate to

the north, and the Pacific plate to the east [3]. The combination of the Ring of Fire and the interaction of these three plates gives Indonesia 129 active volcanoes, representing 13% of all volcanoes worldwide [4].

Mount Merapi is one of Indonesia's active volcanoes, situated across the provinces of Central Java and the Special Region of Yogyakarta. It erupts periodically with varying intensity. The major eruption of 2010 killed 279 people, injured 193, and led to the evacuation of approximately 162,715 people from disaster-prone areas [5]. Eruptions of Mount Merapi have destroyed extensive farmland, hundreds of public buildings including schools and health centers, and thousands of dwellings, causing substantial material losses. Wijayanti et al. describe further health-related threats: exposure to volcanic ash and hazardous gases that can cause respiratory disorders, and pyroclastic flows and extreme temperatures that can cause burns and death [6].

Law Number 24 of 2007 defines preparedness as a series of actions taken to prepare for a disaster by planning and undertaking the necessary steps. The National Disaster Management Agency (BNPB) extends this concept by emphasizing that preparedness involves understanding risk through the identification of hazards, vulnerability, and capacity, and encompasses early warning systems, the preparation of contingency and evacuation plans, and capacity building through education, training, and simulation. BNPB emphasizes that community preparedness depends heavily on individual knowledge and attitude in responding to disaster threats [7].

Because Mount Merapi is an active and hazardous volcano and Turgo Hamlet is one of the settlements on its southern slope at high risk of eruption, research on the relationship between knowledge and preparedness in this community is important. Turgo Hamlet was selected as the study site because it lies approximately five kilometers from the summit of Mount Merapi and falls within the high-risk disaster zone. Through Regional Regulation Number 12 of 2012, Article 33(2), the Government of Sleman Regency designates Turgo Hamlet as part of Disaster-Prone Area III. A preliminary interview conducted on 11 May 2025 with the Head of Turgo Hamlet established that the hamlet is home to 311 households located directly within the eruption-prone area of Mount Merapi. During the eruptions of 1994 and 2010 the hamlet was struck by pyroclastic flows that caused significant damage, making it one of the priority areas in the disaster mitigation program of the Sleman Regency Government. Following those events, the government built 131 relocation housing units on village land. The majority of residents nevertheless chose to remain in their original settlement for reasons of economy, belief, and life philosophy.

The community of Turgo Hamlet participates actively in the disaster preparedness education, outreach, and training activities organized by government and private bodies. Levels of community preparedness nevertheless still vary, which indicates that participation in such activities does not necessarily produce the same level of preparedness in every individual. Studies of the correlation of knowledge and attitude with preparedness among household heads living in the eruption-prone area of Mount Merapi also remain limited. This study was therefore conducted to examine the correlation of knowledge and attitude with preparedness for a Mount Merapi eruption among household heads in Turgo Hamlet, Purwobinangun, one of the areas at highest risk of eruption.

2. Methods

This study used a quantitative approach with a cross-sectional design to examine the correlation of knowledge and attitude with preparedness for a Mount Merapi eruption among household heads. The research was conducted in Turgo Hamlet, Purwobinangun, Sleman, from April to May 2026. The study population comprised the 311 household heads of Turgo Hamlet. A sample of 93 household heads was selected by proportionate stratified random sampling, so that each stratum within the population was represented proportionally. Data were collected using a structured questionnaire covering knowledge, attitude, and preparedness, and were analyzed using Spearman's rank correlation test with a significance level of $\alpha = 0.05$.

3. Results and Discussion

3.1. Results

The levels of knowledge, attitude, and preparedness among the 93 household heads are presented in Tables 1 to 3, and the results of the correlation analysis in Table 4.

Table 1. Level of knowledge among household heads

Knowledge	n	%
Good	55	59
Adequate	27	29
Poor	11	12
Total	93	100

Source: primary data, 2026.

Table 1 shows that knowledge among household heads was generally in the good category, comprising 55 respondents (59%), while the smallest group fell in the poor category, comprising 11 respondents (12%).

Table 2. Level of attitude among household heads

Attitude	n	%
Good	37	40
Adequate	45	48
Poor	11	12
Total	93	100

Source: primary data, 2026.

Table 2 shows that attitude among household heads was generally in the adequate category, comprising 45 respondents (48%), while the smallest group fell in the poor category, comprising 11 respondents (12%).

Table 3. Level of preparedness among household heads

Preparedness	n	%
Prepared	41	44
Moderately prepared	39	42
Not prepared	13	14
Total	93	100

Source: primary data, 2026.

Table 3 shows that 41 household heads (44%) fell in the prepared category, while the smallest group, 13 respondents (14%), fell in the not-prepared category.

Table 4. Results of the Spearman rank correlation test

Relationship tested	Correlation coefficient (r_s)	p-value	n
Knowledge – preparedness	0.622	< 0.001	93
Attitude – preparedness	0.760	< 0.001	93

Source: primary data, 2026.

Table 4 shows that the correlation coefficient between knowledge and preparedness was 0.622 with a p-value below 0.001. The null hypothesis was therefore rejected and the alternative hypothesis accepted, indicating a significant relationship that is strong and positive in direction: the better the knowledge of household heads, the better their disaster preparedness tends to be.

The correlation coefficient between attitude and preparedness was 0.760 with a p-value below 0.001. The null hypothesis was likewise rejected and the alternative hypothesis accepted, indicating a significant, strong, and positive relationship: the more positive the attitude of household heads, the better their disaster preparedness tends to be.

3.2. Discussion

3.2.1. Level of knowledge among household heads

Most household heads in Turgo Hamlet had a good level of knowledge of disaster preparedness, comprising 55 participants (59%), followed by the adequate category with 27 participants (29%) and the poor category with 11 participants (12%). Household heads therefore generally had a sound understanding of preparedness for a potential eruption of Mount Merapi. This high level of knowledge is likely to be influenced by the location of Turgo Hamlet within a disaster-prone area, so that residents have both direct experience and more frequent exposure to information on disaster mitigation, evacuation routes, and self-rescue procedures.

This finding accords with the theory of Lawrence Green, in which knowledge acts as a predisposing factor in the formation of individual behavior. Knowledge enables individuals to understand risk, assess situations, and determine appropriate action in the face of a disaster. The same theory nevertheless emphasizes that optimal preparedness behavior is not determined by knowledge alone: behavior is also shaped by enabling factors such as training and educational facilities, and by reinforcing factors such as support from government, health workers, the Regional Disaster Management Agency (BPBD), disaster volunteers, and community leaders.

Although most participants had a good level of knowledge, that knowledge was not evenly distributed across all indicators. The indicator covering first aid and the prioritization of casualty management recorded the lowest score, at 56%. Some household heads therefore remain limited in their understanding of the appropriate first-aid measures to take during an eruption of Mount Merapi. This low score is likely to be related to the limited availability of practical and continuous first-aid training and simulation, so that residents understand mitigation and evacuation better than casualty management skills.

This finding accords with Dewantara and Mulyaningsih [8], who emphasize that knowledge of basic life support is an important competency in disaster preparedness. Ardhia et al. [9] further show that emergency training can improve the knowledge, attitude, and practice of medical first responders in the community. Improving knowledge of first aid therefore requires a practical learning approach delivered through training and simulation. From the perspective of Lawrence Green's theory, continuous guidance by health workers, BPBD, disaster volunteers, and community leaders acts as a reinforcing factor that can both sustain and improve community knowledge.

From an occupational safety and health (OSH) perspective, the ability to provide first aid forms part of emergency response, which aims to reduce the risk of injury and death before a casualty receives definitive medical care. As decision-makers at household level, household heads have an important role in identifying emergency conditions, securing the scene, providing first aid within their capability, and contacting emergency services promptly. First-aid competency is therefore one of the capacities that communities in high-risk disaster areas need to possess.

Knowledge of first aid and the prioritization of casualty management thus remains an aspect requiring strengthening in efforts to improve community preparedness in Turgo Hamlet. Disaster education programs need to focus not only on conveying information about eruption hazards and evacuation procedures but also on first-aid training, casualty management simulation, and integrated evacuation drills conducted periodically with the involvement of BPBD, the community health center, health workers, and disaster volunteers. Such efforts should improve the knowledge of household heads so that it develops into skills that can be applied effectively in an emergency.

3.2.2. Level of attitude among household heads

Most household heads in Turgo Hamlet held an attitude in the adequate category toward preparedness for a Mount Merapi eruption, comprising 45 respondents (48%), followed by the good category with 37 respondents (40%) and the poor category with 11 respondents (12%). Although most household heads understand the threat of an eruption, therefore, not all yet hold the conviction, awareness, and commitment needed to apply preparedness measures optimally. This condition is likely to be influenced by residents' long experience of living in a disaster-prone area, which on one hand

improves their understanding of eruption characteristics but on the other may lower risk perception through adaptation to a recurring threat.

This finding accords with the theory of Lawrence Green, which holds that attitude is a predisposing aspect in the formation of behavior. In the context of disaster preparedness, a positive attitude encourages individuals to be more vigilant, to be willing to take preventive action, and to participate in preparedness efforts. A suboptimal attitude, by contrast, can impede the formation of preparedness behavior even where the individual already possesses adequate knowledge.

Analysis by indicator shows that attitude toward the risk of a Mount Merapi eruption was the lowest-scoring aspect, at 60%. Some household heads therefore do not yet fully regard the threat of an eruption as a risk requiring sustained vigilance. This is likely to be influenced by risk normalization, the tendency to treat a threat as part of everyday life after repeated exposure to the activity of Mount Merapi. Experience of eruptions with relatively contained impacts may also generate excessive confidence, which further lowers risk perception.

This finding is consistent with earlier research showing that perception of the threat of a Mount Merapi eruption is related to the level of community preparedness [10]. Previous studies have likewise reported that knowledge and attitude are important components in the formation of community preparedness for volcanic eruption [11]. Under Lawrence Green's theory, the formation of attitude is determined not only by predisposing factors but also by enabling factors such as disaster education and access to information, and by reinforcing factors such as support from government, BPBD, health workers, disaster volunteers, and community leaders through continuous outreach, training, and simulation.

From an OSH perspective, attitude toward risk is one of the main components of safety culture. Individuals with a positive attitude toward risk tend to be better able to recognize potential hazards, comply with safety procedures, and take preventive action before an emergency arises. Among communities in the eruption-prone area of Mount Merapi, safety culture is reflected in the willingness of household heads to comply with evacuation instructions, take part in disaster simulations, and make appropriate decisions during an eruption.

Attitude toward the risk of a Mount Merapi eruption therefore still requires strengthening as part of efforts to improve preparedness among household heads in Turgo Hamlet. Strengthening should be pursued through continuous risk communication, risk-based education, periodic disaster simulation, and the active involvement of the community in disaster risk reduction activities. Such efforts should improve risk perception, strengthen the commitment of household heads to preparedness measures, and shape behavior better suited to a potential eruption of Mount Merapi.

3.2.3. Level of preparedness among household heads

Most household heads in Turgo Hamlet fell within the prepared category, comprising 41 respondents (44%), followed by the moderately prepared category with 39 respondents (42%) and the not-prepared category with 13 respondents (14%). Household heads therefore generally show good preparedness for a potential eruption of Mount Merapi, covering response to early warning systems, evacuation planning, the availability of evacuation equipment, and participation in disaster programs. This relatively high level of preparedness is likely to be influenced by the geographical position of Turgo Hamlet within a disaster-prone area, so that residents have experience of eruptions and have received various mitigation efforts from government and other stakeholders.

This accords with the theory of Lawrence Green, which holds that preparedness behavior is influenced by predisposing, enabling, and reinforcing factors. Knowledge and attitude form the basis of preparedness, while the availability of training, information, and disaster facilities acts as an enabling factor and support from government, BPBD, health workers, disaster volunteers, and community leaders acts as a reinforcing factor in sustaining and improving preparedness behavior. Preparedness among household heads therefore depends not only on understanding disaster risk but also on the availability of opportunities to practice and of continuous support.

Although most household heads fell in the prepared category, analysis by indicator shows variation in achievement. The indicators covering response to early warning systems, evacuation planning, and the availability of evacuation equipment scored relatively highly, whereas participation in disaster

training and simulation was the lowest-scoring indicator, at 65%. Community preparedness is therefore still shaped more by direct experience of eruptions than by structured training. This low level of participation is likely to be related to training and simulation that remain incidental rather than periodic, so that not all household heads have the same opportunity to take part.

These results are supported by a 2022 literature review concluding that disaster preparedness training delivered through simulation has a positive effect on community preparedness [12]. Previous research has likewise shown a significant relationship between training and the level of community preparedness [13]. Training and simulation therefore play an important role in improving the ability of communities to translate knowledge and attitude into concrete action through rapid decision-making, evacuation in accordance with procedure, and appropriate response to emergency conditions.

From an OSH perspective, training and simulation are important components of preparedness and emergency response because they build competency, coordination, and the capacity for rapid decision-making. Drills conducted periodically improve the ability of individuals to recognize hazards, follow evacuation procedures, use emergency equipment, and minimize the risk of injury or death when a disaster occurs. This finding also indicates that the enabling and reinforcing factors in Lawrence Green's theory still need optimizing through the provision of regular training programs and active support from the various stakeholders.

Disaster training and simulation in Turgo Hamlet therefore need to be conducted periodically, in a structured and continuous manner, with the involvement of all household heads. Activities may take the form of simulations based on Mount Merapi eruption scenarios, integrated evacuation drills, training in the use of early warning systems, and first-aid training involving BPBD, the village government, the community health center, health workers, and disaster volunteers. Such efforts should improve community participation in training while strengthening preparedness behavior, so that household heads are better prepared to protect themselves, their families, and their surroundings during an eruption of Mount Merapi.

3.2.4. Relationship of knowledge and attitude with preparedness

The Spearman correlation test indicates a significant correlation both between knowledge and preparedness and between attitude and preparedness among household heads facing a Mount Merapi eruption ($p < 0.001$). The correlation coefficients indicate positive relationships of strong magnitude: 0.622 for the relationship between knowledge and preparedness, and 0.760 for the relationship between attitude and preparedness. The better the knowledge and the more positive the attitude of household heads, therefore, the higher their level of preparedness for a potential eruption.

These findings can be explained through the theory of Lawrence Green, which holds that behavior is influenced by predisposing, enabling, and reinforcing factors. In this study, knowledge and attitude are the predisposing factors that form the basis of preparedness behavior. Knowledge helps household heads understand the characteristics of an eruption, recognize risk, and determine appropriate action, while attitude reflects the psychological readiness and willingness to apply that knowledge in concrete action. Improving knowledge and forming a positive attitude therefore both play an important part in shaping preparedness behavior.

The strong relationship between knowledge and preparedness indicates that household heads with a sound understanding of disaster matters tend to be better prepared to make decisions, carry out evacuation, and protect family members during an eruption. The relationship between attitude and preparedness, meanwhile, has a higher correlation coefficient than that between knowledge and preparedness. Preparedness is therefore influenced not only by understanding of disasters but also by a positive attitude toward risk that encourages individuals to comply with evacuation instructions, take part in mitigation activities, and prepare preventive measures before a disaster occurs.

These results accord with research showing that good knowledge contributes to the formation of a more positive attitude and ultimately improves disaster preparedness. The present findings nevertheless also show that not all household heads with good knowledge fell within the good attitude or prepared categories [14]. Knowledge alone is therefore insufficient to form optimal preparedness behavior, as Lawrence Green's theory explains in holding that behavior is also influenced by enabling and reinforcing factors.

This is supported by the univariate results, which show that participation in disaster training and simulation was the lowest-scoring preparedness indicator. Although most household heads had good knowledge and a positive attitude, preparedness behavior therefore still requires support through training and simulation conducted routinely. From an OSH perspective, training and simulation are an important part of emergency preparedness because they improve competency, coordination, and the capacity to make rapid and appropriate decisions in an emergency.

Improving preparedness among household heads accordingly requires strengthened knowledge, the formation of positive attitudes, and the provision of structured and continuous disaster training and simulation programs. The Sleman Regency BPBD, the Purwobinangun Village Government, and the Pakem Community Health Center are well placed to deliver periodic disaster education covering risk communication, first aid, early warning systems, and evacuation drills based on Mount Merapi eruption scenarios. Such efforts should improve the capacity of household heads to make decisions, coordinate evacuation, and protect family members effectively when a disaster occurs.

4. Conclusion

The Spearman rank correlation test shows a significant relationship between knowledge and preparedness, with a Spearman's rho of 0.622 and a p-value below 0.001, and between attitude and preparedness, with a Spearman's rho of 0.760 and a p-value below 0.001. The better the knowledge and the more positive the attitude of household heads, therefore, the higher their level of preparedness for a Mount Merapi eruption.

Declaration

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