

Overview of Landslide Disaster Mitigation Knowledge Levels Among Hikers on Mount Lawu

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ABSTRACT

Landslide incidents in Indonesia between 2020 and 2024 totaled 3,720 events nationwide, resulting in 541 fatalities and 1,235 injuries. Public knowledge regarding landslide disasters in Indonesia remains relatively low. This study was motivated by the landslide risk in the Mount Lawu area, which is characterized by steep slopes, high rainfall, and dense hiking activity, thereby increasing hikers' potential exposure to hazards. The aim of this study was to describe the level of landslide disaster mitigation knowledge among hikers on Mount Lawu. This study employed a quantitative descriptive design with an observational method. The sample consisted of 95 respondents selected using accidental sampling among hikers who met the inclusion criteria. The instrument used was a Guttman-scale questionnaire covering indicators of definition, purpose, warning signs, prevention, and landslide countermeasures. The majority of respondents were in the late adolescent category (17–25 years old), male, had a senior high school/vocational school/Islamic senior high school or equivalent educational background, and had prior hiking experience. The majority of respondents' knowledge of landslide disaster mitigation on Mount Lawu was categorized as good.

Keywords: disaster mitigation knowledge; hikers; landslide



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INTRODUCTION

A landslide is a natural event in which a mass of soil or rock slides over another layer due to the inability of that layer to withstand mass changes caused by extreme weather conditions, such as heavy rainfall (1). Ground movement occurs when an imbalance causes part of a slope to move due to gravitational force, ultimately resulting in a landslide. Areas with steep slopes, such as hilly and mountainous regions, have a high risk of ground movement. In line with this, soil type and geological conditions also greatly influence the occurrence of landslides (2).

Landslide occurrences in Indonesia from 2020 to 2024 showed a declining trend, with a recorded total of 3,720 events spread across the country, resulting in 541 fatalities and 1,235 injuries. Public knowledge of landslide disasters in Indonesia remains relatively low despite many communities residing in landslide-prone areas, largely due to the scarcity of education or engaging learning media available to the public. The Geological Agency, through the Center for Volcanology and Geological Disaster Mitigation (PVMBG), has developed

learning media by publishing books on landslides for education levels ranging from kindergarten to senior high school (3). In Central Java Province, 960 landslide events were recorded between 2019 and 2023, spread across the entire province. Central Java is dominated by lithosol soil—a young, still-developing soil type formed from volcanic activity with varying characteristics (soft, rocky, or sandy)—making the province susceptible to landslide disasters. Meanwhile, Karanganyar Regency recorded 25 landslide cases between 2019 and 2023 (4).

Karanganyar Regency is one of the areas vulnerable to landslide disasters due to its numerous hills and sloping terrain. The regency comprises 17 sub-districts, among which Jatiyoso and Ngargoyoso are particularly prone to landslides. Jatiyoso sub-district, in particular, has steep terrain that makes the local soil prone to sliding (3). The number of hikers between November 2024 and January 2025 reached 1,785 people, indicating high public interest in hiking Mount Lawu despite the existing disaster risk. With mitigation measures already in place, hikers are expected to enjoy a safer hiking experience.

Disaster mitigation refers to a series of efforts aimed at minimizing disaster risk, either through physical infrastructure development or through education to raise awareness and build capacity in facing disaster-related threats (5). Landslide mitigation efforts can be carried out through structural and non-structural approaches. Structural mitigation involves physical measures to minimize disaster impact, such as constructing landslide-resistant structures like embankments or retaining walls in steep-slope areas. Non-structural mitigation relies more on technology for predicting and anticipating disaster risk and is closely related to human resources and relevant institutions, such as the use of GIS (Geographic Information Systems) for landslide hazard mapping (6), as well as conducting disaster simulation exercises to enhance public knowledge in the event of a disaster.

METHODS

This study used a quantitative descriptive design with an observational method. Descriptive research aims to describe current problems or specific phenomena based on empirical data obtained in the field. Data collection was conducted through observation, including interviews and questionnaire distribution. The questionnaire was used as the data collection instrument, providing respondents with a set of written questions to answer. This study was non-interventional in nature, meaning there was no treatment or manipulation of variables; rather, it aimed solely to describe the level of landslide disaster mitigation knowledge among hikers on Mount Lawu.

The population consisted of all hikers present along the Mount Lawu hiking trail base camp between November 2024 and January 2025, totaling 1,785 people, comprising 418 hikers in November, 604 hikers in December, and 763 hikers in January. The calculated sample size was 94.69, rounded up to 95 respondents.

The inclusion criteria were respondents willing to participate by completing the questionnaire, able to read and write, and aged above 12 and below 60 years. The exclusion criteria included mountain porters, mountain rangers, and base camp staff or officers.

The research instrument was a questionnaire used to assess the level of landslide disaster mitigation knowledge. Sampling employed a non-probability technique using the accidental sampling method, in which hikers who incidentally encountered the researcher were used as samples if deemed suitable as a data source.

Data analysis included editing, coding, entry, tabulating, and cleaning. The analysis method used was univariate analysis in the form of descriptive percentages, applied to understand hikers' preparedness for landslide disasters along the hiking trail. Analysis was also conducted on the demographic characteristics of hikers, including frequency distribution and percentage based on age, gender, education level, and hiking experience.

RESULTS

This descriptive study was conducted to describe the level of landslide disaster mitigation knowledge among hikers. Data collection was carried out over two days. The subjects comprised 95 samples within the productive age range of 12–55 years. The research was conducted incidentally among hikers who happened to be encountered at the research location. Characteristic data were categorized based on gender, age, educational background, hiking experience, and knowledge level, as presented in the following tables.

Table 1. Frequency Distribution of Respondents by Age

No	Age Category	Frequency (f)	Percentage (%)
1	Early adolescence (12–16 years)	2	2.1%
2	Late adolescence (17–25 years)	65	68.4%
3	Early adulthood (26–35 years)	17	17.9%
4	Late adulthood (36–54 years)	11	11.6%
Total		95	100%

Source: Primary Data, 2025

The majority of respondents were aged 17–25 years (late adolescence), totaling 65 respondents (68.4%), while the smallest group, aged 12–16 years (early adolescence), comprised 2 respondents (2.1%).

Table 2. Frequency Distribution of Respondents by Gender

No	Gender	Frequency (f)	Percentage (%)
1	Male	53	55.8%
2	Female	42	44.2%
Total		95	100%

Source: Primary Data, 2025

The majority of respondents were male, totaling 53 respondents (55.8%), while female respondents totaled 42 (44.2%).

Table 3. Frequency Distribution of Respondents by Education

No	Education Level	Frequency (f)	Percentage (%)
1	Junior High School/Islamic Junior High School or equivalent	4	4.2%
2	Vocational/ Senior High School/Islamic Senior High School or equivalent	56	68.9%
3	Higher Education	35	36.8%
Total		95	100%

Source: Primary Data, 2025

The majority of respondents had a vocational/senior high school/Islamic senior high school or equivalent background, totaling 56 respondents (68.9%), while the smallest group had a junior high school/Islamic junior high school or equivalent background, comprising 4 respondents (4.2%).

Table 4. Frequency Distribution of Respondents by Hiking Experience

No	Experience	Frequency (f)	Percentage (%)
1	Experienced	79	83.2%
2	Inexperienced	16	16.8%
	Total	95	100.0%

Source: Primary Data, 2025

The majority of respondents had prior hiking experience, totaling 79 respondents (83.2%), while those without such experience totaled 16 respondents (16.8%).

Table 5. Frequency Distribution of Respondents by Knowledge Level

No	Knowledge Level	Frequency (f)	Percentage (%)
1	Good	94	98.9%
2	Fair	1	1.1%
	Total	95	100%

Source: Primary Data, 2025

The majority of respondents had a good level of knowledge, totaling 94 respondents (98.9%), while 1 respondent (1.1%) had a fair level of knowledge.

DISCUSSION

This indicates that younger individuals show high interest in hiking activities, yet remain vulnerable due to a lack of experience and adequate knowledge of disaster risk. Younger individuals tend to have high curiosity but may also be less vigilant regarding hazards present in the hiking environment. This finding is consistent with Darsini, Fahrurrozi and Cahyono (7), who stated that age influences an individual's level of knowledge because it reflects maturity and critical thinking capacity.

A study by Devi and Noorratri (8) also emphasizes that adolescence is a transitional period marked by physical, psychological, and intellectual changes. As age increases, a person's comprehension and understanding tend to develop further, as noted by Syafitri and Hartutik (9), whose study found that the majority of respondents had sufficient knowledge (85%).

Male and female hikers may exhibit different levels of cognitive knowledge regarding disaster mitigation; in practice, however, females tend to be more meticulous when completing tasks. This does not necessarily indicate that males possess lower cognitive knowledge males generally show more varied thinking patterns and greater physical capability. This finding is consistent with Cahyo and Fatmawati (10). According to Permatasari and Sidarta (5), males tend to engage in higher levels of physical activity than females. In addition, male hikers may be more involved in hiking communities, making it easier for them to recruit peers into such activities. These results suggest that men dominate

hiking activities compared to women, possibly reflecting a higher interest in outdoor physical pursuits.

These results suggest that educational attainment plays an important role in shaping a person's knowledge of and preparedness for landslide disaster mitigation. Higher education facilitates individuals in receiving, understanding, and processing information, and enhances critical thinking skills for appropriate decision-making. This finding aligns with previous studies showing a significant relationship between education and public knowledge levels, in which individuals with higher formal education tend to possess greater insight, experience, and cognitive ability in understanding risks, mitigation strategies, and emergency situations in the wild.

According to Sugiri and Fatmawati (11), experience is considered the best teacher, suggesting that experience is not merely a means of acquiring knowledge but also a way of gaining insight in overcoming previously encountered challenges. Facing various situations while hiking enables individuals to develop skills and knowledge essential for coping with disasters such as eruptions. Experienced hikers are generally better prepared physically and mentally and possess the necessary equipment, increasing their chances of a successful hike. In contrast, novice hikers may experience greater anxiety and uncertainty when facing difficult situations such as landslides. This is consistent with Rohimah, Ibrahim and Samiatulmilaah (12), who stated that experience is something a person has undergone in the course of their life journey, and that the absence of prior experience with an object tends to produce a negative psychological attitude toward it.

According to Simehate et al. (13), past experiences influence future behavior, becoming a form of learning; each disaster experience provides an opportunity for individuals to better prepare themselves for threats that may occur at any time.

This finding is consistent with Syafitri and Hartutik (9), who noted that beyond education, several other factors can influence knowledge, including occupation, age, experience, culture, and access to information. Individuals with access to more information sources tend to possess greater knowledge, which can be obtained from books, electronic media (mobile phones, television, radio), print media (newspapers, magazines), and formal education. Beyond information sources and training participation, generally good public knowledge may also be attributed to prior experience with or exposure to landslide events in the surrounding area, as well as community outreach programs.

Overall, the finding that 98.9% of respondents had good knowledge of landslide disaster mitigation suggests that relevant education and information have been fairly well disseminated among hikers on Mount Lawu. This is consistent with previous studies showing that education, experience, occupation, age, culture, and access to information collectively shape public knowledge levels. Personal experience, particularly related to disasters, plays an important role in shaping future behavior and preparedness; therefore, continuous educational efforts remain necessary to ensure all hikers understand warning signs and appropriate mitigation measures.

Education on disaster mitigation can bring positive change in individuals' knowledge, attitudes, and skills in preparing for, facing, and coping with disasters, while also helping to reduce fear during disaster events (14). Disaster mitigation efforts should include the provision of information and mapping of disaster-prone areas, as well as outreach activities to raise public vigilance and awareness. Communities need to understand which actions to take or avoid, and how to protect themselves when a disaster occurs. It is also important to regulate

and organize disaster-prone areas in accordance with the Regulation of the Minister of Home Affairs Number 33 of 2006 concerning General Guidelines for Disaster Mitigation. Disaster mitigation activities include mapping disaster-prone areas, reforestation, and community outreach and awareness-raising, particularly for residents in vulnerable areas.

CONCLUSION

The majority of hiker respondents on Mount Lawu belonged to the late adolescent category (17–25 years), were male, had a senior high school/vocational school/Islamic senior high school or equivalent educational background, and had prior hiking experience. The majority of respondents' knowledge regarding landslide disaster mitigation on Mount Lawu was categorized as good.

Hiking trail managers are encouraged to implement continuous education, particularly for young hikers aged 17–25 years, to strengthen their knowledge of disaster mitigation measures. Hikers are encouraged to actively seek information and participate in training or briefings prior to hiking, particularly regarding potential hazards along their intended route. Future researchers may use this study as a reference for further investigation, incorporating additional variables such as respondents' occupation.

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REFERENCES

1. Andi Tenriola Fitri Kessi and Rizky Maharja. Perilaku Petani Terkait Alat Pelindung Diri (APD) dalam Penggunaan Pestisida di Desa Bonto Kecamatan Malua Kabupaten Enrekang, Jurnal Mitrasehat, 12(1), pp. 80–90. 2022. <https://doi.org/10.51171/jms.v12i1.325>
2. Halawa, G.C.M., Botjing, M.U. and Asrafil. Penentuan Zonasi Tingkat Kerawanan Gerakan Tanah Di Kecamatan Marawola Kabupaten Sigi Sulawesi Tengah, Bomba: Jurnal Pembangunan Daerah, (1), pp. 25–34. 2023.
3. National Disaster Management Agency (BNPB). Indonesia Disaster Data. 2024.
4. Central Statistics Agency (BPS). Number of Natural Disaster Occurrences by Regency/City in Central Java Province. 2023.
5. Permatasari, T. and Sidarta, N. Hubungan tingkat aktivitas fisik dengan acute mountain sickness pada pendaki gunung, Jurnal Biomedika dan Kesehatan, 4(3), pp. 106–112. 2021. <https://doi.org/10.18051/jbiomedkes.2021.v4.106-112>
6. Helwig, N.E., Hong, S. and Hsiao-Wecksler, E.T. Penilaian Risiko Bencana Longsor Di Wilayah Serang, 34(1), ISSN 0125-1790, pp. 1–10. 2020.
7. Darsini, Fahrurrozi and Cahyono, E.A. Pengetahuan: Artikel Review, Jurnal Keperawatan, 12(1), pp. 95–107. 2019.
8. Devi, P.A. and Noorratri, E.D. Gambaran Tingkat Pengetahuan Kesiapsiagaan Bencana Dengan Kejadian Tanah Longsor Pada Siswa SMKN 1 Selo, 2(2), pp. 126–136. 2024.

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9. Syafitri, D.N. and Hartutik, S. Gambaran Tingkat Pengetahuan Tentang Mitigasi Bencana Tanah Longsor Pada Lansia Di Desa Jrah Kecamatan Selo Boyolali, *Public Health and Safety International Journal*, 4(02), pp. 170–177. 2024. <https://doi.org/10.55642/phasij.v4i02.873>
 10. Cahyo, D.P. and Fatmawati, S. Gambaran Tingkat Pengetahuan Tentang Mitigasi Bencana Tanah Longsor pada Remaja di Desa Jeruk Selo Boyolali, *Sehat Rakyat: Jurnal Kesehatan Masyarakat*, 1(4), pp. 455–463. 2022. <https://doi.org/10.54259/sehatrakyat.v1i4.1165>
 11. Sugiri, H.B. and Fatmawati, S. Gambaran Self Efficacy Pada Pendaki Dalam Menghadapi Bencana Erupsi Di Gunung Sindoro, *IJOH: Indonesian Journal of Public Health*, 3(1), pp. 71–88. 2025
 12. Rohimah, S., Ibrahim, I.M. and Samiatulmilaah, A. Pengetahuan Masyarakat Tentang Kesiapsiagaan Bencana Menghadapi Tanah Longsor Di Kabupaten Ciamis, *Jurnal Keperawatan Galuh*, 3(1), p. 11. 2021. <https://doi.org/10.25157/jkg.v3i1.6582>
 13. Simehate, S. et al. Gambaran Tingkat Pengetahuan Masyarakat terhadap Mitigasi Bencana Tanah Longsor di Desa Burni Pase Kabupaten Bener Meriah, *GALENICAL: Jurnal Kedokteran dan Kesehatan Mahasiswa Malikussaleh*, 2(1), p. 117. 2023. <https://doi.org/10.29103/jkkmm.v2i1.8190>
 14. Aprianti, R. et al. Peningkatan Pengetahuan Mengenai Mitigasi Bencana Gempa Bumi di Cianjur, *Jurnal Inovasi Pengabdian Masyarakat Pendidikan*, 4(1), pp. 138–150. 2023. <https://doi.org/10.33369/jurnalinovasi.v4i1.28882>