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Original Research Paper

Realizing a Healthy and Disaster Resilient Campus: A Study on the Integration of Policies and Disaster Mitigation Strategies

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Abstract

Background: Indonesia is highly prone to disasters, and universities have a strategic role in strengthening disaster preparedness through healthy campus initiatives. **Objectives:** This study aimed to analyze the relationship between disaster knowledge, physical environmental health, community involvement, and disaster preparedness among the academic community of the Faculty of Public Health, Tadulako University. **Methods:** A mixed-method sequential explanatory design was applied, involving 294 respondents consisting of students, lecturers, and administrative staff. Quantitative data were collected using structured questionnaires and analyzed with Chi-Square tests, while qualitative data were gathered through in-depth interviews and analyzed thematically using NVivo. **Results:** The findings revealed significant associations between disaster knowledge ($p = 0.000$), physical environmental health ($p = 0.000$), and community involvement ($p = 0.000$) with disaster preparedness. Respondents with better knowledge, supportive environments, and active community participation showed higher preparedness levels. **Conclusions:** Disaster preparedness is influenced by individual, environmental, and social factors, emphasizing the importance of integrating disaster education, resilient infrastructure, and collective engagement into healthy campus programs. Strengthening these aspects is essential to build disaster-resilient campuses, and further studies should develop models integrating the Healthy Campus Framework with the Disaster Preparedness Cycle.

Keywords: Disaster Preparedness; Healthy Campus; Disaster Knowledge; Environmental Health; Community Involvement.

Introduction

Indonesia is one of the countries with the highest disaster vulnerability in the world due to its geographical, geological, hydrological, and demographic conditions. The *World Risk Report 2023* ranks Indonesia 34th out of 193 countries in terms of disaster risk, particularly for earthquakes, tsunamis, floods, and volcanic eruptions.[1] Law No. 24 of 2007 defines disasters as events or series of events that threaten and disrupt community life due to natural, non-natural, or human factors, resulting in loss of life, environmental damage, property loss, and psychological impact.[2] The high frequency of disasters in Indonesia requires strong preparedness across various sectors, including higher education institutions, which house large populations and play strategic roles in disaster risk reduction.

In disaster management, health is one of the top priorities. Minister of Health Regulation No. 75 of 2019 emphasizes the importance of health efforts to minimize health problems during disasters.[3] However, studies indicate that many communities still lack knowledge of appropriate actions during emergencies, potentially leading to severe health issues such as injuries, infectious diseases, and psychosocial disorders.[4,5] Universities, as centers of education and research, hold a

critical role in raising awareness, knowledge, and skills for disaster preparedness. Nevertheless, several studies show that the implementation of health policies and disaster preparedness at universities remains fragmented and has not yet been fully integrated.[6] This condition creates a scientific gap regarding how healthy campus programs can be effectively linked to disaster mitigation strategies.

The *Healthy Campus* concept introduced by the Indonesian Ministry of Health in 2018 aims to create an educational environment that supports the physical, mental, and social health of academic communities through comprehensive programs such as health education, sports facilities, mental health services, and healthy environment policies.[7] However, limited research has directly examined the relationship between healthy campus initiatives and disaster preparedness in higher education settings. This study offers novelty by exploring how the integration of healthy campus programs can strengthen the resilience of academic communities in disaster situations. Therefore, this study contributes to the development of a conceptual model of a *healthy and disaster-resilient campus* that remains underexplored in Indonesia.

The central research question of this study is: how does the implementation of healthy campus programs influence disaster preparedness in higher education institutions? Specifically, this study aims to (1) explore the implementation of healthy campus programs and disaster preparedness in universities, (2) identify variables contributing to campus resilience, and (3) propose evidence-based policy recommendations for developing effective disaster-resilient healthy campuses.

The findings of this study are expected to contribute to the development of more comprehensive campus health policies by emphasizing the integration of health promotion and disaster preparedness strategies. Practically, this research may serve as a foundation for designing *healthy and disaster-resilient campus* guidelines that can be adopted by universities in Indonesia and other disaster-prone countries. Moreover, the results have the potential to improve campus health services, protect academic communities, and support the achievement of Sustainable Development Goals (SDGs), particularly Goal 3 (*Good Health and Well-being*) and Goal 11 (*Sustainable Cities and Communities*).

Materials and Methods

Study Design

This study employed a mixed-method research design using a sequential explanatory model as described by Creswell.[8,9] The research was conducted in two phases: an initial quantitative phase to obtain a general overview of the implementation of healthy campus programs and disaster preparedness, followed by a qualitative phase using in-depth interviews to further explore and deepen the quantitative findings. This design was chosen because it allows a comprehensive understanding of the relationship between health program implementation and disaster preparedness in the context of higher education and public health.

Sample

The study population consisted of all academic members of the Faculty of Public Health, Tadulako University (FKM UNTAD), including students, lecturers, and administrative staff. Samples for the quantitative phase were selected using purposive sampling, where participants were chosen based on predetermined inclusion criteria such as being an active member of the academic community and willingness to participate in the study. Exclusion criteria included individuals unavailable during the

research period or unwilling to provide informed consent. The sample size was calculated using Slovin's formula with a 95% confidence level and a 5% margin of error, resulting in the required number of respondents. For the qualitative phase, informants were selected from among quantitative respondents with relevant knowledge or experience regarding healthy campus programs and disaster preparedness.

Data Collection Technique

Data collection consisted of both primary and secondary sources. Primary data were obtained through structured questionnaires in the quantitative phase and in-depth interviews in the qualitative phase. Secondary data were collected from official documents and archives of FKM UNTAD relevant to the research objectives. The study was carried out at FKM UNTAD, Palu City, over a specified research period. All questionnaires used had been tested for validity and reliability. In the qualitative phase, interviews were guided by semi-structured protocols and conducted with participants selected for their expertise and experience.

Data Analysis Technique

Quantitative data were processed using SPSS software, following the stages of editing, coding, data entry, cleaning, and scoring.[9] Univariate analysis was used to describe the distribution of each variable, while bivariate analysis employed Chi-Square tests with a significance level of $\alpha = 0.05$ to examine the relationship between independent and dependent variables. Qualitative data were analyzed using NVivo software to facilitate coding, categorization, and thematic analysis.[8] This analysis aimed to provide a comprehensive description of the subject matter rather than to test hypotheses. The results are presented in the form of tables, charts, and descriptive narratives.

Ethical Consideration

This study obtained ethical approval from the Ethics Committee of the Faculty of Medicine, Tadulako University. All participants were provided with informed consent before participation, and confidentiality of collected data was strictly maintained in accordance with ethical principles of health research. Participants were informed of their right to withdraw at any time without consequences.

Results

This study involved 294 respondents who were members of the academic community of the Faculty of Public Health, Tadulako University (FKM UNTAD), consisting of students, lecturers, and administrative staff. Respondent characteristics included age, gender, education level, and experience in disaster-related training. These characteristics served as the foundation for subsequent analysis of relationships between research variables.

Table 1. Relationship of Key Variables with Disaster Preparedness

Variable	Category	Not Prepared n (%)	Prepared n (%)	Total n (%)	p-value
Disaster Knowledge	Poor	43 (45.3)	52 (54.7)	95 (100)	0.000*
	Good	8 (4.0)	191 (96.0)	199 (100)	
Physical Environmental Health	Poor	24 (39.3)	37 (60.7)	61 (100)	0.000*
	Good	27 (11.6)	206 (88.4)	233 (100)	
Community Involvement	Low	37 (37.8)	61 (62.2)	98 (100)	0.000*
	High	14 (7.1)	182 (92.9)	196 (100)	

**Note: p < 0.05 indicates a significant relationship. Source: Primary Data (2025).*

The analysis shows a strong and statistically significant relationship between disaster knowledge and disaster preparedness (p = 0.000). Among respondents with poor disaster knowledge, nearly half (45.3%) were categorized as "not prepared", while only 54.7% were "prepared", In contrast, among respondents with good disaster knowledge, only 4.0% were "not prepared", while an overwhelming majority (96.0%) were "prepared".

This finding clearly indicates that disaster knowledge plays a pivotal role in enhancing preparedness levels. Adequate knowledge enables individuals to understand risks, recognize early warning signs, and implement appropriate response measures. The stark contrast in preparedness levels between those with poor and good knowledge underscores the importance of structured educational interventions and training programs within the university setting to improve disaster literacy among the academic community.

The results also reveal a significant association between the physical environmental health of the campus and disaster preparedness (p = 0.000). Respondents who reported poor physical environmental conditions (e.g., inadequate infrastructure, unsafe facilities, or lack of evacuation routes) showed a much lower preparedness level (60.7% prepared, 39.3% not prepared) compared to those in good physical environments (88.4% prepared, 11.6% not prepared).

This suggests that even when individuals may have knowledge or awareness, their actual level of preparedness is strongly influenced by the physical setting in which they live and work. A supportive and safe physical environment, such as well-maintained buildings, clear signage, accessible emergency exits, and disaster-resilient infrastructure, fosters higher levels of readiness. These findings highlight the necessity of integrating environmental health and infrastructure improvements as part of a comprehensive disaster preparedness strategy in higher education institutions.

Community involvement was also found to have a significant effect on preparedness levels (p = 0.000). Among respondents with low community involvement, only 62.2% were prepared while 37.8% were not. Conversely, among those with high community involvement, preparedness levels rose sharply, with 92.9% categorized as "prepared" and only 7.1% as "not prepared".

This demonstrates that active participation in community-based disaster preparedness activities, such as simulation drills, group training, or peer-to-peer awareness programs, significantly enhances readiness. Social networks and collective engagement likely provide individuals with practical skills, support systems, and confidence to respond effectively during emergencies. Therefore, fostering strong community engagement is critical to building a culture of preparedness within the university.

The study findings indicate that disaster preparedness among the FKM UNTAD academic community is significantly associated with knowledge, physical environmental health, and community involvement (all p < 0.001). Respondents with good disaster knowledge, supportive physical environments, and strong community engagement were more likely to demonstrate high levels of preparedness, underscoring the importance of integrating health promotion and community participation in building disaster-resilient campuses.

Discussion

The findings of this study demonstrate that disaster knowledge, physical environmental health, and community involvement are

significantly associated with disaster preparedness among the academic community of FKM UNTAD ($p < 0.001$). Respondents with good disaster knowledge were more likely to be classified as "prepared," highlighting the crucial role of knowledge in shaping readiness behaviors. Similarly, respondents who reported adequate physical environmental conditions and strong community involvement exhibited higher preparedness levels compared to their counterparts. These results confirm the hypothesis that preparedness is a multifactorial construct influenced by individual, environmental, and social determinants.

The association between knowledge and preparedness observed in this study aligns with prior research. Ayuningtyas (2020)[10] reported that disaster literacy directly influences individuals' capacity to recognize risks and implement preventive actions. Hargono (2019)[11] also emphasized that knowledge empowers individuals to anticipate threats and mitigate disaster impacts. Wulandari et al. (2021)[12] found similar results in flood-prone communities in Indonesia, where higher disaster knowledge was linked to better preparedness. On a global scale, Paton and Johnston (2017)[13] highlighted that knowledge shapes risk perception and decision-making in emergencies. With respect to environmental health, our findings support the principles of the *Sendai Framework for Disaster Risk Reduction 2015–2030*, which underscores resilient infrastructure as a foundation of societal preparedness.[14] Bisri (2017)[15] and Sutopo (2018)[16] likewise stressed that adequate infrastructure and community-based environmental management enhance readiness. In terms of community engagement, this study is consistent with Samiri et al. (2018)[17], Sofyana et al.(2021)[18], Syukri et al.(2020)[19], and Puspitasari et al. (2021)[20], who collectively found that participation in disaster simulations, training, and local initiatives fosters solidarity and effective responses. Twigg (2015)[21] also reinforced community involvement as a pillar of disaster risk reduction globally.

These results hold important implications for health and disaster management in higher education institutions. First, strengthening disaster education through structured curricula and regular simulations can significantly enhance disaster literacy. Second, universities must prioritize safe and resilient infrastructure, including evacuation routes and accessible health facilities, to minimize barriers during emergencies. Third, fostering community involvement through participatory training and campus-wide preparedness programs can build collective efficacy and resilience. Collectively, these strategies support the integration of healthy campus initiatives with disaster preparedness, contributing to the creation of *healthy and disaster-resilient campuses*. Such integration can also serve as a model for broader community-based disaster risk reduction efforts in other sectors.

The strength of this study lies in its mixed-method sequential explanatory design, which allowed both quantitative measurement of associations and qualitative exploration of underlying factors. The use of a relatively large and diverse sample enhanced the representativeness of findings within the university context. Nevertheless, some limitations should be acknowledged. First, the cross-sectional design restricts causal inference; the observed associations cannot confirm temporal relationships. Second, self-reported data may be subject to recall bias or social desirability bias. Third, the findings are context-specific to a single faculty and may not be generalizable to all higher education institutions in Indonesia. External factors such as cultural norms, policy enforcement, and resource availability may also influence preparedness but were not fully explored in this study.

Future research is recommended to adopt a longitudinal design to assess changes in preparedness over time and to examine causal pathways between knowledge, environment, and community factors. Additionally, expanding the study across multiple universities and regions would provide a more comprehensive understanding of campus resilience in Indonesia. Qualitative approaches focusing on cultural and institutional dynamics may also reveal deeper insights into barriers and enablers of preparedness. Finally, intervention studies evaluating the effectiveness of integrated *healthy campus and disaster preparedness* models would provide practical evidence for scaling up policies and programs.

Conclusion

This study concludes that disaster knowledge, physical environmental health, and community involvement are key factors contributing to disaster preparedness within the academic community of the Faculty of Public Health, Tadulako University. Individuals with higher disaster knowledge are better able to recognize risks, understand evacuation procedures, and take appropriate mitigation actions, while supportive physical environments and active community participation further strengthen preparedness. These findings underscore the importance of integrating health promotion, resilient infrastructure, and collective engagement into the development of disaster-resilient healthy campuses. In the academic context, this research highlights the need for universities to adopt continuous disaster education programs, invest in preparedness-supporting facilities, and foster community-based initiatives. Practically, the results provide a foundation for policy and program development that can enhance campus resilience and serve as a model for broader disaster risk reduction in higher education. Future studies are recommended to explore the integration of the Healthy Campus Framework with the Disaster Preparedness Cycle to develop practical guidelines adaptable to diverse university settings in Indonesia.

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