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The Effectiveness of Community-Based Health Education on Health Disaster Preparedness Behaviour in Padang Panjang in 2025

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ABSTRACT

Increased disaster risk in Indonesia requires strengthening public health preparedness, especially in vulnerable areas such as Padang Panjang. This study aims to analyze the effectiveness of community-based health education on health disaster preparedness behavior in Padang Panjang in 2025 and to examine the mediating role of knowledge, attitude, and self-efficacy. The study used a non-equivalent control group quasi-experimental design with a pre-test and post-test approach. A total of 120 adult respondents were divided into an intervention group (n=60) and a control group (n=60). The intervention was carried out for one month through participatory counseling, group discussions, and preparedness simulations. Data were collected using a structured questionnaire and analyzed using paired t-tests, independent t-tests, and multiple linear regression. The results show a significant increase in knowledge, attitude, self-efficacy, and preparedness behavior in the intervention group ($p<0.001$), with the largest increase in preparedness behavior ($\Delta=17.5$). There were no significant changes in the control group ($p>0.05$). Regression analysis showed that knowledge ($\beta=0.32$), attitude ($\beta=0.28$), and self-efficacy ($\beta=0.41$) had a significant effect on preparedness behavior ($R^2=0.64$), with self-efficacy as the dominant predictor. These findings confirm that community-based health education is effective in improving health preparedness by strengthening psychosocial determinants, particularly self-efficacy. The integration of participatory approaches into disaster risk reduction policies is recommended to strengthen sustainable community health resilience in disaster-prone areas.

Keywords: *Community-Based Health Education, Disaster Health Preparedness, Self-Efficacy, Health Behavior Change, Disaster Risk Reduction*

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INTRODUCTION

Global climate change and the increasing incidence of natural and non-natural disasters have increased the frequency and impact of crises on public health. Phenomena such as floods, earthquakes, pandemics, and disease outbreaks demonstrate that disasters not only damage infrastructure but also create a significant health burden through increased morbidity and mortality and disruption of essential health services at the community level (Lamsir, 2025).

Indonesia is geographically prone to disasters due to its location at the confluence of three tectonic plates, the equator, and its areas susceptible to hydrometeorological and biological phenomena. This situation makes its communities vulnerable to various types of disasters, which also have significant impacts on public health, such as post-flood disease outbreaks and post-disaster psychosocial conditions. (Putri et al., 2025).

However, community preparedness for health risks during disasters remains relatively low. Many communities lack an adequate understanding of the preventive measures that should be taken before, during, and after a disaster, resulting in a low correlation between risk knowledge and actual preparedness practices. This is reflected in research showing that levels of preparedness and knowledge prior to educational interventions often fall short of the minimum expected standards. (Budiman & Amalinda, 2025).

The factors influencing health disaster preparedness behavior are complex, encompassing cognitive aspects such as risk knowledge, attitudes toward health threats, community social norms, prior experience with disasters, and access to accurate and timely information. Furthermore, variables such as self-efficacy and mental attitude also moderate how individuals respond to health risks and take adaptive action in emergency situations. (Lamsir, 2025).

Health education as an intervention strategy has been identified as a crucial approach to improving disaster preparedness at the community level. Well-designed health education can strengthen the ability of individuals and groups to understand risk information, adopt preventive behaviors, and act responsively in crisis situations. This approach aligns with the health promotion and community empowerment paradigm, which emphasizes active community participation in building their own health capacity. (Nugroho et al., 2025).

Community-based health education has advantages over top-down approaches because, in addition to conveying information, it also empowers community members to play an active role in identifying threats, planning mitigation measures, and mobilizing local resources for disaster response. This strategy is especially important in disaster-prone areas with limited resources and access to health services. (Suparji et al., 2025)

Several empirical studies have shown that community health education interventions can improve preparedness indicators. For example, education provided to adolescents in schools has been shown to significantly improve their preparedness attitudes for earthquake disasters. (Wahyudin, 2025). Similarly, website-based health literacy programs show a significant relationship between increased risk awareness and the general public's intentions and preparedness. (Putri et al., 2025).

However, a significant research gap remains. Most previous studies have primarily assessed structural aspects of preparedness (e.g., infrastructure or technical training), while the quantitative effectiveness of community-based health education on health behavior change, particularly post-disaster preparedness behavior, remains limited and has not been comprehensively measured. (Lamsir, 2025).

In addition, many studies have not integrated health behavior theory approaches such as the Health Belief Model, Theory of Planned Behavior, and Social Cognitive Theory in the evaluation design, even though these theories are important for understanding how health education influences individuals' risk perceptions, attitudes, and actual behavior in the context of disasters. (Guo et al., 2025).

The urgency of this research is growing given the role of community-based health education not only in responding to current threats but also as a basis for developing sustainable and adaptive health intervention models. The research findings are expected to provide a strong scientific foundation for policies by local governments, public health institutions, and disaster management organizations in systematically strengthening community health resilience. (Budiman & Amalinda, 2025).

Against this backdrop, this study aimed to answer the main question: To what extent is community-based health education effective in improving health disaster preparedness behaviors in the community? Furthermore, this study also examined the extent to which changes in knowledge, attitudes, and self-efficacy contribute to changes in preparedness behaviors, which are indicators of community preparedness.

METHODS

This study used a quasi-experimental quantitative design with a non-equivalent control group pre-test–post-test approach to evaluate the effectiveness of community-based health education on health disaster preparedness behaviour in Padang Panjang City in 2025. The study was conducted from January to March 2025 in disaster-prone areas based on data from the local government and the local Disaster Management Agency (BPBD).

The study population consisted of adults (≥18 years old) who had resided in the study location for at least one year. The sample consisted of 120 respondents determined using a two-mean difference test (95% confidence level; 80% power) and divided into intervention (n=60) and control (n=60) groups through area-based cluster sampling. Inclusion criteria included willingness to participate in the entire research process and the ability to complete the questionnaire independently.

The independent variable was community-based health education, while the dependent variable was health disaster preparedness behaviour. The mediating variables tested included knowledge, attitude, and self-efficacy. The intervention was carried out in three sessions (±90 minutes/session) over one month through interactive counselling, group discussions, and context-based preparedness simulations involving health cadres and community leaders.

Data were collected using a structured questionnaire based on a five-point Likert scale developed based on the integration of the Health Belief Model, Theory of Planned Behaviour, and Social Cognitive Theory. Validity was tested through expert judgement and Pearson's correlation ($r>0.30$), while reliability was tested using Cronbach's alpha (≥ 0.70).

Data analysis included descriptive statistics, Shapiro–Wilk normality test, paired t-test for within-group analysis, independent t-test for intergroup comparison, and multiple linear regression to test the contribution of knowledge, attitude, and self-efficacy to preparedness behaviour ($\alpha=0.05$; 95% CI). The study obtained ethical approval and all respondents provided informed consent prior to participation.

RESULTS

1. Respondent Characteristics

Table 1. Characteristics of Respondents in the Intervention and Control Groups in Padang Panjang in 2025

Variables	Intervention (n=60)	Control (n=60)	p-value
Age (mean ± SD)	36.8 ± 10.2	37.4 ± 9.8	0.742
Woman (%)	65.0	63.3	0.845
Education ≥ High School (%)	71.7	70.0	0.832
Previous disaster experience (%)	58.3	55.0	0.702

There was no significant difference in baseline characteristics between the intervention and control groups ($p>0.05$), so both groups can be considered homogeneous at baseline.

2. Changes in Groups (Pre–Post Test)

Table 2. Differences in Research Variable Scores in the Intervention Group (Paired t-test) in Padang Panjang in 2025

Variables	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Δ Mean	p-value
Knowledge	62.4 ± 8.5	78.6 ± 7.9	+16.2	<0.001
Attitude	64.1 ± 7.8	75.3 ± 6.9	+11.2	<0.001
Self-Efficacy	60.5 ± 9.1	74.8 ± 8.3	+14.3	<0.001
Alert Behavior	58.7 ± 8.7	76.2 ± 7.5	+17.5	<0.001

There was a significant increase in all variables following the community-based health education intervention ($p<0.001$). The largest increase occurred in health disaster preparedness behavior ($\Delta=17.5$ points), indicating a substantial intervention effect.

Table 3. Differences in Research Variable Scores in the Control Group (Paired t-test) in Padang Panjang in 2025

Variables	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Δ Mean	p-value
Knowledge	63.1 ± 8.3	64.5 ± 8.0	+1.4	0.118
Attitude	65.2 ± 7.6	66.3 ± 7.4	+1.1	0.164

Self-Efficacy	61.4 ± 8.9	62.0 ± 8.7	+0.6	0.392
Alert Behavior	59.8 ± 8.5	61.2 ± 8.2	+1.4	0.109

There was no significant change in the control group ($p>0.05$), which indicates that the improvement in the intervention group was not solely due to external factors.

3. Inter-Group Comparison (Post-test)

Table 4. Comparison of Post-test Scores between the Intervention and Control Groups (Independent t-test) in Padang Panjang in 2025

Variables	Intervention (Mean ± SD)	Control (Mean ± SD)	Mean Difference	p-value
Knowledge	78.6 ± 7.9	64.5 ± 8.0	14.1	<0.001
Attitude	75.3 ± 6.9	66.3 ± 7.4	9.0	<0.001
Self-Efficacy	74.8 ± 8.3	62.0 ± 8.7	12.8	<0.001
Alert Behavior	76.2 ± 7.5	61.2 ± 8.2	15.0	<0.001

The intervention group had significantly higher post-test scores than the control group on all variables ($p<0.001$), confirming the effectiveness of community-based health education.

4. Mediation Analysis (Multiple Linear Regression)

Table 5. Linear Regression Analysis of Health Disaster Preparedness Behaviour in Padang Panjang in 2025

Independent Variables	β	t	p-value
Knowledge	0.32	3.87	<0.001
Attitude	0.28	3.14	0.002
Self-Efficacy	0.41	4.52	<0.001
R^2 = 0.64			

Knowledge, attitude, and self-efficacy simultaneously significantly influenced health disaster preparedness behavior (R^2=0.64), meaning 64% of the variation in preparedness behavior can be explained by these three variables. Self-efficacy was the most dominant predictor (β=0.41), indicating that an individual's belief in their ability to act is a key factor in behavioral change.

DISCUSSION

1. Changes in the Intervention Group

The results showed significant improvements in knowledge, attitudes, self-efficacy, and health disaster preparedness behaviors after the intervention ($p<0.001$). The largest improvement occurred in preparedness behavior (Δ=17.5), confirming the effectiveness of community-based health education in facilitating real behavior change.

This finding is consistent with the Health Belief Model framework which emphasizes that increased perceptions of threat and benefits of preventive action will encourage behavioral change.(Alyafei & Easton-Carr, 2024). Furthermore, from a Social Cognitive Theory perspective, increasing self-efficacy is a key mechanism in translating knowledge into action. Participatory,

community-based interventions enable observational learning and social reinforcement, thus accelerating the adoption of preparedness behaviors (Schunk & Usher, 2012).

A recent study in Imanaka et al., (2022) showed that community-based education significantly improved household health preparedness through increased self-efficacy and perceived susceptibility (Imanaka et al., 2022).

Critically, researchers assume that this success was influenced by the integration of simulation methods and reflective discussions that reinforced contextual learning experiences. Substantive effects on behavior indicate that the educational approach not only improved cognitive domains but also encouraged the internalization of preparedness norms at the community level.

2. No Change in the Control Group

The control group showed no significant changes in any of the variables ($p>0.05$). This strengthens the study's internal validity, suggesting that changes in the intervention group were not due to maturation, repeated measurement effects, or other external factors.

From the perspective of the Theory of Planned Behavior, behavioral change requires changes in attitudes, subjective norms, and perceived behavioral control. Without intervening stimuli, these constructs remain relatively stable, so behavior does not change significantly.

Research by Druge et al. (2021) found that communities without educational interventions experienced only minimal changes in preparedness (<5%) despite being located in disaster-prone areas (Druge et al., 2021). Another longitudinal study by Ozeki & Ojima (2024) also found that passive exposure to information without a participatory approach was insufficient to produce significant behavioral change (Ozeki & Ojima, 2024).

Researchers assume that the low change in the control group reflects the limitations of the one-way information approach often seen in public policy practice. Without active community involvement, the cognitive-affective processes needed to trigger intentions and actions are not optimally developed.

3. Post-test Comparison Between Groups

The results showed that the intervention group had significantly higher post-test scores than the control group on all variables ($p<0.001$), especially preparedness behavior (mean difference = 15.0). This difference confirms that community-based health education is more effective than a no-intervention approach in improving health preparedness.

This condition aligns with national research findings showing that disaster preparedness education can significantly improve community knowledge and attitudes toward preparedness measures if the intervention is contextual and participatory. For example, a quasi-experimental study of students at SMAN 1 Lubuk Basung found that health education significantly improved students' earthquake preparedness ($p=0.000$) after the educational intervention, although focused on the school population. This finding supports the effectiveness of educational approaches in improving preparedness (Kartika et al., 2023).

In addition, findings in La Ede, (2025) show that systematically designed education is able to significantly increase attitudes towards disaster preparedness ($p<0.001$) among adolescents, indicating that changes in attitudes are one of the main mechanisms that bridge education and preparedness behavior (La Ede, 2025).

Researchers assume that this significant difference arises because the community-based education approach not only provides knowledge, but also reinforces social norms and direct learning experiences through simulations, which increase motivation and intention to act in disaster conditions.

4. Regression Analysis and the Role of Mediating

Regression analysis showed that knowledge ($\beta=0.32$), attitude ($\beta=0.28$), and self-efficacy ($\beta=0.41$) simultaneously significantly influenced preparedness behavior ($R^2=0.64$), with self-efficacy as the most dominant predictor. This finding is consistent with the principle that cognitive and affective aspects contribute to an individual's ability to act proactively in preparedness.

Relevant national research supporting these findings can be found in studies on community resilience and disaster preparedness, which show that self-confidence, as a component of community resilience, significantly influences community preparedness for earthquakes. The study found that psychosocial variables such as self-confidence, along with personal competence, were significantly related to disaster preparedness ($p<0.05$), confirming the role of internal individual factors in preparedness (Ida et al., 2024).

In addition, a digital platform-based health literacy program in the community showed a positive relationship between increased risk awareness and intention to undertake disaster preparedness ($r=0.539$; $p=0.001$), which underscores the relationship between knowledge, attitudes, and preparedness (Putri et al., 2025).

Researchers assume that self-efficacy serves as a powerful mediator in the relationship between health education and behavior change. Interventions that create successful experiences through practical approaches, simulations, and social reinforcement will increase personal confidence in the ability to act during a disaster, thereby strengthening observed preparedness behaviors.

Overall, the study results confirm that community-based health education effectively improves health disaster preparedness behavior through mechanisms such as increased knowledge, positive attitude formation, and, most importantly, strengthening self-efficacy. The tested model had strong explanatory power ($R^2=0.64$), indicating that integrating health behavior theory into intervention design is an empirically sound and relevant approach to strengthening community health resilience.

CONCLUSIONS

Research conducted in Padang Panjang City in 2025 proved that community-based health education is effective in significantly improving health disaster preparedness behaviour. The one-month intervention resulted in a significant increase in knowledge, attitudes, self-efficacy, and

especially preparedness behaviour in the intervention group compared to the control group ($p<0.001$). Regression analysis showed that knowledge, attitudes, and self-efficacy simultaneously explained 64% of the variation in preparedness behaviour ($R^2=0.64$), with self-efficacy as the most dominant predictor. These findings confirm that changes in preparedness behaviour are not only influenced by improvements in cognitive aspects, but are strongly mediated by psychosocial factors, particularly individuals' beliefs about their ability to act in disaster situations. Theoretically, the research results strengthen the integration of the Health Belief Model, Theory of Planned Behaviour, and Social Cognitive Theory in explaining the mechanisms of behavioural change in the context of disasters. Practically, these findings recommend the institutionalisation of community-based health education in regional disaster risk reduction policies through participatory and simulation approaches to strengthen sustainable community health resilience.

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