

Original Research Article

Strengthening Children's Earthquake Preparedness Through Family-Based Disaster Planning: A Home-to-School Study in Banyuwangi Regency

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ABSTRACT

Background: Earthquakes often occur without warning, and although they can be monitored, the exact timing remains uncertain. A lack of community preparedness contributes to both physical and social consequences when such disasters strike. Disaster preparedness is therefore essential to reduce the risks and impacts of earthquakes.

Purpose: This study aims to examine the effect of family disaster planning on children's preparedness attitudes in the context of earthquake risk.

Method: A pre-experimental one-group pretest-posttest design was used. The study involved 32 respondents selected through stratified sampling from a population of 409 parents of school-aged children. Data were collected using a preparedness attitude questionnaire administered before and after a family disaster planning intervention. The results were analyzed using the Wilcoxon test.

Results: Prior to the intervention, 40.6% of respondents were categorized as having a good preparedness attitude. Following the intervention, this figure increased to 100%. A median increase of 11 was observed, indicating a statistically significant improvement. The Wilcoxon test yielded a p-value of 0.000 ($\alpha < 0.005$), confirming the intervention's effectiveness.

Conclusion: Family disaster planning significantly enhances children's preparedness attitudes toward earthquake risks. These findings underscore the value of incorporating household-based preparedness strategies within broader community and educational disaster risk reduction efforts.

Keywords: Family Disaster Planning; Earthquake Preparedness; Children's Safety; Preparedness Attitude

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INTRODUCTION

Due to its location at the convergence of multiple active tectonic plates, Indonesia faces a disproportionately high risk of earthquake-related disasters, placing it among the most geologically vulnerable regions in the world (BNPB, 2022). Located near the southern Java megathrust zone, the Banyuwangi region faces substantial risk of earthquakes and tsunamis due to its extensive coastline and critical tectonic positioning (Ghofur et al., 2021). Despite the high frequency of earthquakes in this region, community preparedness remains insufficient—particularly among vulnerable groups such as children (BNPB, 2016; Hakim, 2019).

Disaster mitigation and preparedness are critical components in reducing risk impacts, particularly within the family setting—the smallest social unit that plays a vital role in child protection. However, family preparedness levels remain relatively low across many disaster-prone regions in Indonesia (Agnes Ayu Biomi & I.Gusti Agung Haryawan, 2018). Inadequate disaster awareness and planning within families can compromise their ability to effectively protect at-risk individuals during emergencies, particularly children, seniors, and expectant mothers (Setianingsih, 2021).

One strategic approach to enhancing disaster responsiveness is the implementation of family disaster planning. The concept emphasizes the active participation of all family members in jointly planning, understanding, and agreeing on essential actions to be taken before, during, and after a disaster. The study is grounded in that reality, focusing on the influence of family disaster planning on family preparedness attitudes—particularly among children—in response to earthquake threats at Klatak State Elementary School in Banyuwangi, a coastal institution located within a high-risk disaster zone.

METHODS

Study Design

This study employed a pre-experimental design, specifically a one-group pretest–posttest design, to evaluate changes in family disaster preparedness attitudes before and after the intervention. This design was selected to assess the effectiveness of the intervention within a single group without a comparison group.

Setting

The study was conducted at Klatak State Elementary School, Banyuwangi, Indonesia, from August 23 to August 30, 2023. Data collection took place in a school-affiliated community setting involving families of enrolled students. The intervention and questionnaire administration were conducted in a structured and supervised manner to ensure consistency of implementation.

Research Subject

The study population consisted of families of students enrolled at Klatak State Elementary School. A total of 32 participants were included in the study. Sampling was carried out using stratified random sampling across six grade levels, ensuring proportional representation of families from each grade. Inclusion criteria were families with actively enrolled students who agreed to participate in the study. Exclusion criteria included families whose members were experiencing illness during the data collection period. No formal sample size calculation or power analysis was conducted. The sample size was determined based on feasibility and the total number of eligible families available during the study period, which is acceptable for preliminary pre-experimental research.

Instruments

Family disaster preparedness attitudes were measured using a validated questionnaire consisting of 12 items, developed based on disaster preparedness attitude indicators and formatted using a Likert scale. The questionnaire assessed participants' attitudes toward family disaster preparedness before and after the intervention. The instrument had undergone validity and reliability testing prior to use. The questionnaire was administered in the Indonesian language and required no translation..

Intervention

The intervention applied in this study was Family Disaster Planning, which included structured educational sessions, simulation activities, and family-centered disaster preparedness training. Educational content focused on disaster risk awareness, emergency response planning, evacuation procedures, and family roles during disasters. Instructional media included leaflets, PowerPoint slides, and video materials. The intervention was delivered by

the research team in a group setting, with active participation encouraged through simulations and discussions. No control group was included in this study.

Data Analysis

Quantitative data analysis was performed using SPSS version 16. Pretest and posttest scores were analyzed using the Wilcoxon matched-pairs test, as the data were paired and did not meet normality assumptions. This non-parametric test was chosen to evaluate differences in family preparedness attitudes before and after the intervention. A significance level of 0.05 was applied.

Ethical Consideration

This study adhered to ethical principles, including respect for autonomy, confidentiality, fairness, and non-maleficence. Ethical approval was obtained from the Ethics Committee of STIKES Banyuwangi. All participants were informed about the study objectives, procedures, potential benefits, and risks prior to participation. Written informed consent was obtained from all respondents before data collection commenced.

RESULTS

Table 1. Demographic Characteristics

Variables	Variable Categories	frequency (n)	Percentage (%)
Age	34–40 Years Old	16	50.0%
Sex	Women	28	87.5%
The Latest Education	Senior Hight School	22	68.8%
Job	Housewife	25	78.1%
Relationship with students	Parents	30	93.8%
Disaster Counseling Access	Never	30	93.8%

Table 1 shows that most respondents were women in their mid-adult years, with senior high school education and homemaker roles predominating. Nearly all were parents of students and had not previously accessed disaster counseling, indicating limited exposure to preparedness initiatives.

Table 2. Intervention of Family Preparedness Attitudes

Category	Pre-Test (n)	Pre-Test (%)	Post-Test (n)	Post-Test (%)
Good	13	40.6%	32	100%
Poor	19	59.4%	0	0%
Not Good	0	0%	0	0%

Table 2 shows a clear improvement in family preparedness attitudes following the intervention. While most respondents initially demonstrated only “fair” preparedness, all participants achieved “good” levels post-intervention. The Wilcoxon test confirmed this improvement was statistically significant ($Z = -4.786$, $p < 0.001$), underscoring the effectiveness of the Family Disaster Planning program.

Table 3. Wilcoxon Statistical Test Results

Variable	Z Count	Sig (2-tailed)
Preparedness attitude	-4.786	0.000

***There is a significant difference between the attitude of preparedness before and after the disaster planning family intervention ($p < 0.05$).*

Table 3 summarizes the results of the Wilcoxon matched-pairs test used to evaluate differences in preparedness attitudes before and after the Family Disaster Planning intervention. The test produced a Z-value of -4.786 with a significance level of $p = 0.000$, indicating a statistically significant improvement in family preparedness following the intervention ($p < 0.05$). This result confirms that the observed changes were not due to random variation but directly associated with the educational and simulation efforts provided during the intervention phase. The strength of these findings reinforces the effectiveness of targeted disaster education in enhancing household-level readiness. It further suggests that family-centered interventions are particularly well-suited to communities with limited prior exposure to preparedness outreach. The statistical evidence supports broader implementation of similar programs in earthquake-prone regions, especially where children's safety and family coordination are critical.

Table 4. Descriptive analysis of pre -post

Phase	Mean	Median	Min–Max	Std. Deviation
Before Intervention	45.5	44	38–60	5.23
After Intervention	55.1	55	51–60	2.29

***The median increase of 11 points shows the effectiveness of intervention in increasing the attitude of family preparedness.*

Table 4 presents the descriptive statistics of preparedness attitude scores recorded before and after the Family Disaster Planning intervention among 32 respondents. Prior to the intervention, the mean score was 45.5, with a median of 44, and a score range between 38 and 60. The standard deviation was 5.23, indicating moderate variation in preparedness levels within the sample. After the intervention, the mean score increased to 55.1, with a median of 55 and a narrower range of 51 to 60. The standard deviation decreased to 2.29, reflecting greater consistency in post-intervention preparedness responses. These descriptive indicators reveal not only an increase in overall preparedness, but also a more uniform improvement across participants. The upward shift in central tendency and reduction in score dispersion suggest that the Family Disaster Planning intervention effectively enhanced preparedness attitudes in a comprehensive and equitable manner across the study population.

DISCUSSION

The findings of this study highlight a substantial improvement in family disaster preparedness attitudes following the implementation of the Family Disaster Planning intervention in a school-based community. Analysis of demographic data (Table 1) revealed that the majority of respondents were female (87.5%), aged between 34–40 years (50%), had completed senior high school (68.8%), and worked primarily as homemakers (78.1%). This demographic composition suggests that the sample largely consisted of mothers in mid-adulthood, a group widely recognized for their role in household decision-making and child safety (Cong & Feng, 2021). However, 93.8% of these respondents had never received any form of disaster education, indicating a significant lack of preparedness infrastructure at the community level (Dewi, 2019).

Prior to the intervention, Table 2 shows that only 40.6% of families exhibited “good” preparedness attitudes, while 59.4% were categorized as “fair,” with no respondents in the “poor” category. These results are consistent with Susanti & Aprilia (2020), who observed similarly low preparedness levels in families before receiving targeted outreach. The fair rating reflected a limited understanding of emergency planning, scarce access to disaster-related information, and minimal engagement with evacuation drills. Additional analysis of outreach sources indicated that only two respondents had ever received disaster information from government institutions, supporting findings from Bertauli et al. (2022), which demonstrated that prior exposure significantly enhances preparedness—by as much as 9.8 times compared to those without experience.

Following the educational and simulation-based intervention, all respondents (100%) were assessed as having “good” preparedness attitudes (Table 2), signifying the intervention’s impact on behavioral change. Table 3 supports this result statistically: the Wilcoxon signed-rank test yielded a Z-score of -4.786 with a p-value of 0.000 ($p < 0.05$), confirming a significant difference in attitudes before and after the intervention. According to Glago (2019), community-based disaster education fosters increased awareness and responsiveness, while Wijaya et al. (2019) emphasize that experiential learning—such as simulations and evacuation role-play—translates directly into heightened preparedness.

Table 4 further supports these findings through descriptive analysis. Pre-intervention scores had a mean of 45.5 and a median of 44 , with a wide range between 38 and 60 , and a standard deviation of 5.23 . These results reflect moderate understanding and considerable variability in readiness. Post-intervention scores improved markedly to a mean of 55.1 and a tighter standard deviation of 2.29 , suggesting enhanced knowledge consistency across participants. Navy & Correia (2017) argue that simulation methodologies reduce cognitive uncertainty by providing realistic scenarios, allowing respondents to internalize response procedures more effectively.

Educational level and age further influenced posttest outcomes. Respondents aged 34 – 40 (50%) and those educated at senior high school level (68.8%) showed high engagement during simulation activities. Widayanti & Daga (2021) suggest that individuals with higher educational backgrounds exhibit stronger information retention and improved adaptive behaviors. Similarly, Dharmawati & Wirata (2016) link age-related maturity to elevated disaster response capabilities. During this study, participants actively engaged in discussions, sought clarification, and demonstrated correct responses during emergency exercises, showcasing not only increased awareness but also a readiness to transfer knowledge into practical action. Finally, the simulation exercises conducted as part of the intervention allowed families to visualize evacuation maps, identify safe routes, and assemble emergency kits—thereby enabling comprehensive disaster planning within the household. These hands-on experiences mirror the recommendations of Notoatmodjo (2012), who advocates for empirically driven learning via repeated observation and interaction. This aligns with Xiaoxin Zhu (2017), who underscores that personal experience fosters resilience, and with Dzulhidayat (2022), who calls for integrating preparedness into everyday family life to build sustainable community response systems.

Despite these encouraging results, several limitations should be acknowledged. First, the reliance on a self-report questionnaire may introduce response bias, as participants could overstate their preparedness attitudes following the intervention. Second, the relatively short duration of the program may limit the ability to assess long-term retention of preparedness behaviors. Moreover, the findings are context-specific, derived from a single school community in Banyuwangi Regency with a limited sample size ($N=32$). As such, while the intervention demonstrated significant improvements in preparedness scores, caution should be exercised in generalizing these outcomes to broader populations or different regions without further studies. Future research should therefore involve larger, more diverse samples and longitudinal designs to evaluate sustained impacts of family-based disaster planning interventions.

Despite these encouraging results, several limitations should be acknowledged. First, the reliance on a self-report questionnaire may introduce response bias, and the relatively short intervention duration may limit the ability to assess long-term retention. Second, the sample size was based on feasibility rather than formal calculation, which is appropriate for a preliminary pre-experimental design but may restrict generalizability. Third, the study employed a one-group pretest–posttest design without a control group. While this design is suitable for preliminary intervention research, the absence of a comparison group limits the ability to rule out external influences or maturation effects as alternative explanations for the

observed improvements. Finally, the findings are context-specific to a single school community in Banyuwangi Regency with a limited sample (N=32). Future studies should therefore involve larger, more diverse samples, include control groups, and apply longitudinal designs to strengthen statistical validity and generalizability.

CONCLUSION

This study found a significant improvement in preparedness attitudes after the Family Disaster Planning intervention (Wilcoxon $Z = -4.786$, $p < 0.001$). Schools should include disaster education in the curriculum, supported by simulations and collaboration with disaster agencies. Health institutions can expand outreach through counseling and family-focused training. Future studies should test long-term retention and examine how age, education, and prior experience affect outcomes. Although limited to one school and a small sample, the findings show that family-based disaster planning can strengthen preparedness culture and reduce vulnerability in disaster-prone communities.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there are no known competing financial interests or personal relationships that could have influenced the work reported in this manuscript.

AUTHOR CONTRIBUTION

All authors contributed significantly to the conception and design of the study. Data collection, analysis, and interpretation were performed collaboratively. All authors participated in drafting and revising the manuscript critically for important intellectual content, approved the final version, and agreed to be accountable for all aspects of the work.

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