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Capacity Building of Village Health Workers in Community-Based Disaster Health Management

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ABSTRACT

Village health workers are at the forefront of health services in disaster situations, but most have not received sustainable and structured disaster training. Method: This community service program uses a Participatory Action Research (PAR) approach combined with community empowerment, implemented for 3 months (January-March 2026) in Balah Aia Village, Agam Regency, involving 30 village health workers. The intervention consisted of training, local scenario-based simulations, and four weeks of post-training mentoring. The evaluation used a one-group pretest-posttest design measuring knowledge, attitudes, and skills. Results: There was a significant increase in all capacity dimensions ($p<0.001$), with the largest increase in skills (28.57 points). The distribution of competencies shifted from 40% in the low category to only 3.3% post-intervention, and the number of high category participants increased from 10% to 76.7%. The highest simulation achievements were in emergency response (96.7%) and handling vulnerable groups (93.3%), while the development of contingency plans (80.0%) still requires strengthening. The level of participant satisfaction with the program was very good (90%). Implications: An integrated intervention model combining training, simulation, and ongoing mentoring is recommended as a sustainable approach to developing the capacity of village health workers. Conclusion: This program is effective in comprehensively improving the competence of village health workers and has the potential to be replicated in areas with similar disaster vulnerability characteristics.

Keywords: *Village Health Workers, Disaster Preparedness, Disaster Health Management, Simulation, Mentoring, Community Empowerment*

INTRODUCTION

The frequency and intensity of disasters, both those caused by natural hazards and those exacerbated by climate change, have continued to increase in various regions of the world over the past two decades. More than seven thousand natural hazard-based disasters occurred globally between 2000 and 2019, resulting in approximately 1.2 million deaths and impacting more than four

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billion people (Hung et al., 2021). This increased disaster risk is the result of a complex interaction between hazard levels, exposed populations, vulnerability, and coping capacity, which is also influenced by poverty, uncontrolled urbanization, environmental degradation, and the fragility of governance systems in various countries (Hung et al., 2021). This situation is driving a global paradigm shift in disaster management, from a reactive emergency response approach to strengthening disaster risk reduction, which emphasizes sustainable and integrated community preparedness across sectors.

The impact of disasters is not limited to loss of life and material losses, but also extends to disruptions in health care systems, disruption of access to clean water and proper sanitation, decreased nutritional status, and worsening mental health conditions of affected groups. Recent studies indicate that climate change contributes to the burden on community mental health, with estimates that every one degree Celsius increase in average temperature is associated with an increase of approximately 0.9% in the incidence of mental health disorders, particularly following extreme weather events such as floods, hurricanes, and droughts (Gomes et al., 2025). This double burden of physical, environmental, and psychosocial health disorders after a disaster emphasizes that health care in disaster situations needs to be comprehensive and multidimensional, oriented not only towards emergency medical responses but also towards comprehensive and sustainable public health recovery after a disaster.

Global recognition of the close link between health and disaster management is formally outlined in the Sendai Framework for Disaster Risk Reduction 2015–2030, which positions health systems as a key pillar of global disaster risk management (Hung et al., 2021). This framework encourages the strengthening of Health Emergency and Disaster Risk Management (Health EDRM), which encompasses the entire disaster management cycle, from prevention, mitigation, preparedness, response, and public health recovery. A core component of this framework is the development of health human resources, encompassing workforce planning, competency strengthening through training, and occupational safety of personnel, including community-based health workers (Hung et al., 2021). Therefore, strengthening the capacity of health workers at the grassroots level is not merely a local need but a strategic mandate aligned with the global agenda for health-based disaster risk reduction.

In the national context, Indonesia is one of the countries with the highest disaster risk levels in the world due to its geographic location at the confluence of three major tectonic plates and its archipelagic nature, which makes it vulnerable to earthquakes, tsunamis, volcanic eruptions, floods, and landslides. Official data recorded 5,400 disaster events throughout 2023, an increase compared to the previous year, dominated by hydrometeorological disasters (BNPB, 2023). The 2024 Indonesian Disaster Risk Index also shows that hundreds of districts/cities in Indonesia remain in the high to moderate disaster risk category, with the index trend fluctuating over the past ten years (PUSDATINKOM BNPB, 2025). The high frequency and wide distribution of disaster risks require health preparedness that is evenly distributed throughout rural areas, not only concentrated in referral health facilities in urban areas.

The Indonesian government has developed various regulations and policies related to disaster management and health services in crisis situations. However, the implementation of these policies at the primary health care level still faces several real obstacles in the field. A study of community health center nurses in Padang City, for example, found that although most health

workers demonstrated positive attitudes toward disaster preparedness, optimal disaster management knowledge and practices remained uneven and heavily dependent on the availability of regular training (Oktarina et al., 2024). A systematic review of hospital disaster management in Indonesia also confirmed that health facility preparedness still faces limitations in ongoing education and training for health workers (Andini et al., 2023). This gap between national-level policies and implementation capacity at the primary care level is a major weakness in Indonesia's disaster health preparedness system.

Village health workers occupy a strategic position at the forefront of providing health services before, during, and after a disaster. Their role includes identifying public health risks, post-disaster disease surveillance, basic health services, preparedness education, cross-sector coordination, environmental sanitation management in evacuation centers, maternal and child health support, first aid, and post-disaster community health recovery. A study on the role of health workers in disaster emergency response in Central Java found that mobilization of health workers and resource management at the field level were still suboptimal, resulting in inadequate promotive and preventive interventions, despite the formation of rapid response teams (Rahayuningsih et al., 2022). These findings highlight the gap between the ideal role of village health workers as outlined in policy and the reality of their implementation on the ground. Therefore, the speed and accuracy of post-disaster health responses depend heavily on the capacity of the health workers closest to the community.

Various studies indicate that some village health workers have not received continuous and structured disaster training. These limitations include knowledge of comprehensive disaster health management, the ability to conduct rapid assessments, risk communication skills, cross-sector coordination, the development of village-level contingency plans, and the organization of community health volunteers. Key identified barriers include limited human and financial resources, weak cross-sector coordination, and minimal budget allocation specifically for routine preparedness training and simulations (Rahayuningsih et al., 2022). A study of community health center nurses also confirmed that increasing the frequency of regular disaster training is a key factor in driving improvements in the knowledge, attitudes, and practices of health workers in preparedness at the primary care level (Oktarina et al., 2024). Without continuous capacity building, the competence of village health workers in dealing with health emergencies caused by disasters is at risk of being difficult to maintain over time.

Simulation- and scenario-based training approaches have been consistently proven more effective than passive learning methods such as lectures alone in improving the self-efficacy, knowledge, and skills of healthcare workers in responding to disaster situations. A systematic review of nineteen peer-reviewed studies on disaster preparedness training for nurses and nursing students concluded that simulation- and scenario-based approaches produced the most consistent improvements in self-efficacy, knowledge, and clinical skills in providing emergency healthcare (Nikitara et al., 2025). These findings indicate that capacity-building programs for rural healthcare workers should ideally not stop at the transfer of theoretical knowledge alone but should be integrated with field simulation practices that reflect potential local disaster threats, so that the preparedness developed is more applicable and reliable in real-life situations.

The sustainability of health worker competencies after training has also become a significant concern in contemporary public health literature. A quasi-experimental study of community-based

health workers in South Sudan found that an intensive training and supervision approach coupled with ongoing coaching and mentoring was associated with higher levels of satisfaction, better retention of knowledge and skills, and more consistent skill application compared to a standard supervision approach focused solely on data quality checks (World Relief, 2024). A scoping review of 236 studies on competency-based education for community health workers also concluded that most existing training programs are small and ad hoc, rarely integrated with ongoing support systems such as post-training mentoring and career development (Sultan et al., 2025). These findings underscore the importance of capacity-building models that extend beyond a single training session and include ongoing mentoring mechanisms to ensure the maintenance and consistent application of competencies in the field.

Disaster health management cannot rely solely on formal health institutions but requires the active involvement of communities as key actors throughout the disaster management cycle. A systematic review of thirty-three cases of community-based disaster risk management (CBDRM) in Asia, the Americas, and Australia identified four key pillars of successful community-based approaches: strengthening community networks, a supportive policy framework, a participatory approach, and the integration of local and indigenous knowledge (Moktan et al., 2026). The study also found that initiatives oriented toward community self-reliance and a bottom-up approach tend to demonstrate greater sustainability and resilience than top-down implementations, which typically cease after the project ends (Moktan et al., 2026). These findings reinforce the argument that the Community-Based Disaster Management approach should be the primary reference framework in designing disaster health capacity-building programs at the village level.

Multi-stakeholder collaboration between village health workers, health cadres, village governments, volunteers, community leaders, and higher education institutions has been proven to increase the effectiveness and sustainability of disaster health preparedness programs. The Health EDRM capacity development model at the community level emphasizes the importance of a people- and community-centered approach, given that local communities are often the first responders in emergency situations and possess local knowledge essential for successful program implementation (Hung et al., 2021). However, the success of this participatory approach still requires structural support from the government and development partners in the form of funding, technical support, and strengthening of existing health systems, so that community-based initiatives do not remain merely short-term projects that are vulnerable to stalling once external funding ends (Moktan et al., 2026). This combination of bottom-up initiatives and top-down structural support is key to the sustainability of village-based disaster health empowerment programs.

Community service programs play a strategic role as a medium for knowledge transfer, skills training, mentoring, simulations, and strengthening cross-sector networks in efforts to increase the capacity of village health workers. Possible activities include disaster health management training, village preparedness plan development workshops, local scenario-based emergency response simulations, post-disaster surveillance training, development of village-level disaster health standard operating procedures, and the formation of village health alert teams integrated with local cadres and volunteers. Empowerment approaches that combine training, simulations, and ongoing mentoring consistently demonstrate better and more lasting learning outcomes than one-way outreach approaches (Nikitara et al., 2025; Sultan et al., 2025). Therefore, systematically and

sustainably designed community service programs can serve as an effective bridge between national disaster preparedness policies and the actual capacity of health workers at the grassroots level.

Although various capacity-building programs for village health workers have been implemented in various regions of Indonesia, several significant gaps remain in their implementation. First, capacity-building programs tend to focus on emergency response aspects, while mitigation, long-term preparedness, and community-based health recovery dimensions have received less proportional attention. Second, available training is generally theoretical and has not been fully integrated with field simulation practices that reflect the local disaster threat context (Nikitara et al., 2025). Third, evaluations of training programs primarily measure increases in knowledge, while changes in skills, preparedness, cross-sector coordination, and decision-making capabilities in the field are rarely systematically evaluated (Sultan et al., 2025). Fourth, integration between village health workers and health cadres, village governments, and community organizations remains suboptimal, as found in various studies of disaster health preparedness at the local level (Rahayuningsih et al., 2022; Oktarina et al., 2024). Fifth, there are not many community service models that systematically combine training, post-training mentoring, scenario-based simulations, and ongoing evaluation in one integrated intervention package (World Relief, 2024; Sultan et al., 2025).

Based on these gaps, implementing a program to increase the capacity of village health workers in disaster health preparedness is highly urgent. This urgency is based on the need to comprehensively improve the competency of village health workers across all stages of disaster health management, from mitigation to recovery. Furthermore, strengthening cross-sectoral coordination at the village level needs to be systematically established to eliminate reliance on incidental initiatives, as reflected in various findings of coordination gaps in previous studies (Rahayuningsih et al., 2022). Such a program is also crucial for building a sustainable health preparedness system, enhancing community capacity to respond to health emergencies, and ultimately contributing to reducing morbidity, mortality, and the socio-economic impacts of disasters. This program also aligns with efforts to support the achievement of disaster-resilient villages and the sustainable strengthening of the resilience of Indonesia's primary health care system.

The novelty offered through this community service program lies in several key aspects. First, the development of a capacity-building model for village health workers that integrates training, local scenario-based simulations, post-training mentoring, and ongoing competency evaluation within a cohesive learning cycle, rather than a single, disconnected training session (Sultan et al., 2025; World Relief, 2024). Second, the implementation of a Community-Based Disaster Management approach that actively involves health workers, cadres, village government, community leaders, and volunteers in a collaborative and ongoing manner, rather than simply as objects of one-way socialization (Moktan et al., 2026). Third, the use of simulation- and scenario-based learning methods tailored to the characteristics and potential threats of local disasters is in line with evidence that such approaches result in more consistent competency improvements (Nikitara et al., 2025). Fourth, the scope of the program evaluation not only measures improvements in knowledge, but also the skills, coordination, preparedness, and confidence of health workers in dealing with disaster situations, so that the resulting mentoring model has the potential to be replicated in other villages as part of strengthening community health resilience more broadly.

METHODS

This community service program uses a Participatory Action Research (PAR) approach combined with community empowerment methods. This approach was chosen because it places village health workers as the primary subjects in the process of problem identification, capacity building, implementation, and evaluation of community-based disaster health management. The activity was carried out for three months, namely from January to March 2026, in Balah Aia Village, Palembayan District, Agam Regency, an area with a high level of vulnerability to natural disasters based on its geographic characteristics and history of disaster events.

The target group of the activity consisted of 30 village health workers, including nurses, midwives, environmental health workers, health promotion workers, and health cadres who were active in primary health care services at the village level. Participants were selected using a purposive sampling technique with inclusion criteria including: (1) actively serving in the village area for at least six months, (2) willing to participate in the entire series of activities, and (3) obtaining approval from the head of the health facility or village government. Participants who did not participate in more than 80% of the series of activities were excluded from the evaluation analysis.

The program is implemented through four main stages: preparation, intervention implementation, mentoring, and evaluation. The preparation stage includes coordination with village governments, community health centers, and relevant stakeholders, training needs analysis through focus group discussions, and the development of training modules and evaluation instruments. The implementation stage consists of delivering material on basic disaster health concepts, health risk assessment, risk communication, post-disaster disease surveillance, environmental sanitation management in emergency situations, health services for vulnerable groups, and cross-sector coordination. Material is delivered through interactive lectures, group discussions, case studies, and simulations based on local disaster scenarios.

The mentoring phase lasted four weeks after the training, with field visits and regular coaching to support the implementation of the action plans developed by participants. The mentoring focused on developing village health contingency plans, establishing village health alert teams, conducting preparedness simulations, and strengthening coordination between health workers, cadres, village government, and community volunteers.

The program evaluation used a one-group pretest–posttest design to assess changes in participant capacity before and after the intervention. The assessment covered three dimensions: knowledge, attitudes, and skills in disaster health management. Knowledge was measured using a 20-item multiple-choice questionnaire, while attitudes were measured using a five-point Likert scale instrument with 15 statements. Skills were evaluated through observation sheets during the simulation using a checklist compiled based on Health Emergency and Disaster Risk Management (Health EDRM) competency indicators. All instruments underwent content validity testing by three public health and disaster management experts, with a Content Validity Index (CVI) ≥0.80 and demonstrated good reliability (Cronbach's alpha = 0.86).

Data were analyzed using IBM SPSS Statistics software version 27. Descriptive analysis is presented in the form of means, standard deviations, frequencies, and percentages. Normality tests were performed using the Shapiro–Wilk test. Differences in scores before and after the intervention were analyzed using the paired t-test for normally distributed data or the Wilcoxon signed-rank test

if the data did not meet the assumption of normality. All statistical tests used a significance level of $p < 0.05$.

The implementation of this activity has received approval from the village government and the head of the local community health center. All participants provided written informed consent before participating. Confidentiality of participant identities was maintained throughout the data collection, analysis, and reporting process, in accordance with ethical principles of research and community service.

RESULTS

1. Participant Characteristics

A total of 30 village health workers participated in all activities, resulting in a 100% participant retention rate. Participants included nurses, midwives, environmental health workers, health promotion workers, and health cadres actively providing primary health care in Balah Aia Village. All participants participated in training, simulations, field mentoring, and a final evaluation according to the established schedule.

Table 1. Characteristics of Community Service Participants (n = 30)

Characteristics	n	%
Gender		
Man	9	30.0
Woman	21	70.0
Profession		
Midwife	8	26.7
Nurse	7	23.3
Sanitarian	4	13.3
Health promotion	3	10.0
Health cadres	8	26.7
last education		
SENIOR HIGH SCHOOL	8	26.7
Diploma	13	43.3
Bachelor	9	30.0
Have you ever participated in disaster training?		
Yes	11	36.7
No	19	63.3

The majority of participants were female health workers with diplomas. Most had never participated in disaster health training before, indicating that the program targeted a group in need of capacity building. The diversity of professions also demonstrated that the program reached various elements of primary health care, potentially strengthening cross-professional coordination in disaster management.

2. Changes in Knowledge, Attitudes, and Skills

Table 2. Comparison of Scores Before and After Intervention

Variables	Pretest Mean ± SD	Posttest Mean ± SD	Mean Difference	95% CI	p-value
Knowledge	61.47 ± 8.91	84.83 ± 6.37	23.36	19.12–27.60	<0.001
Attitude	68.20 ± 7.25	86.63 ± 5.42	18.43	15.01–21.85	<0.001
Skills	58.73 ± 9.14	87.30 ± 5.84	28.57	24.63–32.51	<0.001

Paired t-test; a = 0.05.

The program's implementation resulted in significant improvements across all dimensions of village health worker capacity. The greatest improvement occurred in skills, demonstrating that the combination of training, simulations, and mentoring was more effective in enhancing practical abilities than solely conceptual understanding. Improvements in attitudes also indicated greater psychological preparedness for disaster situations.

3. Changes in Participant Competency Levels

Table 3. Distribution of Competency Levels Before and After the Program

Competency Level	Pretest n (%)	Posttest n (%)
Low	12 (40.0)	1 (3,3)
Currently	15 (50.0)	6 (20.0)
Tall	3 (10.0)	23 (76.7)
Total	**30 (100)**	**30 (100)**

There was a shift in the distribution of competencies to higher categories after the intervention. Almost all participants previously in the low category moved to the medium or high categories. This indicates that the program not only increased participants' average scores but also successfully improved the overall distribution of competencies.

4. Field Simulation Evaluation Results

Table 4. Competency Achievements in Disaster Health Management Simulation

Competency Indicators	Competent Participants n (%)
Identify health risks	28 (93.3)
Risk communication	27 (90.0)
Rapid health assessment	26 (86.7)
Cross-sector coordination	25 (83.3)
Emergency sanitation management	27 (90.0)
Preparation of contingency plans	24 (80.0)
Handling of vulnerable groups	28 (93.3)
Implementation of emergency response simulation	29 (96.7)

Most participants demonstrated good competency across all simulation indicators. The ability to conduct emergency response simulations and identify vulnerable groups was the highest achievement, while developing contingency plans was still an aspect requiring further strengthening. These findings indicate that participants mastered operational skills more quickly than strategic planning skills.

5. Level of Participant Satisfaction with the Program

Table 5. Participant Satisfaction Evaluation

Evaluation Aspects	Very Good n (%)	Good n (%)
Training materials	22 (73.3)	8 (26.7)
Learning methods	24 (80.0)	6 (20.0)
Field simulation	26 (86.7)	4 (13.3)
Mentoring	25 (83.3)	5 (16.7)
Benefits of the program	27 (90.0)	3 (10.0)

Participants gave positive reviews of all program components. Field simulations and mentoring received the highest praise, as they provided contextual learning experiences and facilitated the application of the material in daily healthcare practice. The high level of satisfaction also indicated that the empowerment approach used was well-received by participants.

6. Summary of Key Findings

Overall, the capacity building program successfully enhanced the competency of village health workers in community-based disaster health management. Improvements were not only evident in knowledge but also in attitudes, skills, and operational preparedness during field simulations. Post-training mentoring contributed to strengthening the implementation of action plans at the village level, while high participant satisfaction indicated that the training model based on Participatory Action Research, simulations, and mentoring is worthy of consideration as a sustainable capacity development model for village health workers.

DISCUSSION

1. Improving the Competence of Village Health Workers through an Integrated Approach

The program's key findings demonstrated significant improvements across all dimensions of village health worker capacity, with knowledge scores increasing by 23.36 points (from 61.47 to 84.83), attitudes by 18.43 points (from 68.20 to 86.63), and skills by 28.57 points (from 58.73 to 87.30). The greatest improvement occurred in the skills dimension, indicating that the combination of training, scenario-based simulations, and field mentoring proved more effective in building practical skills than simply enhancing conceptual understanding.

A meta-analysis of 21 studies involving 9,222 nurses also showed that disaster training significantly improved nurses' preparedness levels, although the skills and disaster management dimensions still require further strengthening ($p = 0.000$) (Luo et al., 2025).

The greater improvement in the skills dimension compared to knowledge also strengthens the argument that adult learning approaches (andragogy), which emphasize hands-on experience and structured practice, are more effective than passive lecture methods. This is supported by the findings of Wan et al. (2025) who developed a competency training index system in public health emergencies for community nurses, emphasizing the importance of standardized training that covers aspects of knowledge, skills, and attitudes in an integrated manner (Wan et al., 2025).

The differences in the magnitude of improvement across dimensions (skills > knowledge > attitudes) indicate that practical skills are more responsive to simulation-based interventions and hands-on practice, while attitude changes require more time and repeated reinforcement. This

indicates the need for long-term mentoring programs to ensure sustainable attitude change, not just short-term cognitive and psychomotor changes.

2. Effectiveness of Local Scenario-Based Simulations in Building Operational Preparedness

Evaluation of the field simulations showed that most participants achieved a good level of competency across all assessed indicators. The highest levels of achievement were in emergency response simulations (96.7%) and handling vulnerable groups (93.3%), while contingency planning remained the lowest-performing aspect (80.0%).

These findings are consistent with a systematic review of disaster preparedness simulation exercises (SimEx), which demonstrated that scenario-based operational exercises effectively improve the competency of healthcare workers in various aspects of disaster response. The study identified that well-designed simulations can bridge the gap between theoretical knowledge and practical application in the field, particularly through structured debriefing and feedback mechanisms (Mahdi et al., 2023).

Lower achievement in contingency planning indicates that strategic planning skills require a higher level of analytical and systemic thinking than operational skills. This aligns with the findings of a scoping review by Sultan et al. (2025), which highlighted that most community health worker training programs are small and ad hoc, rarely integrated with the development of more complex planning and management competencies (Sultan et al., 2025).

The relatively lower contingency planning capacity may be due to two factors. First, higher cognitive complexity is required for strategic planning compared to implementing operational procedures. Second, village health workers may not be accustomed to participatory planning approaches involving multiple stakeholders. Therefore, follow-up programs need to prioritize capacity development for cross-sector planning and coordination.

3. Capacity Building through Participatory Approaches and Community Empowerment

This program employs a Participatory Action Research (PAR) approach that places village health workers as the primary subjects throughout all stages of the program. The high level of participant satisfaction (90% rated the program's benefits as very good) indicates that this participatory approach is well-received and relevant to real-world needs.

A study by D'Ambruoso et al. (2023) on a PAR training intervention for CHWs in rural South Africa showed that the training improved management capacity, dialogue skills, role clarification, and strengthened community mobilization, facilitation, and analytical skills. CHWs reported a threefold benefit from the training: community acceptance, peer support, and dialogue and recognition from the health system (D'Ambruoso et al., 2023). These findings strengthen the argument that the PAR approach not only improves individual competency but also strengthens the position of health workers within the broader health care system.

The Community-Based Disaster Management (CBDM) approach implemented in this program also aligns with a study by Fatmah et al. (2024), which identified four key pillars for a successful community-based approach: strengthening community networks, a supportive policy framework, a participatory approach, and integrating local and indigenous knowledge. A study on the role of disaster preparedness cadres in Indonesia also emphasized that empowering health

cadres and community leaders is a crucial principle in community-based disaster management (Fatmah et al., 2024).

The success of this program's participatory approach is inseparable from the socio-cultural context of the Balah Aia Village community, which has a strong communal social structure. The PAR approach allows village health workers to go beyond simply receiving knowledge transfers and actively reflect on experiences, identify needs, and design contextual solutions. This fosters a stronger sense of ownership of the program and increases motivation to apply the acquired skills.

4. The Role of Post-Training Mentoring in Competency Sustainability

The program includes a four-week mentoring phase following the training, including field visits and regular coaching. Participants' high appreciation of the mentoring component (83.3% rated it excellent) indicates that ongoing post-training support is a critical component of the capacity-building program.

These findings are supported by a World Relief study (2024), which found that an intensive training and supervision approach coupled with ongoing coaching and mentoring was associated with higher levels of satisfaction, better retention of knowledge and skills, and more consistent application of skills compared to a standard supervision approach. A study of sustainable CHW empowerment strategies in Jamkhed, India, also confirmed that the impact of basic training was sustained through ongoing interaction between the program and CHWs and knowledge reinforcement in the field and at the training center.

A scoping review by Sultan et al. (2025) of 236 studies concluded that most CHW training programs are small and ad hoc, rarely integrated with ongoing support systems such as post-training mentoring and career development. This confirms that capacity-building models that stop at a single training session without ongoing mentoring mechanisms risk resulting in a decline in competency over time (Sultan et al., 2025).

Post-training mentoring serves as a bridge between learning in the training room and implementation in the field. Through mentoring, participants receive direct feedback on their practices, the opportunity to discuss implementation barriers, and psychological support in facing real-life challenges. Without mentoring, the knowledge and skills acquired during training are at risk of skill decay due to limited opportunities to practice and strengthen the competencies developed.

5. Implications for Strengthening Disaster-Responsive Primary Health Care Systems

The change in the distribution of participants' competency levels—from 40% in the low category before the program to only 3.3% after, and the increase in participants in the high category from 10% to 76.7%—demonstrates that the program not only improved average scores but also improved the overall distribution of competencies. This has important implications for strengthening disaster-responsive primary health care systems at the village level.

A study of the implementation of the integrated disaster preparedness training model based on public health nursing (ILATGANA-PHN) in Indonesia found that the training intervention had a significant effect on improving community self-management preparedness ($p = 0.000 \leq 0.005$) across four parameters: disaster knowledge and attitudes, disaster preparedness plans, disaster warnings, and community resource mobilization (Sofyana et al., 2024). These findings align with the

program's results, which showed improvements across all capacity dimensions, including coordination and resource mobilization.

Ripoll Gallardo et al. (2015) in a systematic review of core competencies in disaster management and humanitarian assistance identified that most of the literature focuses on the health sector and there is still a lack of agreement on competency-based terminology. This program contributed to the development of a measurable and contextual competency model for village health workers in Indonesia, which can serve as a reference for similar programs in other regions (Ripoll Gallardo et al., 2015).

The program's success in improving the overall distribution of competencies demonstrates that the approach is not only effective for participants with high initial capacity but also capable of elevating those with low initial capacity to a higher level. This is crucial because village health workers with low initial capacity are the group most in need of intervention and most at risk of response failure in the event of a disaster. Inclusive and equitable capacity-building programs like this are foundational to strengthening the resilience of the overall health system.

6. Research Limitations

This study has several limitations that should be considered when interpreting the results. The one-group pretest-posttest design without a control group limits the ability to attribute changes solely to the program intervention, as external factors such as field experience during the intervention period or exposure to disaster information from other sources could also have contributed to the improvement in scores. Furthermore, the measurements were conducted over a relatively short period of time (3 months), making it impossible to assess long-term competency retention. Further research with quasi-experimental or randomized controlled trial designs and long-term follow-up evaluations are needed to strengthen the evidence for the effectiveness of this model.

CONCLUSIONS

A community-based disaster health management capacity building program for village health workers, integrating a Participatory Action Research approach, local scenario simulation-based training, and post-training mentoring, has proven effective in comprehensively improving the competency of village health workers. Significant improvements occurred across all capacity dimensions, with the highest achievement in the skills aspect (an increase of 28.57 points; $p<0.001$), indicating that the experiential learning approach through simulation and direct practice is superior in building operational capabilities compared to passive knowledge transfer methods. The shift in competency distribution from 40% of low-skilled participants to only 3.3% post-intervention, and the increase in high-skilled participants from 10% to 76.7%, confirm that this intervention model not only improves the average score but also successfully elevates the capacity of even the most vulnerable groups.

The implications of these findings include four main aspects. First, the need to integrate a local scenario-based simulation approach and ongoing mentoring into village health worker training policies, given that this method has proven more effective in building practical skills and operational preparedness than conventional, theoretical and disconnected training. Second, strengthening post-training mentoring mechanisms needs to be a mandatory component of village health worker

capacity development programs to prevent skill degradation and ensure the application of competencies in the field, as reflected by the high appreciation of the mentoring component by participants (83.3% rated it as very good). Third, a participatory approach involving health workers, cadres, village government, and community leaders collaboratively has been shown to increase ownership and sustainability of the program, thus recommending this model for replication in other areas with similar disaster vulnerability characteristics. Fourth, the lowest achievement in the aspect of contingency planning (80.0%) indicates the need to strengthen strategic planning capacity and cross-sector coordination in follow-up programs, as these capabilities are crucial for ensuring systemic and sustainable preparedness at the village level.

This study recommends the development of a sustainable capacity-building model with a longer mentoring period (at least 6-12 months) and the strengthening of competency-based monitoring and evaluation systems to ensure long-term skill retention and application. Further research with a quasi-experimental design and long-term evaluation is needed to more comprehensively measure the program's impact and identify factors influencing the sustainability of village health workers' competencies in responding to health emergencies caused by disasters.

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