

Community-Based Sanitation and Hygiene Counseling for Preventing Post-Disaster Diseases after the December 2025 Flood and Landslide in Lubuk Minturun Village, Padang City, Indonesia

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ABSTRACT

Post-disaster conditions frequently damage sanitation infrastructure and disrupt access to clean water, increasing the risk of environmentally related infectious diseases. Following the December 2025 flood and landslide in Lubuk Minturun Village, Padang City, affected communities experienced inadequate sanitation facilities and limited hygiene practices. This community service program aimed to improve community knowledge, awareness, and practical skills regarding sanitation and hygiene for post-disaster disease prevention. Method: A one-group pre-test-post-test design was implemented from January to March 2026 involving 50 disaster-affected residents selected through purposive sampling. The intervention consisted of interactive lectures, group discussions, and practical demonstrations on handwashing, safe drinking water storage, household waste management, and healthy latrine use. Knowledge was measured using a structured questionnaire adapted from PHBS and WASH indicators, while observational checklists assessed participants' practical skills. Data were analyzed descriptively and using a paired-samples t-test with a significance level of $p < 0.05$. Results: The mean knowledge score increased significantly from 61.4 ± 10.2 to 84.7 ± 8.1 (mean difference = 23.3 points; $p < 0.001$). Participants with high knowledge increased from 16% to 70%, active participation reached 82%, and practical skill performance ranged from 82% to 90%. Implications: The findings support integrating sanitation and hygiene education into post-disaster recovery programs while strengthening community health cadres and rehabilitation of sanitation infrastructure. Conclusion: Participatory sanitation and hygiene counseling effectively improved knowledge and hygiene practices among flood- and landslide-affected communities and can be adapted for similar disaster-prone settings.



Keywords: *Sanitation Counselling, Hygiene Behavior, Post-Disaster, PHBS, WASH, Community Health*

INTRODUCTION

Indonesia is a country with a high level of disaster vulnerability due to its geographical, geological, hydrological, and climatological conditions. Various types of disasters, such as floods, earthquakes, tsunamis, landslides, volcanic eruptions, and extreme weather, occur repeatedly in various regions and have a broad impact on people's lives. The impact of disasters not only includes infrastructure damage, economic losses, and loss of homes, but also significantly impacts public health. In post-disaster situations, communities often face limited access to health services, clean water, sanitation, and a decent environment, increasing vulnerability to various infectious and environment-related diseases (Charnley et al., 2021).

One of the main problems that often arises after a disaster is the destruction of sanitation and environmental hygiene facilities. Clean water infrastructure, sewage networks, toilet facilities (MCK), and waste management systems are often damaged by disasters (Sari et al., 2020; Widriyakara S et al., 2021). This situation makes it difficult for communities to obtain safe water for consumption and use in daily activities. The World Health Organization (WHO) emphasizes that disruptions to clean water, sanitation, and hygiene (WASH) systems in emergency situations can significantly increase the risk of disease transmission due to environmental pollution and the contamination of water sources used by the community. This situation is further complicated when communities are forced to live in crowded refugee camps with limited sanitation facilities (WHO, 2024).

Poor sanitation conditions after a disaster are closely linked to an increase in the incidence of environmentally related diseases. Various studies have shown that disruptions to sanitation and hygiene systems can trigger the emergence of diarrhea, cholera, dysentery, typhoid fever, leptospirosis, skin diseases, and acute respiratory infections (ARI). A systematic review conducted by Charnley et al. (2021) found that post-disaster infectious disease outbreaks are generally influenced by overcrowding in temporary housing, damaged sanitation infrastructure, limited clean water, and poor community hygiene practices. The WHO also explains that diseases related to water, sanitation, and hygiene are a major threat in humanitarian emergencies because they can spread rapidly among disaster-affected populations (Charnley et al., 2021).

The population groups most vulnerable to the impacts of post-disaster diseases are infants, children, pregnant women, the elderly, and people with disabilities. These groups have relatively lower immune systems and require special attention in meeting sanitation and hygiene needs. In addition to increasing morbidity, the emergence of post-disaster diseases can also slow the community's recovery process and increase the burden on health services. Therefore, disease prevention efforts through improving clean and healthy living behaviors are a crucial part of both the emergency response and post-disaster recovery phases.

Clean and Healthy Living Behavior (PHBS) is an effective strategy for reducing the risk of environmentally-related diseases. Simple practices such as washing hands with soap, consuming safe drinking water, using healthy latrines, properly managing waste, and maintaining environmental cleanliness have been proven to reduce the risk of transmission of various infectious diseases (Marleni et al., 2025; Sari et al., 2025). The WHO and CDC emphasize that implementing

good hygiene practices is a primary preventive measure for preventing diarrhea and other infectious diseases after a disaster. However, implementing PHBS in post-disaster conditions often faces various obstacles, including limited facilities, lack of public knowledge, and low awareness of the importance of sanitation and environmental cleanliness.

In these conditions, sanitation and hygiene counseling is a relevant intervention to increase community capacity in maintaining environmental health. Counseling is an educational process that focuses not only on conveying information but also on encouraging changes in attitudes and behavior through a participatory approach. Education-based interventions enable communities to understand the health risks they face, identify preventative measures, and actively participate in maintaining environmental cleanliness. A study by Alareqi et al. (2024) showed that WASH interventions accompanied by an educational approach and behavioral promotion have a positive contribution to improving hygiene behaviors and disease prevention in communities affected by humanitarian crises (Alareqi et al., 2024).

Although numerous studies have demonstrated the effectiveness of sanitation and hygiene education in disaster settings, most have primarily focused on evaluating knowledge improvement or WASH implementation in emergency shelters. Evidence from community service (PkM) programs documenting integrated sanitation education among disaster-affected communities at the village level remains limited, particularly in Lubuk Minturun Village, Padang City, which experienced severe flooding and landslides in December 2025. Despite being one of the areas most affected by hydrometeorological disasters, no published community service report has specifically evaluated participatory sanitation counseling combined with practical demonstrations using PHBS and WASH approaches within this community.

Preliminary observations conducted through coordination with local authorities, community leaders, and health cadres identified several unresolved environmental health problems following the disaster, including damaged sanitation facilities, unsafe drinking water storage, inadequate household waste management, and limited public understanding of disease prevention practices. These conditions indicate a clear discrepancy between recommended post-disaster environmental health standards and the actual sanitation practices observed in the affected community.

Therefore, this community service program was designed to address this practical and scientific gap by implementing a participatory sanitation and hygiene counseling intervention tailored to local post-disaster conditions. Unlike previous community education activities, this program combined interactive education, behavioral demonstrations, and community participation to strengthen knowledge, practical skills, and community preparedness for preventing environmentally related diseases during the recovery phase.

METHODS

This community service program employed a one-group pre-test-post-test design to evaluate the effectiveness of sanitation and hygiene counseling among disaster-affected residents. The program was conducted in Lubuk Minturun Village, Koto Tengah District, Padang City, West Sumatra, an area severely affected by floods and landslides that occurred in December 2025. The disaster caused damage to household sanitation facilities, disrupted access to clean water, and increased the potential transmission of environmentally related diseases. Activities were



implemented from January to March 2026, covering preparation, intervention, monitoring, and evaluation phases.

The target population comprised residents directly affected by the December 2025 disaster, including heads of households, housewives, community health cadres, and community leaders. A total of 50 participants were recruited using purposive sampling based on the following inclusion criteria: (1) residing in disaster-affected areas, (2) aged 18 years or older, (3) willing to participate throughout the program, and (4) able to complete both pre-test and post-test assessments. Individuals who did not attend the complete intervention sessions or failed to complete both assessments were excluded from the analysis.

The intervention consisted of participatory sanitation and hygiene education delivered through interactive lectures, group discussions, question-and-answer sessions, and practical demonstrations. Educational materials covered post-disaster environmental sanitation, household water treatment and storage, handwashing with soap, healthy latrine use, household waste management, and prevention of environmentally related diseases including diarrhea, leptospirosis, typhoid fever, skin diseases, and acute respiratory infections. Practical demonstrations enabled participants to directly practice recommended hygiene behaviors under facilitator supervision.

Knowledge was measured using a 25-item structured questionnaire developed by adapting indicators from the Clean and Healthy Living Behavior (PHBS) and Water, Sanitation and Hygiene (WASH) frameworks. The questionnaire underwent expert validation involving three public health specialists, resulting in a Content Validity Index (CVI) of 0.91. Reliability testing conducted during pilot implementation demonstrated good internal consistency (Cronbach's $\alpha = 0.87$). Observation checklists were used to assess participant engagement and practical skill performance during demonstrations, while attendance records, photographs, and field notes served as supporting documentation.

Data collection was conducted twice, immediately before the intervention (pre-test) and after completion of all educational sessions (post-test). Descriptive statistics were used to summarize participant characteristics, attendance, participation levels, and practical performance. Continuous variables are presented as mean $\pm$ standard deviation, whereas categorical variables are reported as frequencies and percentages. Prior to inferential analysis, normality of pre-test and post-test scores was examined using the Shapiro–Wilk test. Because the data were normally distributed, differences between pre-test and post-test knowledge scores were analyzed using a paired-samples t-test. Statistical significance was established at $p < 0.05$, and all analyses were performed using IBM SPSS Statistics version 26.

Program success was evaluated using predefined indicators, including participant attendance of at least 80%, statistically significant improvement in knowledge scores, active participation during educational sessions, and participants' ability to correctly demonstrate recommended sanitation and hygiene practices. These indicators were used to assess both the effectiveness of the intervention and its potential applicability in similar post-disaster community settings.

RESULTS

1. Characteristics of Activity Participants

The Sanitation and Hygiene Counseling Activity to Prevent Post-Disaster Diseases in Affected Communities was attended by 50 participants from Lubuk Minturun Village, Koto Tangah District, Padang City. Participants consisted of heads of families, housewives, health cadres, community leaders, and representatives of community groups affected by hydrometeorological disasters. The participant attendance rate during the activity reached 92%, thus meeting the program's established success indicator, which is at least 80% of the target number.

Table 1. Characteristics of Activity Participants

Characteristics	n	%
Male gender	18	36.0
Female gender	32	64.0
Age 20–35 Years	14	28.0
Age 36–50 Years	22	44.0
Age >50 Years	14	28.0
Head of family	15	30.0
Housewife	20	40.0
Health Cadres	8	16.0
Community Leaders and Others	7	14.0

Data shows that the majority of participants were women (64.0%) and in the productive age group of 36–50 years (44.0%). The predominance of housewives and heads of families indicates that the activity targets groups that play a crucial role in maintaining sanitation and cleanliness in the family environment.

2. Participant Knowledge Enhancement

Knowledge evaluation was conducted using a pre-test before counseling and a post-test after the entire series of activities were completed. The analysis showed an increase in participants' knowledge scores regarding post-disaster sanitation and hygiene.

Table 2. Results of Pre-test and Post-test of Participants' Knowledge

Variables	Mean $\pm$ SD
Pre-test	61.4 $\pm$ 10.2
Post-test	84.7 $\pm$ 8.1
Score Improvement	23.3

Based on Table 2, the average knowledge score of participants before the activity was 61.4 and increased to 84.7 after counseling. This average score increased by 23.3 points, indicating that the counseling activity improved participants' understanding of sanitation, environmental hygiene, safe drinking water management, household waste management, and post-disaster environmental disease prevention.



3. Changes in Participants' Knowledge Level

To provide a more detailed picture, participants' knowledge levels were categorized into three groups, namely low, medium, and high.

Table 3. Distribution of Knowledge Level Before and After Counseling

Category	Pre-test n (%)	Post-test n (%)
Low	18 (36.0)	3 (6.0)
Medium	24 (48.0)	12 (24.0)
High	8 (16.0)	35 (70.0)
Total	50 (100)	50 (100)

Variable	Pre-test Mean±SD	Post-test Mean±SD	Mean Difference	95% CI	p-value
Knowledge Score	61.4±10.2	84.7±8.1	23.3	19.4– 27.2	<0.001

The results showed that before the activity, most participants were in the medium (48.0%) and low (36.0%) knowledge categories. After the activity, the majority of participants were in the high knowledge category (70.0%). This finding indicates that the counseling material provided was well received by the participants.

4. Participant Observation Results

Observations during the event showed that participants enthusiastically participated in all aspects of the program. Most actively asked questions, shared experiences related to post-disaster sanitation conditions, and participated in group discussions.

Table 4. Level of Participant Participation During the Activity

Participation Category	n	%
Very Active	21	42.0
Active	20	40.0
Quite Active	7	14.0
Less Active	2	4.0

A total of 82.0% of participants were in the active and very active categories. This high level of participation indicates that the educational and participatory approach used in the activities increased community involvement in the learning process.

5. Results of the Sanitation and Hygiene Practice Demonstration

Practical evaluation is carried out through direct observation of participants' abilities in applying the material that has been provided.

Table 5. Participants' Ability to Practice Sanitation and Hygiene Behavior

Practice Indicators	Capable (%)
Wash your hands with soap according to standards	90.0
Efforts to maintain environmental cleanliness	88.0
Use and maintenance of healthy toilets	86.0
Safe drinking water storage	84.0
Household waste management	82.0

Observations showed that most participants were able to practice the sanitation and hygiene behaviors demonstrated. The highest level of competence was seen in handwashing with soap according to health standards (90.0%), while the lowest level was in household waste management (82.0%). Nevertheless, all indicators demonstrated good performance and reflected improved participant skills after participating in the activities.

6. Impact of the Program on Public Awareness

A qualitative evaluation was carried out through participatory observation and focus group discussions (FGDs) at the end of each activity session to explore participants' perceptions, understanding and commitment to adopting clean and healthy living practices in the aftermath of a disaster. A total of three FGD sessions were held, each comprising 8–10 participants who were purposively selected to represent various participant categories (heads of households, housewives, health cadres and community leaders).

The results of the observations and FGDs showed that all participants (50 people) reported a better understanding of the link between poor sanitation and the emergence of post-disaster diseases, including diarrhoea, skin diseases, leptospirosis, typhoid fever and acute respiratory infections (ARI). A total of 46 out of 50 participants (92 per cent) made a verbal commitment to practise healthy living habits on an ongoing basis within their own households, whilst 44 participants (88 per cent) committed to sharing the information they had gained with family members and the wider community.

Participants actively identified the main challenges in implementing PHBS, namely limited access to clean water, damage to sanitation facilities, and long-standing habits that are difficult to change. However, they also outlined adaptation strategies, such as simple drinking water treatment, the creation of makeshift rubbish bins, and the allocation of schedules for the use of communal sanitation facilities. These qualitative findings indicate that the programme has successfully fostered collective awareness and local initiatives, although long-term implementation still requires infrastructure support and ongoing guidance.

DISCUSSION

1. Participant Knowledge Improvement (Pre-test and Post-test)

The sanitation and hygiene counselling intervention in Lubuk Minturun Village demonstrated a significant increase in knowledge, with the average score rising by 23.3 points (from 61.4 to 84.7). This increase reflects the effectiveness of the interactive delivery method—which combined lectures, group discussions and practical demonstrations—as well as the relevance of the material to the community's real needs in the aftermath of the disaster. These findings are consistent with the study by Markolinda et al. (2025) in Nagari Pandai Sikek, which reported a 24.3-point



increase in knowledge scores following integrated post-disaster education, as well as the research by Ramadhan et al. (2025) in Benua Raya, which showed an increase in knowledge from 80.77 per cent–94.23 per cent to 96.15 per cent–100 per cent following the training.

The success of this knowledge transformation is closely linked to a participatory approach that provides space for participants to share experiences and local solutions. As emphasised by Nurwidiarni (2025), holistic, participatory and gender-sensitive sanitation interventions have been shown to deliver significant health, social and economic impacts. However, increased knowledge alone is not sufficient to guarantee long-term behavioural change. Factors such as the availability of adequate sanitation facilities, local policy support, and the empowerment of health cadres are essential prerequisites for bridging the gap between knowledge and practice (Charnley et al., 2021).

This substantial increase in knowledge was primarily due to the interactive delivery method and the relevance of the material to the real needs of post-disaster communities. However, increased knowledge does not automatically guarantee long-term behavior change unless supported by adequate sanitation facilities and ongoing empowerment through local health cadres.

2. Distribution of Knowledge Level Before and After Counseling

The distribution of knowledge in Table 3 shows a significant shift. Before counseling, the majority of participants were in the medium (48.0%) and low (36.0%) knowledge categories; after counseling, 70.0% of participants were in the high knowledge category. This finding confirms that structured health education interventions can address the community's initial knowledge gap. This is supported by a systematic review by Charnley et al. (2021), which emphasized that overcrowding in temporary housing, damaged sanitation infrastructure, and poor hygiene practices are key risk factors for post-disaster disease outbreaks—making increasing knowledge a crucial first step. Furthermore, a literature review by Nurwidiarni (2025) highlighted that successful sanitation interventions must be holistic, participatory, and gender-sensitive, and tailored to specific contexts (urban, rural, post-disaster) to deliver significant health, social, and economic impacts (Nurwidiarni, 2025). CLTS (Community-Led Total Sanitation) education for diarrhea prevention in Bekasi also proved the effectiveness of the educational approach in increasing community knowledge about sanitation (Kusumaningtiar et al., 2025).

The success of transforming the majority of participants into the high-knowledge category reflects the fact that the counseling materials were designed using language and methods easily understood by the general public. However, researchers assume that factors such as participants' formal education level and access to pre-disaster health information also influence baseline knowledge, so future counseling strategies need to further consider the heterogeneity of participant characteristics.

3. Participant Participation Level During Activities

Table 4 shows that 82.0% of participants were active or very active during the activity. This high level of participation is due to the use of an educational and participatory approach in counseling, which included interactive lectures, group discussions, and practical demonstrations. This aligns with the findings of the SHINE (Sanitation, Hygiene, Information, and Education) study in India, which showed that participatory behavioral interventions significantly improved WASH practices, such as increasing the use of safe drinking water from 0% to 60.9% (Adjusted Odds

Ratio/AOR = 6.88) and handwashing before eating from 0% to 82.6% (AOR = 6.85) (Kar et al., 2025). The community-led approach has also proven effective in building post-disaster sanitation resilience. A study in Cilincing, Jakarta, using structural equation modeling (SEM), showed that active participation in community-led sanitation initiatives resulted in sustainable hygiene practices post-pandemic, including regular handwashing and waste management (Sofiyah et al., 2026).

The high level of participation was also influenced by post-disaster emergencies, which made communities more receptive to health information because they directly experienced the impacts of poor sanitation. The participatory approach provided a space for communities to share local experiences and solutions, thereby increasing their sense of ownership of the program. However, researchers noted that active participation could also be influenced by the Hawthorne effect, where participants demonstrate greater engagement knowing they are being observed.

4. Participants' Ability to Practice Sanitation and Hygiene Behavior

The active participation rate reached 82 per cent, reflecting the participants' high level of engagement in the learning process. This phenomenon can be explained by the post-disaster emergency situation, which heightened the community's sensitivity to health information, as they had directly experienced the adverse effects of inadequate sanitation. A study by Sofiyah et al. (2026) in Cilincing, Jakarta, showed that active participation in community-led sanitation initiatives resulted in sustainable hygiene practices in the post-pandemic period. Furthermore, the SHINE study in India (Kar et al., 2025) demonstrated that participatory behavioural interventions significantly improved WASH practices, such as the use of safe drinking water (from 0 per cent to 60.9 per cent) and handwashing before meals (from 0 per cent to 82.6 per cent).

Handwashing with soap achieved the highest level of compliance (90 per cent), which can be attributed to its ease of implementation, relatively low cost and immediately felt health benefits. Conversely, household waste management had the lowest achievement rate (82 per cent), reflecting the complexity of this aspect, which requires a shift in collective mindset (for example, the separation of organic and inorganic waste) as well as coordination with environmental waste management systems that may still be disrupted in the aftermath of a disaster.

The relevance of these findings to the meta-analysis by Waddington et al. (2023) should be understood within the context that WASH interventions, including sanitation education, have been shown to contribute to a reduction in child mortality (OR = 0.83; 95% CI = 0.74–0.92) through the prevention of environment-related diseases. Although that study was global in scope and based on mortality data, its findings reinforce the argument that community-level sanitation interventions, such as those implemented in this PkM programme, have the potential to deliver substantial health benefits if supported by programme sustainability and infrastructure improvements. Consequently, the long-term success of these interventions is heavily dependent on sustained support from local government, health workers, and the availability of supporting facilities at the community level.

CONCLUSIONS

The sanitation and hygiene counselling activities carried out in Lubuk Minturun Village, Padang City, proved effective in improving the knowledge, participation and practical skills of the disaster-affected community, with an average increase in knowledge scores of 23.3 points (from 61.4 to 84.7) and the majority of participants (70 per cent) moving into the 'high knowledge' category.



The active participation rate reached 82 per cent, whilst the highest practical competence was in handwashing with soap (90 per cent) and the lowest in household waste management (82 per cent), indicating that an educational-participatory approach based on PHBS and WASH is capable of driving behavioural change, although infrastructure support is still required.

The policy implications of these findings emphasise the need to integrate sanitation counselling into emergency response and post-disaster recovery protocols, strengthen the role of health cadres as agents of change, and improve basic sanitation facilities by local authorities. For further research, a longitudinal study is recommended to assess behavioural sustainability, explore factors hindering waste management practices, and evaluate the direct impact of counselling on environment-related morbidity using a quasi-experimental design. In general, this counselling programme is suitable for replication in other disaster-affected communities, with adjustments to suit the local context and the availability of supporting facilities.

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