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Community-based health education improves knowledge of dengue hemorrhagic fever prevention: evidence from a pre–post intervention in indonesia

Netty Budi Lestari[1]✉, Yuli Peristiowati[1], Suriani Bahrun[2], Dian Meiliani Yulis[2]
[1] Universitas STRADA, East Java, Indonesia
[2] Universitas Megarezky, South Sulawesi, Indonesia

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ABSTRACT

Background: Dengue Hemorrhagic Fever (DHF) remains a major public health challenge in Indonesia, requiring effective community-based preventive strategies. Health education is considered a key intervention for improving public awareness and promoting sustainable dengue prevention practices. This study aimed to evaluate the effectiveness of a community health education program in improving knowledge regarding DHF prevention among residents in the working area of UPTD Puskesmas Mekar Sari.

Methods: A community-based pre-experimental study using a one-group pre-test and post-test design was conducted among 37 community members. The intervention consisted of a 90-minute health education session delivered through lectures, interactive discussions, demonstrations, and educational leaflets emphasizing the PSN 3M Plus strategy. Participants completed identical knowledge questionnaires before and immediately after the intervention. Descriptive statistics were used to summarize changes in knowledge scores.

Results: Before the intervention, 70.3% of participants had poor knowledge and 29.7% had fair knowledge, while none achieved a good knowledge level. Following the intervention, all participants (100%) attained the good knowledge category. The mean knowledge score increased from 8.00 to 12.89, with an average improvement of 4.89 points, indicating a substantial enhancement in participants' understanding of dengue transmission, symptoms, and prevention.

Conclusion: Community-based health education effectively improved knowledge of DHF prevention and reinforced community awareness of the PSN 3M Plus strategy. Integrating regular educational activities into primary healthcare programs may strengthen community participation and contribute to sustainable dengue prevention efforts.

Keywords: community health education, dengue hemorrhagic fever, disease prevention, health promotion

✉Corresponding Author. Email: nettyblestari1978@gmail.com
Universitas STRADA, East Java, Indonesia

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INTRODUCTION

Dengue Hemorrhagic Fever (DHF) remains one of the major infectious diseases and continues to pose a significant public health challenge in Indonesia. The disease is caused by the dengue virus, which is transmitted through the bites of Aedes aegypti and Aedes albopictus mosquitoes. Rapid population mobility, climate change, increasing population density, and limited public awareness of environmental hygiene have all contributed to the continued rise in dengue incidence[1]. DHF is an acute viral infection characterized by sudden high fever, thrombocytopenia, increased capillary permeability, and hemorrhagic manifestations, which may progress to shock and death if not promptly and appropriately managed[2,3].

DHF affects individuals of all age groups and may result in severe complications and mortality when appropriate treatment is delayed. Therefore, preventive measures remain the most effective strategy for controlling dengue transmission[4,5]. Effective dengue prevention requires not only the commitment of healthcare professionals but also active community participation through the implementation of Clean and Healthy Living Behaviors and the routine practice of the Mosquito Breeding Site Elimination Program (PSN 3M Plus). UPTD Puskesmas Mekar Sari, as a primary healthcare facility, plays an essential role in delivering promotive, preventive, curative, and rehabilitative health services. According to surveillance data from UPTD Puskesmas Mekar Sari, 20 confirmed DHF cases were reported within its service area in 2025. These findings indicate that dengue remains an important public health concern requiring strengthened preventive efforts and greater community empowerment.

One effective strategy for reducing the risk of dengue transmission is the provision of community health education. Health education aims to improve public knowledge, foster positive attitudes, and encourage behavioral changes that enable individuals to independently implement preventive measures[6,7]. Educational materials include information on the causes of dengue, clinical signs and symptoms, modes of transmission, the importance of early detection, and the implementation of the PSN 3M Plus strategy, which involves regularly draining water storage containers, tightly covering water containers, recycling unused items that may become mosquito breeding sites, and adopting other appropriate vector control measures. Through this community service program, community knowledge and awareness regarding dengue prevention are expected to improve, thereby encouraging active participation in maintaining environmental cleanliness and consistently implementing the PSN 3M Plus strategy. Enhanced community participation is anticipated to reduce the incidence of DHF within the UPTD Puskesmas Mekar Sari service area and ultimately contribute to improving overall community health.

METHOD of IMPLEMENTATION

This community service program employed a pre-experimental one-group pre-test and post-test design to evaluate the effectiveness of health education in improving community knowledge regarding Dengue Hemorrhagic Fever (DHF). The activity was conducted at UPTD Puskesmas Mekar Sari, Samarinda, Indonesia, involving 37 community members selected through convenience sampling. The implementation of the program consisted of four sequential stages

Preparation Phase

The preparation phase involved coordination with the management of UPTD Puskesmas Mekar Sari to determine the implementation schedule, target participants, venue, and educational materials. Health education materials were developed based on the Indonesian Ministry of Health guidelines for dengue prevention. Educational media included PowerPoint presentations, leaflets, posters, and demonstration materials related to mosquito breeding site elimination (PSN 3M Plus).

Intervention Phase

Before the educational intervention, all participants completed a pre-test questionnaire consisting of 15 multiple-choice questions assessing their knowledge of DHF. The educational session was delivered by health professionals using lectures, interactive discussions, question-and-answer sessions, and practical demonstrations. The educational topics included: Definition and causes of Dengue Hemorrhagic Fever (DHF), Transmission through Aedes aegypti mosquitoes, Clinical signs and symptoms, Risk factors for dengue transmission, Mosquito breeding site elimination through the 3M Plus strategy, Community participation in dengue prevention, Environmental sanitation and healthy behaviors, Each educational session lasted approximately 90 minutes, followed by discussion and practical demonstrations.

Evaluation Stage

Knowledge improvement was assessed using identical pre-test and post-test questionnaires. Participants completed the post-test immediately after the educational session. Data were analyzed descriptively by calculating frequencies, percentages, and mean scores. Knowledge levels were classified into three categories: Good, Fair, Poor. The effectiveness of the intervention was determined by comparing pre-test and post-test scores.

Reporting Stage

The results of the educational program were compiled into a community service report containing participant characteristics, evaluation results, activity documentation, and recommendations for strengthening community participation in dengue prevention programs

RESULT

A total of 37 community members participated in the health education program on Dengue Hemorrhagic Fever (DHF). The effectiveness of the intervention was evaluated by comparing participants' knowledge before and immediately after the educational session using identical questionnaires. The findings demonstrated a marked improvement in participants' knowledge following the intervention.

Table 1. Participants' Knowledge Levels Before and After Health Education (n = 37**)**

Knowledge Category	Pre-test n (%)	Post-test n (%)
Good	0 (0.0)	37 (100.0)
Fair	11 (29.7)	0 (0.0)
Poor	26 (70.3)	0 (0.0)
Total	**37 (100)**	**37 (100)**

The proportion of participants with poor knowledge decreased from **70.3%** before the intervention to **0%** after the educational session, while all participants achieved the good knowledge category following the intervention.

Table 2. Comparison of Knowledge Scores Before and After Health Education

Variable	Mean	Minimum	Maximum
Pre-test	8.00	6	10
Post-test	12.89	12	14
Mean Difference	**+4.89**		

The mean knowledge score increased by **4.89 points**, indicating a substantial improvement in participants' understanding of DHF prevention following the educational intervention.

Figure 1. Distribution of Knowledge Categories Before and After Health Education

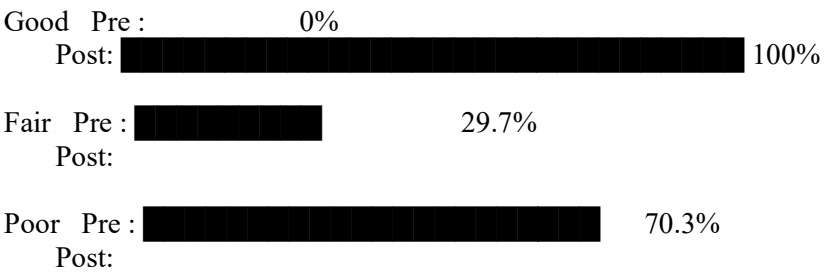
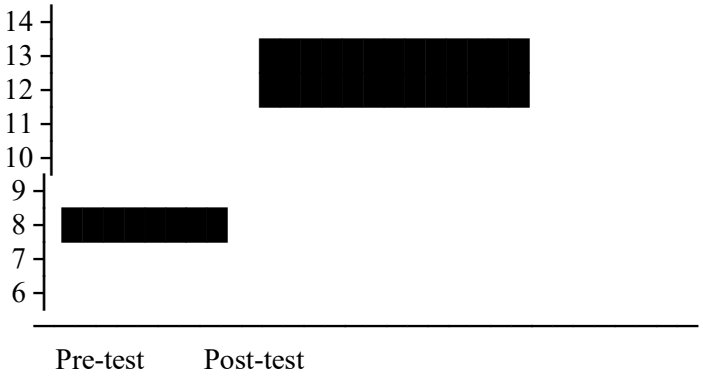


Figure 2. Comparison of Mean Knowledge Scores



Pre-test = 8.00
Post-test = 12.89

The educational intervention produced a considerable improvement in community knowledge regarding Dengue Hemorrhagic Fever prevention. Before the intervention, the majority of participants (70.3%) demonstrated poor knowledge, whereas none achieved the good knowledge category. Following the health education session, all participants (100%) reached the good knowledge level. Furthermore, the average knowledge score increased from 8.00 to 12.89, representing a mean improvement of 4.89 points. These findings indicate that community-based health education using lectures, interactive discussions, and demonstrations of the PSN 3M Plus strategy effectively enhances public knowledge and supports dengue prevention initiatives in primary healthcare settings.

DISCUSSION

The findings of this community service program demonstrate that structured health education is an effective strategy for improving community knowledge regarding Dengue Hemorrhagic Fever (DHF) prevention. Following the educational intervention, all participants achieved the good knowledge category, while the mean knowledge score increased from 8.00 during the pre-test to 12.89 during the post-test, representing an average improvement of 4.89 points. These results suggest that community-based educational interventions can substantially enhance public understanding of dengue transmission, clinical manifestations, and preventive practices, particularly the implementation of the Mosquito Breeding Site Elimination (PSN 3M Plus) strategy.

The improvement observed in this study can be explained by the comprehensive educational approach adopted during the intervention. Participants received information through lectures, interactive discussions, demonstrations, and printed educational leaflets, allowing them to acquire knowledge using multiple learning modalities[8]. Interactive health education promotes greater participant engagement than

passive information delivery because it enables individuals to ask questions, clarify misconceptions, and relate educational messages to their daily experiences. Such participatory learning methods facilitate better knowledge retention and increase the likelihood that newly acquired knowledge will be translated into preventive behaviors[9,10].

From a theoretical perspective, these findings are consistent with the Health Belief Model (HBM), which proposes that individuals are more likely to adopt preventive health behaviors when they perceive themselves to be susceptible to a disease, recognize its seriousness, understand the benefits of preventive actions, and have sufficient confidence to perform those actions[11,12]. By increasing participants' awareness of dengue transmission, risk factors, warning signs, and preventive measures, the educational intervention likely strengthened their perceived susceptibility and perceived benefits, thereby encouraging greater willingness to practice environmental sanitation and mosquito breeding site elimination. Similarly, Notoatmodjo's Health Education Theory emphasizes that knowledge serves as the foundation for developing positive attitudes and ultimately influences healthy behavioral practices within communities[13,14].

The findings are also consistent with previous studies demonstrating the effectiveness of health education in dengue prevention. The World Health Organization (WHO) has consistently emphasized that community participation remains one of the most effective strategies for reducing dengue transmission because vector control cannot rely solely on insecticide application or healthcare services[15,2]. Sustainable community engagement through continuous education, environmental management, and behavioral modification plays a fundamental role in interrupting the breeding cycle of Aedes mosquitoes. Likewise, several studies conducted in dengue-endemic countries have reported that educational interventions significantly improve public knowledge, household vector control practices, and participation in community-based mosquito surveillance programs.

An important aspect of this program is the emphasis placed on the PSN 3M Plus strategy, which remains the cornerstone of dengue prevention in Indonesia. The intervention encouraged participants to routinely drain water storage containers, tightly cover water reservoirs, recycle unused materials capable of collecting rainwater, and implement additional preventive measures to eliminate mosquito breeding sites[1]. Since Aedes aegypti predominantly breeds in artificial water containers surrounding households, consistent implementation of PSN 3M Plus has considerable potential to reduce mosquito density and interrupt dengue transmission. The educational session also highlighted the importance of maintaining environmental cleanliness, reinforcing the principle that dengue prevention requires collective community action rather than individual efforts alone[16,17].

The substantial increase in knowledge observed in this study further highlights the strategic role of primary healthcare centers as community health promotion hubs. As the first level of healthcare services in Indonesia, Puskesmas are uniquely positioned to integrate preventive education into routine activities such as Posyandu services, maternal and child health programs, school health initiatives, and village health campaigns[18]. The collaboration between healthcare professionals, community health volunteers (cadres), local leaders, and residents demonstrated during this program illustrates how multisectoral partnerships can strengthen public health interventions and improve community participation in disease prevention[19,20]. Although the educational intervention produced excellent short-term outcomes, knowledge improvement alone does not necessarily guarantee long-term behavioral change. Behavioral modification is a complex process influenced by socioeconomic conditions, cultural beliefs, environmental factors, and the availability of community support systems[21]. Therefore, continuous reinforcement through periodic health education, household monitoring, community clean-up campaigns, and regular larval surveillance is essential to sustain behavioral changes over time[21,22]. Establishing community-based mosquito monitoring groups and strengthening collaboration with neighborhood organizations may further enhance the sustainability of dengue prevention efforts.

This program also has several practical implications for public health practice. First, structured health education should become a routine component of dengue control programs implemented by primary healthcare facilities. Second, educational interventions should utilize participatory learning methods rather than relying exclusively on one-way lectures to maximize participant engagement and knowledge retention. Third, health promotion materials should be culturally appropriate, easy to understand, and adapted to the educational background of community members. Finally, integrating digital health promotion tools, such as mobile applications, social media campaigns, and online educational videos, may expand the reach of dengue prevention programs and improve public access to accurate health information.

Despite these encouraging findings, several limitations should be acknowledged. The study employed a one-group pre-test and post-test design without a control group, limiting the ability to attribute knowledge improvement exclusively to the educational intervention. In addition, the relatively small sample size and convenience sampling approach may reduce the generalizability of the findings to other populations. Furthermore, participant knowledge was evaluated immediately after the intervention, preventing assessment of long-term knowledge retention and sustained behavioral changes. Future community service and research initiatives should incorporate larger sample sizes, controlled study designs, and follow-up assessments to determine whether improved knowledge translates into sustained preventive behaviors and measurable reductions in dengue incidence. Overall, the present findings provide strong evidence that community-based health education is an effective and feasible strategy for strengthening dengue prevention at the primary healthcare level. By improving community knowledge, encouraging active participation in PSN 3M Plus implementation, and fostering collaboration among healthcare providers and local stakeholders, such educational interventions can contribute meaningfully to sustainable dengue control and support Indonesia's national efforts to reduce the burden of Dengue Hemorrhagic Fever.

CONCLUSION

This community service program demonstrated that structured health education is an effective approach for improving community knowledge and awareness regarding the prevention of Dengue Hemorrhagic Fever (DHF). The educational intervention, which combined lectures, interactive discussions, demonstrations, and printed educational materials, resulted in a substantial increase in participants' understanding of dengue transmission, clinical manifestations, and preventive measures. Following the intervention, all participants achieved a good level of knowledge, highlighting the effectiveness of community-based educational strategies in promoting dengue prevention. The findings emphasize the importance of integrating the Mosquito Breeding Site Elimination (PSN 3M Plus) strategy into routine community health promotion activities conducted by primary healthcare centers. Strengthening collaboration among healthcare professionals, community health volunteers, local leaders, and residents is essential to sustain behavioral changes and encourage active community participation in vector control initiatives. Continuous health education, periodic monitoring, and environmental sanitation programs should be implemented to reinforce preventive behaviors and reduce mosquito breeding sites. Although this program primarily evaluated short-term knowledge improvement, it provides valuable evidence supporting the role of health education in community empowerment and dengue prevention. Future programs should include long-term follow-up assessments, larger participant populations, and behavioral outcome evaluations to determine whether increased knowledge leads to sustained preventive practices and contributes to reducing dengue incidence in endemic communities.

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