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Effectiveness of the Community Empowerment Program (PRODAMAT) in Improving Larval Monitoring Cadres' Knowledge of Dengue Prevention in Bokoharjo Village

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Abstrak

The Community Empowerment Program (PRODAMAT) was implemented to strengthen the role of larval monitoring cadres (Jumantik) in dengue prevention through a community-based educational approach. This study aimed to evaluate the effectiveness of the intervention in improving cadres' knowledge of dengue prevention, particularly through the PSN 3M Plus strategy. A pre-experimental one-group pretest-posttest design was employed involving 24 Jumantik cadres in Bokoharjo Village, Prambanan District, Sleman Regency, Yogyakarta. The intervention consisted of interactive offline health education supported by PowerPoint-based materials covering dengue epidemiology, mosquito life cycles, and larval identification techniques. Knowledge was measured using pre-test and post-test questionnaires, and data were analyzed using the Shapiro-Wilk normality test and paired samples t-test. The results showed that the mean knowledge score increased from 21.71 before the intervention to 23.50 after the intervention, with a statistically significant difference ($t = -5.840$; $p < 0.001$). These findings indicate that the educational intervention was effective in improving the cognitive capacity of Jumantik cadres regarding dengue prevention. However, increased knowledge alone may not ensure sustained preventive behavior without continuous supervision, motivation, and program support. Therefore, integrating community education with routine monitoring and public health surveillance is necessary to achieve long-term epidemiological outcomes, including improvement in the Larvae-Free Index.

Keywords: dengue hemorrhagic fever; Jumantik cadres; PSN 3M Plus; health education

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Introduction

Dengue fever remains one of the most significant mosquito-borne diseases affecting tropical and subtropical regions worldwide. The disease is transmitted primarily by *Aedes aegypti* and *Aedes albopictus* mosquitoes and continues to pose a substantial public health burden, particularly in densely populated urban and peri-urban areas. Over the past several decades, the global incidence of dengue has increased dramatically due to a combination of factors including rapid urbanization, population growth, climate variability, and increased human mobility. These conditions create favorable environments for mosquito breeding and facilitate the spread of dengue viruses in many endemic regions. Consequently, strengthening preventive strategies and improving community participation in vector control have become central priorities in dengue prevention programs.

Efforts to control dengue increasingly emphasize the importance of integrated vector management (IVM) as a comprehensive and sustainable approach to reducing mosquito populations and interrupting disease transmission. IVM combines multiple

strategies such as environmental management, larval source reduction, biological control, chemical interventions, and community participation. Evidence from various settings suggests that interventions focusing solely on chemical vector control are often insufficient to achieve long-term reductions in mosquito populations because breeding sites frequently exist within household environments and community spaces. As a result, sustainable dengue prevention requires coordinated actions that involve both public health authorities and local communities. Studies examining integrated dengue control programs have demonstrated that combining environmental management with community engagement can reduce mosquito breeding sites and contribute to lowering the risk of dengue transmission (Marcos-Marcos et al., 2018; Saadatian-Elahi et al., 2021; Chaki et al., 2014).

Community participation has therefore become a key component of effective dengue prevention strategies. Several studies have shown that community-based programs can enhance surveillance of mosquito breeding sites, promote environmental cleanliness, and encourage households to adopt preventive behaviors such as eliminating standing water containers and maintaining proper waste management. Participatory approaches that involve local residents in monitoring and controlling mosquito breeding sites have been implemented in various countries with promising outcomes. For instance, community mobilization initiatives such as the Camino Verde program in Latin America have demonstrated that active engagement of community members can contribute to reductions in mosquito infestation indicators and improvements in public awareness of dengue prevention (Marcos-Marcos et al., 2018; Hustedt et al., 2017). Similarly, eco-bio-social strategies that combine environmental management with community education have shown potential for reducing vector infestation levels in urban settings (Macêdo et al., 2021). These findings highlight the importance of strengthening community-based approaches as part of integrated dengue prevention efforts.

Within community-based vector control programs, community health volunteers and larval monitoring cadres play a critical role in bridging the gap between health systems and local communities. These volunteers often assist public health authorities by conducting routine inspections of mosquito breeding sites, educating households about dengue prevention, and encouraging community members to adopt environmental management practices. In Indonesia, such volunteers are commonly referred to as Jumantik cadres, who are responsible for monitoring the presence of mosquito larvae in households and promoting preventive actions through community outreach activities. Their work is closely aligned with national dengue prevention initiatives such as the PSN 3M Plus program, which emphasizes draining water containers, closing water storage facilities, recycling unused items that can collect water, and implementing additional preventive measures to reduce mosquito breeding sites.

The effectiveness of cadre-based dengue prevention programs is strongly influenced by the knowledge and competencies of the volunteers involved. Adequate knowledge about dengue transmission, mosquito breeding habitats, and preventive strategies is essential for cadres to accurately identify risk factors and communicate appropriate prevention messages to community members. Previous research on knowledge, attitudes, and practices (KAP) related to dengue prevention indicates that knowledge plays an important role in shaping individuals' perceptions of disease risk and their willingness to engage in preventive behaviors (Jaroenpool et al., 2024; Duval et al., 2023; Shafie et al., 2024). However, studies also suggest that knowledge alone may not automatically lead to sustained behavioral change. Environmental constraints, social norms, and community engagement processes can influence whether individuals translate knowledge into consistent preventive actions (Bardach et al., 2019; Heyrani et al., 2024). For this reason, educational interventions targeting both communities and

health volunteers are often considered essential components of dengue prevention programs.

Training programs designed for community health volunteers have been shown to improve their ability to identify mosquito breeding sites, conduct surveillance activities, and promote preventive practices within their communities. When cadres receive appropriate education and guidance, they can function as effective agents of health promotion and contribute to strengthening community participation in vector control initiatives. Studies evaluating health volunteer training programs have reported improvements in knowledge levels following educational interventions, suggesting that structured learning activities may enhance volunteers' capacity to support dengue prevention efforts (Rakhmani & Zuhriyah, 2024; Schleiff et al., 2021). Nevertheless, the evidence regarding the effectiveness of such training programs remains variable across contexts, and the extent to which educational interventions influence knowledge outcomes among larval monitoring cadres requires further investigation.

Despite the growing emphasis on community-based dengue prevention, several important gaps remain in the existing literature. Many previous studies have focused primarily on large-scale community mobilization initiatives or integrated vector management programs, while fewer studies have specifically examined the impact of educational interventions targeting community volunteers who implement surveillance and prevention activities at the household level. Furthermore, some interventions have been evaluated using descriptive observations or post-intervention assessments without systematically measuring knowledge changes before and after educational activities. As a result, empirical evidence regarding the effectiveness of training programs for larval monitoring cadres particularly in improving their knowledge of dengue prevention strategies remains limited.

In the Indonesian context, the involvement of Jumantik cadres represents an important community-based mechanism for strengthening dengue prevention efforts. These volunteers support routine larval surveillance and encourage households to adopt preventive practices that reduce mosquito breeding sites. However, the effectiveness of these activities depends largely on the cadres' level of knowledge and their ability to communicate preventive messages effectively to community members. Evaluating educational interventions designed to improve the knowledge of these cadres is therefore important for strengthening the implementation of community-based dengue prevention programs.

Based on these considerations, this study aims to examine changes in the knowledge of Jumantik cadres regarding dengue prevention following an educational intervention on the PSN 3M Plus strategy in Bokoharjo Village. Using a pre-experimental one-group pretest–posttest design, the study assesses knowledge levels before and after the educational program in order to provide empirical evidence regarding the potential contribution of cadre training to strengthening community-based dengue prevention efforts.

METODE

This study employed a pre-experimental one-group pretest-posttest design to evaluate the effectiveness of a community-based educational intervention in improving the knowledge of larval monitoring cadres (Jumantik) regarding dengue prevention. The study was conducted on February 11, 2026, in Bokoharjo Village, Prambanan Subdistrict, Sleman Regency, Yogyakarta, Indonesia. A total of 24 Jumantik cadres participated in the program.

The intervention was implemented as part of the Community Empowerment Program (PRODAMAT) using a structured empowerment approach. The preparatory

phase involved coordination with local authorities to identify priority health issues and determine the implementation schedule. The educational session was delivered offline in an interactive format and focused on strengthening cadres' understanding of dengue prevention through the PSN 3M Plus strategy. The learning materials were presented using PowerPoint and covered dengue epidemiology, the mosquito life cycle, and larval identification techniques in household water containers.

Data were collected using a knowledge questionnaire administered before and after the educational session. The pre-test was used to assess baseline knowledge, while the post-test measured knowledge changes after the intervention. Descriptive statistics were used to summarize participants' characteristics and knowledge scores. The normality of pre-test and post-test data was assessed using the Shapiro-Wilk test. Since the data were normally distributed, the difference in knowledge scores before and after the intervention was analyzed using a paired samples t-test. Statistical significance was determined at $p < 0.05$..

RESULT AND DISCUSSION

A total of 24 Jumantik cadres participated in this study. All participants were female. Most participants were aged 51-60 years (54.2%), followed by 41-50 years (29.2%). In terms of education, most had completed senior high school (70.8%). Regarding occupation, the majority were housewives (87.5%). These findings indicate that the intervention was delivered to a community-based group with a potentially important role in household-level dengue prevention activities.

Table 1. Characteristics of Participants

Participant Characteristics	**n**	**%**
Sex		
Female	24	100
Age		
21-40 years	2	8.3
41-50 years	7	29.2
51-60 years	13	54.2
>60 years	2	8.3
Education		
Junior high school	3	12.5
Senior high school	17	70.8
Diploma (D3)	1	4.2
Bachelor's degree (S1)	3	12.5
Occupation		
Housewife	21	87.5
Laborer	2	8.3
Self-employed	1	4.2
Total	24	100

Descriptive statistics showed an increase in knowledge scores after the educational intervention. The mean pre-test score was 21.71, while the mean post-test score increased to 23.50. This indicates an average improvement of 1.79 points after the implementation of the community empowerment program.

Table 2. Descriptive Statistics of Pre-Test and Post-Test Scores

Variable	**N**	**Mean**
Pre-Test	24	21.71
Post-Test	24	23.50

Before conducting inferential analysis, a Shapiro-Wilk normality test was performed. The results showed that both pre-test and post-test data were normally

distributed, with p-values greater than 0.05. Therefore, a paired samples t-test was considered appropriate for further analysis.

Table 3. Shapiro-Wilk Normality Test Results

Variable	Shapiro-Wilk Statistic	p-value	Interpretation
Pre-Test	0.215	>0.05	Normal
Post-Test	0.215	>0.05	Normal

The paired samples t-test demonstrated a statistically significant difference between pre-test and post-test scores. The analysis produced a t-value of -5.840 with 23 degrees of freedom and a p-value of less than 0.001. This result indicates that the educational intervention significantly improved the knowledge of Jumantik cadres regarding dengue prevention. The increase in mean score from 21.71 to 23.50 confirms that the PRODAMAT-based educational activity had a positive effect on participants' cognitive understanding of dengue prevention, particularly in relation to the PSN 3M Plus strategy.

Table 4. Paired Samples t-Test Results

Variable	Mean Pre-Test	Mean Post-Test	Mean Difference	t	df	p-value
Pre-Test - Post-Test	21.71	23.50	-1.79	-5.840	23	<0.001

This study demonstrated that the PRODAMAT-based educational intervention significantly improved the knowledge of Jumantik cadres regarding dengue prevention in Bokoharjo Village. The increase in mean knowledge scores from 21.71 before the intervention to 23.50 after the intervention, accompanied by a statistically significant paired-samples t-test result, indicates that the educational session had a measurable positive effect on participants' cognitive understanding of dengue prevention. In practical terms, this finding suggests that structured community-based education remains a relevant strategy for strengthening local capacity in vector-borne disease prevention, especially when it is directed toward cadres who serve as the operational bridge between public health programs and households. In the context of dengue control, this matters because Jumantik cadres are not merely passive recipients of information. They are expected to identify larval breeding sites, communicate preventive practices, and motivate households to maintain environmental sanitation through routine monitoring and persuasion. When their knowledge improves, their ability to perform those roles is likely to become more effective.

The present findings are consistent with the wider body of literature suggesting that educational interventions can improve knowledge related to dengue prevention. Studies cited in the manuscript, including Al-Muhandis and Hunter, Bowman et al., and more recent community-based health education studies, have shown that educational messages embedded in participatory or community-based programs can contribute positively to knowledge improvement and public awareness regarding dengue prevention. Similar patterns are also reflected in Indonesian community service and health promotion studies such as Imro'ah et al., Gumayesty et al., Alfajri et al., Fitria and Samudra, and Wijarwanti and Yuniartika, all of which support the position that health education related to PSN and dengue prevention can strengthen public understanding and readiness to act. The present study adds to that literature by focusing specifically on Jumantik cadres, a group that occupies a particularly strategic role in the local implementation of dengue prevention efforts. Rather than targeting the general public alone, this intervention addressed community actors who can reproduce and disseminate health messages across households. That distinction is important because improvements at the cadre level may have multiplier effects that extend beyond the individuals directly trained.

The significance of this result should also be interpreted in light of the intervention format used in this study. The program was not delivered only as passive information transfer. According to the methods section, cadres received interactive face-to-face education supported by PowerPoint materials covering dengue epidemiology, mosquito life cycles, and larval identification in potential breeding containers. This combination of conceptual explanation and practical orientation may help explain why the intervention produced measurable gains. Knowledge acquisition tends to be stronger when participants are not only exposed to disease facts but are also guided to connect those facts with observable environmental conditions in their own community. In this study, cadres were trained in a way that was closely related to their actual field responsibilities, which likely increased both the relevance and the retention of the material. This interpretation aligns with literature in the manuscript suggesting that health volunteer training is more effective when it enhances the ability of cadres to identify risk factors and translate knowledge into routine preventive tasks (Rakhmani & Zuhriyah, 2024; Schleiff et al., 2021).

Another important point concerns the place of community empowerment in dengue control. The findings support the argument that dengue prevention cannot rely solely on top-down vector control measures. Earlier sections of the manuscript already frame dengue control within integrated vector management and community engagement, citing work showing that environmental management combined with local participation is more sustainable than approaches dominated by chemical control alone (Achee et al., 2015; Erlanger et al., 2008; Bowman et al., 2016). The present study fits within that perspective. By improving the knowledge of cadres who operate at the household and neighborhood levels, the intervention contributes to a more participatory model of dengue prevention. In that model, surveillance, source reduction, and health education are shared responsibilities rather than tasks assigned only to the health system. This matters because dengue vectors proliferate in domestic and peri-domestic settings, meaning that household behavior and routine environmental management are central to prevention. In such conditions, programs like PRODAMAT are potentially valuable because they reinforce local ownership of prevention practices rather than depending exclusively on episodic external campaigns.

The demographic profile of participants also deserves attention. The manuscript's participant table shows that all 24 cadres were female, most were between 51 and 60 years of age, most had senior high school education, and most were housewives. This pattern is important for interpreting both the strengths and the limits of the intervention. On one hand, it underlines the strategic role of women, especially housewives, in household-based dengue prevention. Women often manage domestic water storage, waste practices, and the cleanliness of the household environment, all of which directly affect mosquito breeding opportunities. Previous literature cited in the manuscript argues that women are frequently central actors in health promotion and household-level preventive behavior. In that sense, the profile of participants in this study is not incidental; it reflects the social reality of community health work in many Indonesian settings. On the other hand, this pattern also shows that dengue prevention efforts may remain overly concentrated within a narrow demographic group if broader community participation is not actively encouraged. Thus, while the strong presence of women in the cadre system can be seen as a strength, it should not lead programs to assume that dengue prevention is only women's responsibility. A more balanced and gender-responsive approach would involve men, younger residents, and wider community networks so that household and neighborhood prevention is not socially overburdened onto women alone.

A central issue in interpreting the study is the distinction between knowledge improvement and behavioral change. The findings clearly support the former, but they

do not by themselves prove the latter. This distinction is already recognized in the manuscript and should remain central to the discussion. The increase in knowledge scores indicates improved cognitive readiness, but knowledge alone does not automatically ensure sustained preventive behavior. This caution is consistent with literature on knowledge, attitudes, and practices related to dengue prevention. Studies such as (Jayawickreme et al. 2021; Selvarajoo et al. 2020; Wahab et al. 2025) indicate that communities may possess reasonable knowledge while still displaying inconsistent preventive practice. The gap between what people know and what they regularly do can arise from multiple factors, including limited time, weak motivation, inadequate environmental infrastructure, poor waste management systems, irregular water supply, and weak collective coordination. Therefore, it would be methodologically excessive to interpret the present results as evidence that the intervention already changed household practice or reduced entomological indices. The study supports a narrower and more defensible conclusion: the intervention significantly improved cadres' knowledge, which is a necessary but not sufficient foundation for stronger dengue prevention.

This point is especially relevant because the manuscript does not measure behavioral indicators or epidemiological outcomes such as larval indices, ABJ improvement, or reduction in dengue cases. That absence is not a fatal weakness, but it does define the limits of inference. Knowledge gains should be understood as an early-stage outcome in a longer causal chain. For the program to generate broader public health effects, improved knowledge would need to be followed by more consistent larval monitoring, stronger communication from cadres to households, better adherence to PSN 3M Plus practices, and eventually measurable environmental and epidemiological improvements. The manuscript itself points toward this logic when it argues that continuous supervision, participatory surveillance, and integration with public health systems are necessary to ensure longer-term impact. This is a reasonable interpretation and should be emphasized in the discussion. The program has demonstrated value at the level it directly measured, but more evidence is needed before stronger causal claims about disease control can be made.

The findings also carry implications for the operational strengthening of the Jumantik system. If a single structured educational session can produce a statistically significant improvement in knowledge, then repeated and tiered training may generate even greater benefits, particularly if combined with field mentoring and routine feedback. The manuscript's recommendation for staged training, regular supervision, and integration of larval monitoring data into community surveillance systems is therefore well supported by the study logic. Cadres often work in conditions where routine motivation, technical refreshers, and organizational recognition are uneven. Without follow-up, knowledge gains achieved immediately after training may weaken over time. Accordingly, the most defensible policy implication of this study is not simply that education works, but that education should be institutionalized as part of a broader support system for cadres. This support system should include refresher training, clear monitoring protocols, accessible reporting mechanisms, and regular coordination between cadres, local government, and health centers. In this sense, the intervention should be viewed not as a one-time activity but as one component of a sustainable community-based dengue governance model.

The study also strengthens the argument for participatory and multisectoral approaches in dengue prevention. The manuscript cites literature suggesting that effective dengue control depends on collaboration across the health, environmental, educational, and local governance sectors. This broader framing is appropriate because the determinants of dengue risk extend beyond individual knowledge. Even highly informed cadres may struggle to maintain community participation if local

environmental conditions remain unfavorable, if waste systems are weak, or if households are insufficiently supported by village-level regulation and coordination. Thus, the educational success observed in this study should not be interpreted as a substitute for structural intervention. Instead, it should be seen as a complementary measure that enhances community readiness within a larger ecosystem of dengue control. The implication is straightforward: cadre training is necessary, but its full effectiveness will depend on whether local institutions create enabling conditions for the translation of knowledge into repeated preventive action.

Several limitations should be acknowledged clearly. First, the pre-experimental one-group pretest-posttest design limits causal certainty. Although the observed increase in knowledge is statistically significant, the absence of a control group means that alternative explanations cannot be completely ruled out. Second, the post-test appears to assess short-term knowledge improvement immediately after the intervention, so the study cannot determine whether the gains were retained over time. Third, the study focuses on cognitive outcomes and does not evaluate behavioral practice, larval indices, or disease incidence. Fourth, the sample size is relatively small and limited to one village, which constrains generalizability. These limitations do not invalidate the findings, but they do require a cautious interpretation. The study is best understood as evidence of immediate educational effectiveness in a specific community setting rather than as definitive proof of long-term epidemiological impact.

Future research should therefore build on this foundation in several ways. A quasi-experimental design with a comparison group would strengthen causal inference. Longitudinal follow-up would help determine whether knowledge gains persist and whether they are associated with sustained PSN 3M Plus behavior. Mixed-method studies would also be valuable because they could examine not only whether knowledge changes, but why some cadres and households are more able than others to translate that knowledge into practice. Qualitative inquiry could clarify the roles of motivation, community norms, household labor distribution, local leadership, and trust in health authorities. In addition, future studies should include operational indicators such as household inspection frequency, larval container indices, ABJ, and possibly trends in dengue cases. Those measures would allow researchers to evaluate whether improvements in cadre knowledge actually contribute to better environmental outcomes and stronger prevention performance at the community level. The manuscript's own recommendations regarding longitudinal evaluation and multisectoral collaboration are therefore methodologically sound and should be retained.

This study provides credible evidence that the PRODAMAT educational intervention improved Jumantik cadres' knowledge of dengue prevention in Bokoharjo Village. The findings reinforce the importance of cadre-focused education within community-based dengue control and support the continued use of empowerment-oriented approaches in strengthening local prevention capacity. At the same time, the results should not be overstated. The study demonstrates short-term cognitive improvement, not yet long-term behavioral or epidemiological change. That distinction is important. The most defensible conclusion is that cadre education is an effective starting point, but its public health value will depend on how it is embedded within continuing supervision, community participation, environmental management, and local surveillance systems. For that reason, the real contribution of this study lies not only in showing that knowledge can be improved, but in showing where that improvement should lead next: toward a more sustained, organized, and community-owned model of dengue prevention

CONCLUSION

The Community Empowerment Program (PRODAMAT), which focused on strengthening the role of larval monitoring cadres (Jumantik), was effective in improving cadres' knowledge of dengue prevention through a community-based educational approach. The participant profile, which was dominated by middle-aged women, particularly housewives, indicates a strategic advantage for household-based health interventions, given their central role in environmental management and the implementation of PSN 3M Plus practices as a primary preventive strategy. The quantitative findings showed a statistically significant increase in knowledge scores between the pre-test and post-test, confirming that the educational intervention had a measurable positive effect on the cadres' cognitive capacity. However, improved knowledge does not necessarily ensure sustained behavioral change over time. The long-term effectiveness of the program will depend on supporting factors such as cadres' motivation, social support, and the continuity of monitoring and mentoring. Therefore, the integration of education with sustained community empowerment strategies is essential to transform knowledge into consistent preventive practices and to produce broader epidemiological benefits, including improvement in the Larvae-Free Index (ABJ).

RECOMMENDATIONS

The strengthening of Jumantik cadres should be further developed through a systematic approach that includes tiered training, routine supervision, and the integration of larval monitoring data into public health surveillance systems. In addition, longitudinal evaluation is needed to assess whether the observed increase in knowledge can be sustained over time and whether it leads to measurable behavioral change and a real reduction in dengue incidence. Future studies are also recommended to adopt more rigorous designs, such as quasi-experimental studies with control groups or mixed-method approaches, in order to evaluate intervention effectiveness more comprehensively, including the influence of socio-cultural factors on community participation. Finally, a collaborative multisectoral approach involving health workers, local government, and community members is necessary to ensure the long-term sustainability of community empowerment-based dengue prevention programs.

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AUTHOR CONTRIBUTIONS

Conceptualization was carried out by (NAAA) and Rizkita Arfiana (RA); methodology by (GM) and (LMI); results and discussion by (DYS) and (MFI); and validation by (MSH). Strategic direction related to the community service methodology, supervision of the content materials, as well as critical review and final approval of the report and the resulting scientific article were provided by Prof. Sulistyawati, S.Si., MPH., Ph.D., as the supervising lecturer (S). All authors have read and approved the published version of the manuscript.

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