**JURNAL EMPATHY** Pengabdian Kepada Masyarakat
Vol. 6, No.1, June 2025
DOI : https://doi.org/10.37341/jurnalempathy.v6i1.288

# Ovitrap Training Improves Dengue Hemorrhagic Fever (DHF) Control

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***Background:*** *Dengue hemorrhagic fever (DHF) is a significant and growing global public health challenge in subtropical regions, affecting millions of people worldwide. Ovitrap is an innovation aimed at effectively controlling mosquito populations and reducing the risk of diseases like DHF. The ovitrap training aims to enhance public understanding of dengue vector control and to develop skills in effectively using ovitraps to prevent the spread of disease.*

***Methods:*** *The activity began with an explanation and determination of the schedule in collaboration with partners. The implementation included a pre-test, the delivery of materials on mosquito vector control and ovitrap techniques, demonstrations, participant practice, and was concluded with a post-test to evaluate understanding.*

***Results:*** *The increase in the average knowledge score of participants from 7.86 to 9.00 after the activity was supported by the results of the Wilcoxon Signed-Rank test with a significance value (p-value) of 0.006 ($p<0.05$) which means there is a significant difference between the average knowledge before and after the activity.*

***Conclusion:*** *The training on ovitrap techniques for DHF control succeeded in improving the community's understanding and skills in managing the risk of DHF disease spread. The community is advised to routinely use ovitraps to control mosquito populations and be accompanied by maintaining environmental hygiene.*

**ARTICLE HISTORY**
Received: November 29th, 2024
Accepted: July 11th, 2025

**KEYWORDS**
aedes aegypti; dengue hemorrhagic fever; ovitrap; vector control;

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**Cite this as:** Martini, M., Adi, M. S., Kusariana, N., Udiyono, A., & Fauzi, M. (2025). Ovitrap Training Improves Dengue Hemorrhagic Fever (DHF) Control in Semarang City. *Jurnal Empathy Pengabdian Kepada Masyarakat*, *6*(1), 23–29. https://doi.org/10.37341/jurnalempathy.v6i1.288

## INTRODUCTION

Dengue fever (DHF) results from infection with one of four single-stranded RNA viruses of the genus Flavivirus, namely dengue virus 1,2,3, or 4 (DENV1-4). The virus is mostly spread through the bite of Aedes mosquitoes, mainly Aedes aegypti and Aedes albopictus. Aedes aegypti is a small black-and-white tropical mosquito that lays its eggs in artificial containers such as flower vases, old tires, rainwater collection buckets, and trash cans around the house. It tends to rest indoors and bite humans during the day, with two peaks of biting activity: after dawn at sunrise and in the evening before sunset. Female Aedes aegypti mosquitoes also have sensitive feeding behavior, often biting several people in one blood meal and can transmit dengue virus to many people in a short time (1).

Dengue viruses that infect humans through the bite of an infected mosquito will trigger several symptoms such as high fever up to 40 ºC, nausea, vomiting, and severe headache (2). It can also cause pain behind the eyes, as well as muscle and joint pain. In addition, the patient may experience swelling of the lymph glands and the appearance of a rash on the skin (3). Dengue has become a growing public health problem, with approximately four billion people in 130 countries at risk. Since the beginning of 2023, the world has seen an increase in dengue cases and deaths in endemic areas, with a wider spread to previously unaffected areas. More than 5 million dengue cases and more than 5.000 dengue-related deaths have been recorded in six WHO regions, including the Americas, Southeast Asia, Western Pacific, Eastern Mediterranean, Europe and Africa (4).

The number of dengue cases in Indonesia continues to grow and often develops into an Extraordinary Event (KLB) every year. In the last five years (2018-2022), the number of districts affected by DHF has continued to increase. In 2018, 440 districts/municipalities (85.6%) were affected by DHF, and from 2019 to 2022, the number of affected districts/municipalities has exceeded 90%(5). However, in 2023 there was a decrease in cases compared to 2022, from 143,266 cases and 1,237 deaths in 2022, to 114,720 cases and 894 deaths in 2023 (6).

The city of Semarang is one of the cities with a significantly high incidence of dengue fever in recent years, and it is classified as a dengue-endemic area in Central Java. The Semarang City Government has initiated the WINGKO SEMARANG program (Wolbachia in the City of Semarang). This program utilizes Wolbachia-infected Aedes aegypti mosquitoes to interrupt the cycle of dengue transmission.

Both past and current dengue prevention and control efforts rely on vector control as the only measure that can be taken to protect the public. The goal of vector control is to reduce pathogen transmission by minimizing or eliminating human contact with vectors (7). One approach that is environmentally friendly and effective is the use of the ovitrap technique, which is a simple device made of materials such as bamboo strips, plastic cups, or black cans, which are equipped with ovistrips, which are rough cloth or paper used to hold mosquito eggs. Ovitraps are designed with a natural concept so that they are safer and more environmentally friendly (8).

The application of ovitraps by applying the 3M principle, namely recycling used plastic bottles or cans, is an environmentally friendly and efficient step in reducing the population of Aedes aegypti mosquito larvae (9). Ovitraps made from disposable materials show excellent results in detecting Aedes aegypti populations, even in the dry season when populations decline. The working principle of ovitraps is to attract female mosquitoes to lay eggs, so that Aedes mosquito populations can be effectively controlled (10).

Mosquito populations in several countries, such as Houston, Texas, Chiang Mai, Thailand, Sao Paulo, Brazil, Australia, and also in Indonesia, such as Semarang, and Banjar Baru have been shown to decrease after the application of ovitraps (11). The use of ovitraps has not become a habit in the community so it is a challenge, considering that ovitraps can be an effective tool in supporting dengue control strategies both in prevention and case control efforts. Good understanding can be a driver of behavior change, including in terms of health-related knowledge and behavior (10).

Conversely, most people do not know about ovitraps in terms of their function, workings, and application as a mosquito vector control tool that causes DHF. Many of them do not understand how ovitraps can help monitor and reduce mosquito populations,

so the application of this technique has not become part of their environmental control habits. In addition, the problem is that people still do not realize that used items, such as plastic bottles or used cans, can be creatively utilized to make ovitraps that are effective, environmentally friendly, and economical (10). It is expected that participants can have a deeper understanding of how ovitraps work and the benefits of using them in disease prevention efforts. This activity also aims to build public awareness about the importance of controlling dengue vector mosquitoes for the sake of mutual health.

## METHODS

This service activity involved the community of public place sanitation managers in Semarang City which was held at Horison inn Semarang. Activities were carried out in October 2024 through an approach in the form of providing material, discussions, and practical demonstrations of making and using ovitraps. The expected result of this service activity is an increase in participants' skills in using the ovitrap technique as a method for controlling vectors that cause dengue fever.

The service team provided most of the material, especially about controlling mosquito vectors that cause dengue and using the ovitrap technique as a monitoring tool. Students were also involved in compiling modules, entering data, guiding participants during practice, and assisting in the preparation of reports. This service activity was carried out in several stages, starting with explaining the activity to the target, followed by determining a schedule that was adjusted to the time available for partners and targets.

Furthermore, the implementation of the activity begins with the administration of a pre-test, followed by the delivery of material on mosquito vector control that causes DHF and the use of the ovitrap technique as a monitoring tool. Before participants practice making and using ovitraps, the service team will first conduct a demonstration. After the demonstration, participants will immediately practice the technique at their respective locations. The activity ends with an evaluation through a post-test to measure participants' understanding.

## RESULTS

There were 22 participants in this activity, including people who manage sanitation in public places. The material presented included the definition of ovitrap, the benefits of ovitrap, and the stages in the manufacturing process.




**Figure 1**. Submission of Material by the Service Team

To determine the increase in participants' understanding, a pre-test and post-test were conducted for 15 participants who were asked to answer in writing a questionnaire containing 10 questions about dengue control before and after the material was delivered. The following are the 10 questions contained in the questionnaire.

**Table 1.** Frequency of Number of Respondents who Answered Correctly to Each Question (n=15 Participants)

| Question | Number of Respondents with Correct Answers | | | |
|---|---|---|---|---|
| | Pretest | | Posttest | |
| | n | % | n | % |
| Mosquitoes transmitting dengue fever do not suck blood at hours above 9:00 p.m. | 10 | 67 | 12 | 80 |
| Places commonly used by dengue mosquitoes to lay eggs dug holes. | 12 | 80 | 14 | 93 |
| The following are not included in the 3M Movement, namely wearing a mosquito net when sleeping. | 15 | 100 | 15 | 100 |
| Dengue fever can be prevented by the following, except hanging clothes outside the house. | 15 | 100 | 15 | 100 |
| Efforts to eradicate mosquitoes that transmit dengue fever, except fogging. | 9 | 60 | 14 | 93 |
| Dengue fever is caused by a virus. | 4 | 27 | 9 | 60 |
| The characteristics of dengue mosquitoes are black in color with white spots. | 15 | 100 | 15 | 100 |
| The type of mosquito that transmits dengue fever is Aedes aeghypti. | 15 | 100 | 14 | 93 |
| Mosquitoes that transmit dengue fever usually breed in stagnant water. | 10 | 67 | 12 | 80 |
| The following are efforts to prevent dengue fever: keeping fish and avoiding hanging clothes. | 13 | 87 | 13 | 87 |

Note: n = number of observations; % = percentage

Based on the results of the analysis, there was an increase in participants' understanding after the provision of the material, as seen from the number of correct answers by more respondents in the post-test. In question number 6, the number of respondents who answered correctly was the least among other questions, namely only 4 (27%) in the pre-test and 9 (60%) in the post-test, indicating that participants' understanding of the topic still needs to be improved. A significant increase was seen in question number 5, where 9 respondents answered correctly (60%) in the pre-test, and it increased to 14 respondents who answered correctly (93%) in the post-test.

**Table 2.** Knowledge Scores Before and After the Training Activities on Improving Dengue Hemorrhagic Fever (DHF) Control (n=15 Participants)

| Time of Assessment | Mean ± SD | *p-value** |
|---|---|---|
| Pre-test | 7.86 ± 1.18 | **0.006** |
| Post-test | 9.00 ± 1.41 | |

Note: SD = Standard Deviation; *Wilcoxon Signed-Rank Test

The increase in the average knowledge score of participants from 7.86 to 9.00 after the activities was supported by the Wilcoxon Signed-Rank test results. The significance value (p-value) of 0.006 ($p < 0.05$) indicates a significant difference between the average knowledge before and after the activities. This signifies that the activities successfully enhanced the participants' knowledge significantly.

## DISCUSSION

The results of this activity support the findings of Melati (2020), which showed a significant difference in the results of the pre-test and post-test before and after counseling on ovitrap making, with a p-value of 0.001 ($p<0.05$). In general, the results show that the activities succeeded in increasing the knowledge of participants. However, some topics in certain questions need to be strengthened through more specific material (12).

This activity also provided a demonstration session on making ovitraps using plastic bottle waste and installing them in the field at the location of each participant. The purpose of this demonstration is to provide participants with a practical understanding of how to make and install ovitraps directly. Previous research showed that this method is more effective in improving the understanding and practice of the target. This is because participants can better understand and master the material by being directly involved in the manufacturing and installation process, which contributes to an increased ability to apply the knowledge learned. The direct involvement of participants in practice is also one indicator of the success of this activity, where participants show enthusiasm and activeness in following each stage of the training and applying the knowledge gained in the field (13).




**Figure 2.** Demonstration and Practice of Ovitrap Making

In the discussion session, participants showed high activeness by giving responses, asking questions, and sharing experiences, which reflected their enthusiasm in understanding the material presented. The results of this community service activity indicate that training supplemented with direct demonstration sessions on the creation and installation of ovitraps successfully enhanced the knowledge and skills of participants in controlling dengue fever. The active involvement of participants in field practices encouraged a deeper understanding and the ability to apply the knowledge gained. The implications of these findings underscore the importance of a participatory and applicative educational approach in community empowerment efforts for environmental health (2,14).

The sustainability of the program can be achieved by recommending similar activities to be expanded to other endemic areas, reinforcing training materials on topics that participants still find challenging, and conducting long-term monitoring and evaluation of the implementation of ovitraps in participants' environments (15). This activity requires cross-sector collaboration, such as with health departments and educational institutions, to support the socialization and implementation of ovitraps more broadly and sustainably.

## CONCLUSIONS AND SUGGESTIONS

The training on ovitrap techniques for dengue control succeeded in increasing community understanding and skills in managing the risk of dengue disease spread. Through the provision of educational materials, interactive discussions, and hands-on practice of making ovitraps, training participants can understand effective ways to monitor and control the population of Aedes aegypti mosquitoes in the surrounding environment. Through this activity, the community is advised to routinely use ovitraps as a simple but effective method in controlling the Aedes aegypti mosquito population. In addition, it is important for the community to maintain environmental hygiene by preventing stagnant water that has the potential to become mosquito breeding grounds. Periodic monitoring of ovitraps is also necessary to ensure their effectiveness and prevent the wider spread of dengue.

## ACKNOWLEDGEMENTS

Our gratitude goes to the Semarang City Health Office, Semarang City Ministry of Religious Affairs, Semarang City Education Office, and other related institutions for the support and cooperation provided in the implementation of this service activity. We hope that these contributions can have a positive impact on society.

## DECLARATION OF USE OF AI IN SCIENTIFIC WRITING

AI tools were used solely for grammar and language editing. The authors take full responsibility for the content and integrity of the manuscript.

## CONFLICT OF INTERESTS

The author states that there are no conflicts of interest.

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