Socialization and practical training on making lemongrass spray as a dengue prevention effort in the PKK group in Gesikan 3 Hamlet

Wilda Natalia [1], Dini Darianti [2], Siti Aisyah Amini [3], Vety Dwi Lukitasari [4], Herlina Fhadila [4], Dia Yulikasari [4], Nabila Nur Madina [5], Aliyah Ardiwati Ma'ruf [6], Ikbal Hasan Fauzi [5], Putra Alhamdi Jusuf [1], *Arridho Ramadhan Firdaus[7]

[1] Faculty of Health Sciences, S1 Nutrition Study Program, Universitas 'Aisyiyah Yogyakarta, Indonesia
[2] Faculty of Economics of Social Sciences and Humanities, S1 Management Study Program, Universitas 'Aisyiyah Yogyakarta, Indonesia
[3] Faculty of Health Sciences, S1 Midwifery Study Program, Universitas 'Aisyiyah Yogyakarta, Indonesia
[4] Faculty of Health Sciences, S1 Nursing Study Program, Universitas 'Aisyiyah Yogyakarta, Indonesia
[5] Faculty of Health Sciences, S1 Physiotherapy Study Program, Universitas 'Aisyiyah Yogyakarta, Indonesia
[6] Faculty of Economics Social Sciences and Humanities, S1 Psychology Study Program, Universitas 'Aisyiyah Yogyakarta, Indonesia
[7] Faculty of Science and Technology, S1 Information Technology Study Program, Universitas 'Aisyiyah Yogyakarta, Indonesia
*Email : arridhoramadhanfirdaus@unisayogya.ac.id

Abstract.

Dengue Hemorrhagic Fever (DHF), a severe mosquito-borne viral illness transmitted by Aedes aegypti mosquitoes, remains a critical public health challenge in Indonesia, with the Ministry of Health reporting 210,644 cases and 1,239 deaths nationwide in 2024, demonstrating the urgent need for sustainable community-based prevention approaches. This empowerment initiative targeted PKK mothers in Hamlet Gesikan 3, Bantul Regency, through comprehensive education and practical training in producing natural repellent spray from locally sourced lemongrass (Cymbopogon citratus), which contains effective bioactive compounds including citronellal and geraniol that repel mosquitoes while being environmentally friendly and economically accessible. The program achieved exceptional results with full attendance of all 30 participants, a 93.3% knowledge transfer success rate measured through interactive assessment, and complete practical success with all participants successfully producing functional repellent sprays, thereby establishing a sustainable community prevention model that reduces dependence on chemical interventions while empowering women as health agents through local resource utilization and skill development for long-term DHF control. This approach not only addresses immediate protection needs but also creates a replicable framework for community-led health initiatives that can be adapted across different regions, ultimately contributing to reduced disease incidence while strengthening community resilience and self-reliance in public health management through knowledge dissemination and practical skill acquisition that transforms passive recipients into active health defenders within their own communities.

Keywords: Dengue; PKK; Lemongrass Spray; Prevention; Community Empowerment.

1. Introduction

Dengue Hemorrhagic Fever (DHF), the most severe manifestation of dengue virus infection, is a potentially life-threatening disease. It is caused by one of four dengue virus serotypes (DEN-1, DEN-2, DEN-3, and DEN-4), transmitted primarily through the bite of infected Aedes aegypti mosquitoes. The clinical presentation of DHF includes sudden high fever (>38.5°C), severe myalgia, arthralgia, headache, retro-orbital pain, nausea, vomiting, and a characteristic maculopapular rash. Crucially, DHF is also marked by thrombocytopenia (platelet count <100,000/mm³) and plasma leakage, which can progress to Dengue Shock Syndrome (DSS) if not managed appropriately [1]. The spectrum of dengue infection ranges from asymptomatic or mild febrile illness to classic Dengue Fever (DF) and the severe forms of DHF and DSS, reflecting varied host immune responses [2].

According to the Indonesian Ministry of Health (2024), DHF constitutes a significant public health burden in Indonesia, with high incidence rates and frequent outbreaks. Epidemiological data indicates a considerable disease burden, with 114,720 reported cases and 894 fatalities recorded throughout 2023. An increasing trend is evident in 2024, with reports up to week 43 documenting 210,644 DHF cases and 1,239 deaths across 259 districts/cities in 32 provinces. The SKDR surveillance system cumulatively reported 624,194 suspected dengue cases during the same period. Data from the Yogyakarta Special Region (DIY) Health Office in 2020 recorded 3,618 DHF cases (Incidence Rate - IR 94.15 per 100,000 population) with 13 deaths (Case Fatality Rate - CFR 0.36%). The highest number of cases was in Bantul Regency (1,222 cases), while the lowest was

in Yogyakarta City (296 cases). The highest IR was in Gunungkidul Regency (132.27/100,000), and the lowest was in Sleman Regency (66.41/100,000). The highest CFR was observed in Kulon Progo Regency (0.95%).

An alternative approach to reducing DHF incidence, particularly in DIY, is the development of natural repellent sprays utilizing organic insecticides derived from plants, such as lemongrass (Cymbopogon), as a complement to chemical insecticides, which can cause skin irritation. Lemongrass (Cymbopogon citratus) contains three primary active compounds: citronellal, citronellol, and geraniol. Citronellal and geraniol are particularly effective at repelling insects, including mosquitoes, making lemongrass a viable candidate for a natural insecticide targeted at Aedes aegypti [3]. Beyond its efficacy, lemongrass is advantageous due to its affordability, accessibility, and ease of processing, making it highly suitable for adoption by PKK mothers' groups in DHF prevention initiatives. Utilizing this local resource can empower PKK groups through socialization and training programs, simultaneously reducing dependency on chemical fogging.

Educational programs on producing natural repellent from lemongrass extract have been successfully implemented in other communities, such as Munggur Village, Karanganyar Regency. These activities received positive community feedback, characterized by high enthusiasm and active participation [4]. Therefore, this community service project aimed to empower PKK mothers in Hamlet Gesikan 3 through socialization and practical training on formulating a lemongrass-based repellent spray, serving as a strategic effort towards independent and sustainable DHF prevention.

2. Method

This community service activity employed a participatory approach, combining two primary methods: socialization and hands-on practical training. The core material focused on utilizing lemongrass (Cymbopogon citratus) as a raw material for formulating a natural and eco-friendly mosquito repellent spray. The participants were members of the PKK women's group in Hamlet Gesikan 3, Wijirejo Village, Bantul Regency, DIY. PKK mothers were selected based on their strategic role as agents for sustainable knowledge transfer and their potential to foster community self-reliance in producing local health products.

2.1. Procedures

a. Preparation and Coordination

The initial stage involved securing permits and coordinating with the head of the local PKK group to obtain approval. Official invitations were subsequently distributed to representatives from each Neighborhood Association (RT). The target was 30 PKK members from Hamlet Gesikan 3.

b. Preparation of Materials and Equipment

Comprehensive presentation materials on the benefits and production procedures were prepared. The required equipment included:

1) Leaflets
2) Cooking pot
3) Stove
4) Measuring cup
5) Strainer
6) Spray bottles
7) Basin
8) Knife
9) Cutting board

c. Preparation of Practice Materials

The ingredients used gor the practial session were:

1) Lemongrass
2) 70% Alcohol
3) Water

d. Implementation

The core activity was structured as follows: material presentation, a question-and-answer session, a live demonstration, hands-on practice, and a testing session for the produced spray.

e. Evaluation

Participant understanding was evaluated through direct questioning with relevant questions pertaining to the delivered material. This method assessed information absorption and knowledge transfer success.

Fig. 1. Ingredient Preparation

2.2. Assesment of Knowledge Transfer Success

Participants were categorized as having understood the material if they actively and spontaneously provided correct answers during the Q&A session and could answer at least 80% (3 out of 4) of the oral questions correctly.

3. Result and Discussion

The activity was conducted on August 12, 2025, from 4:00 PM to 5:45 PM Western Indonesian Time. To maximize participation and accessibility, the session was held simultaneously at two locations within Hamlet Gesikan 3: the residence of the Hamlet Head and the residence of the Head of RT 02. This strategy was effective, achieving full attendance from the target of 30 PKK representatives.

3.1. Effectiveness of Knowledge and Skils Transfer

The activity successfully transferred both theoretical knowledge and practical skills. Cognitively, evaluation through an interactive Q&A session revealed that 28 out of 30 participants (93.3%) could correctly answer three out of four questions, indicating a strong grasp of the DHF prevention material. However, this assessment method is acknowledged to have inherent subjective limitations. For more objective data in future initiatives, the implementation of written pre-test and post-test assessments is highly recommended. Research by Jaya et al. (2025) demonstrates that a pre-posttest design is significantly more effective in quantitatively measuring actual impact and competency development, providing a superior metric compared to one-off assessments by capturing dynamic learning progress.

A more tangible measure of success was observed in the practical session, where 100% of participants successfully produced the repellent spray and evaluated its aroma. The high success rate and participant enthusiasm align with findings by Meviani et al. (2023), whose training participants reported no difficulties in processing due to the use of simple and readily available tools and materials. This perfect success rate underscores the efficacy of the demonstration and hands-on training approach for imparting simple, practical skills. A procedure designed around common household equipment significantly reduced barriers to replication, empowering participants to independently produce the spray at home. It is important to note that the aroma test served to build user confidence and was not an efficacy test. The product's effectiveness is highly dependent on extract concentration, which may vary in home production due to a lack of standardization. This finding is consistent with Wahedi et al. (2024), who clearly demonstrated that ethanolic extract of *Cymbopogon citratus* is significantly more effective than its aqueous extract. This superior efficacy is attributed to ethanol's ability to optimally extract bioactive compounds such as alkaloids, flavonoids, and terpenoids. Consequently, for future similar activities, the use of solvents like ethanol in homemade spray formulations is strongly recommended to achieve adequate bioactive concentration and effectiveness. The selection of lemongrass was evidence-based. Although standardization at the household level remains a

challenge, lemongrass was chosen based on research indicating its potential effectiveness even with simple extraction methods. Rahmanajali et al. (2025) specifically recommend a 50% concentration of lemongrass stem extract as the most effective, achieving 100% larval mortality within 3 hours.

3.2. Supporting Factors and Sustanaibility potential

The full attendance rate (100% of the 30 targeted participants) was a fundamental factor in the activity's success. This was directly facilitated by an effective mobilization strategy involving coordination with the PKK leader and the selection of strategic venues at the homes of community leaders (Hamlet Head and RT Head). This top-down approach via trusted figures proved highly effective for community outreach and participation.

The program's effectiveness was underpinned by two key factors: the target profile and the implementation methodology. The PKK mothers, as key actors in family health, possessed intrinsic motivation and a direct interest in the material, ensuring high engagement and knowledge adoption. The methodology itself was not novel but adhered to a proven PKK empowerment model, as described by Novitasari & Alfirdaus (2024), which utilizes education through cadre facilitators. Thus, trained PKK cadres can act as multipliers, leveraging their social credibility to disseminate the workshop's knowledge, thereby creating a sustainable multiplier effect within the community.

The analysis indicates strong sustainability potential. The ready availability of raw materials (easily cultivated lemongrass and accessible alcohol) makes this a sustainable and low-cost solution. The efficacy and safety of lemongrass as a repellent are supported by robust scientific evidence. Research by Ua et al. (2021) demonstrated a dose-dependent relationship between increasing concentration of *Cymbopogon citratus* extract and increased mortality rates of Aedes aegypti larvae. The successful formulation of a lemongrass oil spray effective against Culex mosquitoes for up to 7 days, as reported by Kurniaty et al. (2024), is highly relevant, as it is based on the same active compounds (e.g., citronellal, geraniol) known to repel Aedes aegypti. This suggests that with appropriate concentration, homemade sprays have potential for adequate durability. Further support comes from Yessi Rahayu et al. (2025), who highlighted the safety and efficacy of lemongrass as a natural alternative without harmful side effects, reducing reliance on chemical products. Research by Ginting et al. (2024) on the efficacy of a lemongrass and clove oil combination against adult mosquitoes elucidates a synergistic mechanism: citronellal causes dehydration and paralysis, while eugenol in clove attacks the nervous system. This not only confirms lemongrass's repellent properties but also suggests potential for more potent future formulations.

This skill possesses potential economic value through product and packaging innovation. Most strategically, the role of PKK mothers as agents of change will organically amplify the project's impact, as knowledge and skills are shared within their extensive social networks, creating a sustainable multiplier effect. Participants acquired not only knowledge and skills but also the confidence to apply them, bolstered by scientific evidence. To ensure long-term sustainability, establishing small community-based pilot groups to monitor usage and conduct simple field tests for localized efficacy validation is recommended. Support from local health cadres will be crucial for disseminating this innovation. The high level of participant engagement and pertinent questions regarding lemongrass application strongly indicates that the material was well-received and addressed a genuine community need.

Fig 2. Joint Documentation

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