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COMMUNITY EMPOWERMENT THROUGH THE ENHANCEMENT OF ENTREPRENEURSHIP IN THE PRODUCTION OF LOTION AND MOSQUITO SPRAY FOR DENGUE FEVER IN SUKMAJAYA, DEPOK

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ABSTRACT

Dengue fever has become one of the endemic diseases in the Sukmajaya area of Depok. This disease can claim the lives of up to 10% of those affected. Community empowerment, particularly through the empowerment of PKK groups. This community service aims to increase the community's ability to prevent the spread of the *Aedes aegypti* mosquito through empowering the PKK group community. It can prevent the spread of mosquitoes by introducing natural materials as mosquito repellents and creating lotion and spray products as alternative solutions. The program involves training and assistance in producing lotions and sprays using natural ingredients. Using essential oils as raw materials, along with marketing techniques, can be a solution to address this issue. The Community Service Team of the Faculty of Pharmacy and Science (FFS) UHAMKA and the Faculty of Economics and Business (FEB) UHAMKA provided comprehensive training and guidance in the pharmacy skills program. Participants were instructed on creating lotion and mosquito repellent spray formulations using natural ingredients, including orange leaf extract, orange oil, lavender oil, and clove oil. The training consisted of lectures followed by a hands-on workshop on entrepreneurship, focusing on the importance of selecting appropriate packaging and promoting the products effectively. Participants are very enthusiastic about acquiring this skill because it enhances the capabilities of PKK administrators in utilizing natural materials in forms that will later boost the spirit of entrepreneurship and help prevent dengue fever.

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INTRODUCTION

Sukmajaya, Depok, is an area that is prone to the spread of dengue fever due to the high population of *Aedes aegypti* mosquitoes. Efforts to control dengue fever have been carried out by the local government through the *Jumantik* program, or mosquito larvae monitoring. However, this activity remain suboptimal due to a lack of community participation (Lukiyono *et al*., 2022). The number of dengue fever cases in Sukmajaya, Depok, remains quite high, so additional measures are needed to address this issue. In 2024, there were 700 reported cases of dengue fever in Sukmajaya, Depok. (Yauwan *et al*., 2022). Eleven sub-districts and 63 villages are classified as endemic areas, although reports from the city of Depok indicate that efforts to eradicate mosquito breeding sites (PSN) have successfully increased the larva-free rate (ABJ) to a safe value of 95.02% in 2020 (>= 95%). (Mary *et al*., 2023)

One innovation that can be implemented to reduce the spread of dengue fever is empowering women through the enhancement of entrepreneurship in the production of mosquito-repellent lotion. Empowering women by improving their knowledge and skills in creating effective mosquito repellent lotion, and spray products is one way to help prevent dengue fever within the surrounding community (Desak *et al*., 2023) (Widya dan Weny *et al*., 2023). The PKK in Sukmajaya, Depok, is a women's organization with great potential for empowerment.

The PKK is a women's organization that has the potential to be empowered in the prevention of dengue fever (Angela dan Denny., 2023). The women's empowerment program through training in producing mosquito-repellent lotion aligns with the government's efforts to improve family welfare through the PKK movement. This activity can also support the PKK's work programs related to family health (Nisrina *et al*., 2023) The Faculty of Pharmacy at Muhammadiyah University Prof. Dr. Hamka, in collaboration with the Faculty of Economics and Business, has carried out community service in Sukmajaya, Depok, to fulfill the *Tri dharma* of higher education. This initiative aims to equip the community ith practical means for dengue fever prevention while also fostering entrepreneurial opportunities.

Lotion is a topical preparation that is typically less thick and greasy than ointments, but thicker and more viscous than creams. Its emulsion form allows for easy application and washing off from the skin, making it a suitable choice for mosquito repellents (Sutaryono et al., 2020) . The benefit of lotion as a repellent formulation lies in its ability to carry active ingredients, such as essential oils and plant extracts, that have proven mosquito-repellent properties (Oyedele et al., 2002) (Sutaryono et al., 2020). The process of making lotion is

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straight forward and can be easily adopted by local communities. Several studies have investigated the mosquito-repellent properties of various plant-based ingredients. The active ingredient for repellent lotion consists of essential oils like camphor, cinnamon, citronella, lemongrass, lime, orange, neem, basil, Vitex, Lantana, eucalyptus, and clove. Essential oils are natural, biodegradable, and generally considered safe for topical application (Rogahang et al., 2023)(Oyedele et al., 2002)(Reegan et al., 2014). Lemongrass oil, in particular, has shown promising mosquito-repellent activity, with ointment and cream formulations containing 1% v/v lemongrass oil exhibiting repellency rates of 50% or greater for 2-3 hours (Oyedele et al., 2002). This was comparable to the performance of commercial synthetic mosquito repellents (Oyedele et al., 2002). The combination of essential oils can also produce synergistic effects. A study found that a formulation containing a blend of essential oils, including camphor, cinnamon, citronella, lemongrass, lime, orange, neem, basil, Vitex, Lantana, eucalyptus, and clove, showed strong mosquito repellency against *Culex quinquefasciatus* and *Aedes aegypti* mosquitoes (Reegan et al., 2014).

MATERIAL AND METHOD

To address the issues faced by partners in enhancing the knowledge and skills of the Sukmajaya Depok PKK administrators in the production of lotion and mosquito repellent spray, the following steps are implemented:

1. Socialization Stage

The socialization of the activities is conducted to prepare the participants from the partner organization who will take part in the implementation, ensuring that participants allocate free time and that the target number of participants is achieved. The socialization process involves announcements and communication through the PKK management of RW 026 Sukmajaya, Depok.

This stage also involves designing the service activities that will be implemented. It involves the preparation of locally available materials in the Sukmajaya area that can be used as repellents, as well as the procurement of additional materials to produce repellent formulations and mosquito spray. The formulation of repellent and mosquito repellent preparations is carried out, alongside the development of pre-test and post-test instuments to quantitatively measure the community's improvement in knowledge and skills regarding the use of natural materials for mosquito repellents and the creation of simple pharmaceutical preparations.

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2. Training Stage

2.1. Pre-test

A pre-test is conducted before the training begins. The pre-test is given in the form of multiple-choice questions, consisting of 15 questions. The questions cover topics that will be addressed during the training. The pre-test is conducted within 10 minutes.

2.2. Lecture

Participants will receive a lecture on techniques using natural materials that can be effective as repellents or mosquito deterrents. This activity is carried out by bringing several examples of natural materials that can be used. Participants are introduced to the process of producing simplicia from natural materials, which are later transformed into extracts, serving as raw materials to produce lotions and sprays. The lecture activities are also used to introduce the ingredients in the formulation of spray and lotion preparations. To enhance, participants are also provided with material modules and leaflets on natural ingredients for mosquito repellent. Before the lecture, participants are given a pre-test first.

2.3. Training on the preparation of mosquito repellent lotion and spray

Stage one: Participants are taught how to make simplicia and extracts.

Stage two: Participants are taught how to prepare the spray formulation.

Stage three: Participants are taught how to prepare the lotion formulation.

The formula for preparing the spray formulation is adapted and modified from Made's research (2023).

3. Stage of Technology Application

The application of technology is carried out by providing participants with the opportunity to create repellent and spray as mosquito deterrents. During this stage, participants are divided into groupsof four. Each group attempts to create one type of formulation.

4. Support and Evaluation Stage

4.1. Hedonic Testing

Participants assess the comfort level of the lotion and spray formulations they have created . This includes assessing factors such as spreadability and any potential adverse effects, such as erythema or allergies .

4.2. Evaluation

The evaluation is conducted through a post-test after the training, with the questions being the

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same as those given during the pre-test. This allows for the collection of data to inform any improvements in participants' knowledge and skills as a result of the PKM activities.

4.3. Monitoring

Monitoring of dengue fever patients is conducted in the following month after education is provided. Data is obtained from the village to observe the trend in the number of patients over several months. Comparisons are made between the number of dengue fever cases in 2024 and 2025 to determine whether there is a decrease in the number of patients due to changes in behavior/lifestyle after receiving counseling and training.

5. Program Sustainability Stage

The sustainability stage of the program is carried out by examining whether new business ventures arise from the community service activities, and if so, they are facilitated by providing information for the processing of production permits, in accordance with the applicable requirements. The quantification of income increase can be obtained from the rise in the number of businesses related to community service that is carried out.

Continued assistance is still needed. If there are unresolved questions or obstacles preparing lotion or spray formulations, participants can contact the service team via email, or the phone number provided by the contact person.

RESULT AND DISCUSSION

Empowering women through the enhancement of entrepreneurial skills in producing lotion and mosquito repellent spray for dengue fever prevention is a very important initiative. This activity not only provides new skills for women in Sukmajaya Depok, but it can also serve as an alternative source of income for them. (Widiarto *et al*., 2022). In this community service activity, the UHAMKA pharmacy team has successfully assisted and provided counseling to the members of the PKK in the Sukmajaya RW community in Depok.

Through the training on making lotion and mosquito repellent spray, it is hoped that their knowledge and skills in entrepreneurship can be enhanced (Widiarto *et al*., 2022). The lotion is a cosmetic preparation used to moisturize, soften, and protect the skin, and it can also serve as a base for other active ingredients, such as sunscreen, antiseptics, or even mosquito repellent (Leviana *et al*., 2020). The mosquito-repellent lotion created is a semi-solid preparation with two types: a yellowish-green variety containing essential oils and citrus leaf extract as raw materials and a white variety containing only essential oils for the active

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ingredients. Lavender oil is widely used as a mosquito repellent; the active compounds in lavender oil are known to repel or eliminate mosquitoes (Inayati & Dhanti, 2021) (Nurhasanah *et al.,* 2020) (Lestari & Pahriyani, 2020) (Widiarto *et al.,* 2022). The linalool and linalyl acetate compounds in lavender oil has good mosquito-repelling activity (Lestari & Pahriyani, 2020; Nurhasanah *et al.,* 2020). These bioactive compounds disrupt the mosquito's nervous system, causing confusion and deterring biting behavior . (Lesmana *et al*., 2021).

Clove oil is also known to have mosquito-repellent properties. Its active compound , eugenol, can be an alternative active ingredient to produce mosquito repellent lotion. (Lestari & Pahriyani, 2020). Lime oil, in this context, refers to lime (*Citrus aurantiifolia* L.) which is known to have good mosquito-repelling activity (Lestari & Pahriyani, 2020). Components such as limonene, citral, and geranyl acetate, exhibit effective mosquito-repelling properties. (Lestari & Pahriyani, 2020).

Mosquito spray is a preparation applied by spraying onto the skin, where its scent is released can influence the olfactory stimuli of mosquitoes (Sahidin *et al*., 2019). Spray serves as a good alternative to an anti-mosquito solution because it offers practical advantages in usage, provides quick effects, and delivers effective results (Sahidin *et al*., 2019) (Lestari & Pahriyani, 2020).(Lamin *et al*., 2023). Active compounds with mosquito-repelling properties function by inhibiting the mosquito's olfactory receptors, thereby repelling mosquitoes or hindering their activity. (Lamin *et al*., 2023)

This community service activity was held on Friday, September 21, from 08:00 AM to 12:00 PM WIB. The participants, consisting of 25 administrators from RW Sukmajaya, Depok, attended the event in person. All activities were conducted offline.

The event began with an opening by the MC, followed by speeches Mrs. Nurmala, the head of the PKK RW Sukmajaya Depok; Mr. Sodik Murdiono, S.Pd, MM the village head of Sukmajaya; , and Mrs. Rini Prastiwi, a representative of the community service activity leadership team.

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Figure 1.
Product spray presentation by each group

The pretest was conducted after the opening ceremony.Participants were given 15 questions based on the material during the session. The alloted time for completion was 10-15 minutes. The event continued with a presentation on natural materials that can be used as mosquito repellents. These natural materials were brought to the session, and heir benefits and applications as mosquito repellents were thoroughly explained to the participants. The presentation was delivered by Mrs. Vera Ladeska.

Figure 2.
Product Lotion presentation by each group

The next activity was the presentation of material on making lotion and mosquito repellent spray, delivered by Mrs. Rini Prastiwi. The material was presented along with examples of the spray and lotion that had been previously made by the service team. Next, the participants were then divided into several groups, with each group tasked with creating lotion

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and spray preparations. They worked through the process of weighing ingredients, formulation, and transferring the final products into containers. The participants demonstrated great enthusiasm throughout the preparation activity. Spray formulations were prepared quickly, as the manufacturing process is relatively straightforward. For lotion formulation, participants must ensure that the lotion produced does not break and is homogeneous.

Figure 3.
Opening Event

After that, participants were allowed to take a short break to enjoy snacks for 10-15 minutes. The activity then continued with a presentation on selecting appropriate packaging for mosquito repellent spray and lotion products, as well as the business opportunities associated with them. This material is provided by Mrs. Dewi Pudji Rahayu, a lecturer at the Faculty of Economics and Business. The 20-minute presentation provides examples of packaging that can be used for mosquito repellent sprays and lotions.

Figure 4.
Making anti-mosquito lotion by participants

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Figure 5.
Lotion and Mosquito Spray for Dengue Fever

At the final stage, participants were allowed to ask questions about the material presented. Product reviews, comments, and feedback from participants are collected. At this stage, the participants' enthusiasm is very high. In conclusion, the community service team provided materials including electric stoves, raw materials, and additives used in the production of mosquito spray and lotion, packaging, digital scales, mortars and pestles, a pocketbook containing instructions for making cream and lotion formulations, packaging, and pricing strategies that participants can use in their entrepreneurial endeavors. The documentation of the activities can be seen in Figures 3 and 4. while the pocketbook that was provided can be seen in Figure 6.

Figure 6.
Pocketbook

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The increase in participants' knowledge can be seen in the picture. There was an increase before and after the implementation of the activity, particularly in three aspects: dengue fever, isolation of essential oils, and also about entrepreneurship. Knowledge gains reached above 80%, as shown in Figure 7.

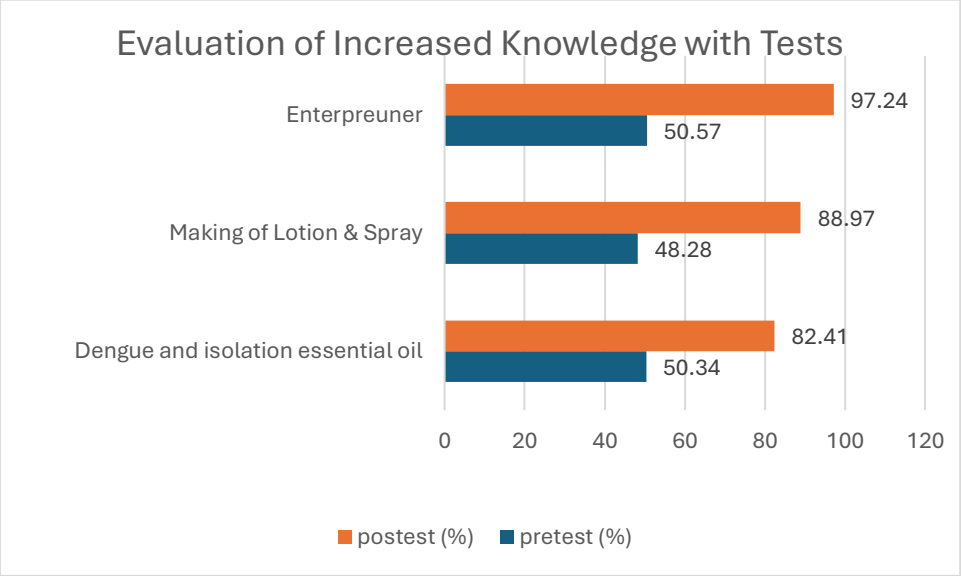

Figure 7.

Evaluation of Increased Knowledge with Tests

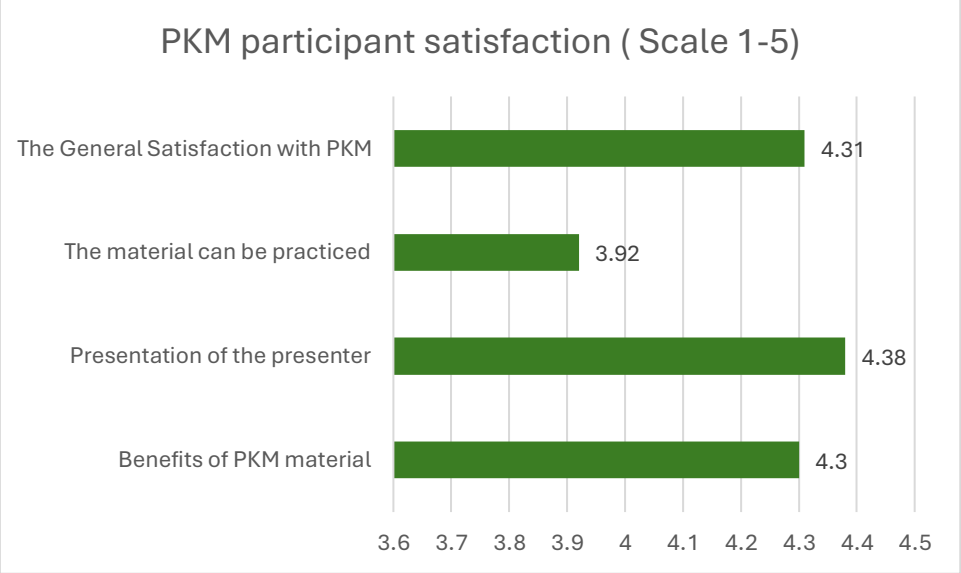

Figure 8.

PKM participant satisfaction (Scale 1-5)

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CONCLUSION AND RECOMMENDATION

Enhancing the understanding of the Depok community regarding the utilization of natural materials to produce pharmaceutical preparations, such as sprays and lotions, is essential. This initiative not only provides valuable knowledge for the prevention of dengue fever but also creates a business opportunity for the community. The process of making sprays and lotions requires guidance, as formulations derived from natural materials exhibit unique characteristics depending on the specific extract used. Therefore, ensuring the quality of these products necessitates both ta supportive production process and a thorough evaluation of the formulations.

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