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Socialization of Liquid Soap Preparation from Lime Peel Extract for Health Improvement in Jarum Village

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ABSTRACT

Hand hygiene is a critical component in preventing disease transmission, particularly in community settings. This community service initiative aimed to enhance public knowledge and practices regarding proper handwashing techniques using antibacterial liquid soap formulated with lime peel essential oil extract. The program combined theoretical education on the antibacterial properties of lime peel extract with practical demonstrations of correct handwashing procedures. Methods included pre- and post-test evaluations to measure knowledge improvement, alongside hands-on training in proper handwashing techniques. Results demonstrated significant improvement in participants' understanding, with 100% correct answers on key questions regarding hand hygiene importance and techniques. The initiative concluded that integrative health education effectively promotes community health awareness and proper hygiene practices, recommending expanded outreach to other regions.

Keywords : ***Community Health; Essential Oil; Hand Hygiene; Lime Peel Extract; Liquid Soap***

INTRODUCTION

Disease transmission frequently occurs through repeated contact with contaminated surfaces, particularly hands, making hand hygiene a crucial preventive measure [1]. The World Health Organization (WHO) recommends handwashing with soap under running water as a simple yet effective method to reduce disease transmission [2]. In Indonesia, promoting Clean and Healthy Living Behavior (PHBS) remains a national priority under Law No. 36 of 2009 concerning Health, which aims to enhance public awareness, willingness, and capability for healthy living [3], [4].

The specific conditions in Jarum Village, Klaten Regency, reveal a significant community gap. Based on a preliminary need assessment conducted through informal interviews with the head of RT 02 RW 09, it was found that there is no routine handwashing with soap practice among residents before meals and the community lacks access to information on how to produce herbal-based liquid soap independently. This situation underscores the urgency of a targeted community intervention.

Lime peel (*Citrus aurantifolia*) contains essential oils with demonstrated antibacterial properties, primarily due to compounds such as limonene (36.32%), beta-pinene (10.81%), and benzene methyl (6.33%) [5]. These compounds can disrupt the cellular membrane of bacteria, leading to cell lysis and death, making them particularly effective against common skin pathogens like *Staphylococcus epidermidis* and *Staphylococcus aureus* [6], [7]. The selection of lime peel as the active ingredient is based on local advantages such as its low cost compared to commercial antibacterial soaps, its environmental benefit in reducing household waste, and its ease of processing into a value-added health product. Previous research has demonstrated that essential oils from citrus peels exhibit broad-spectrum antimicrobial activity [8].

Despite this proven efficacy, a service gap exists between theoretical knowledge and community practice. While some residents recognize the importance of handwashing, actual compliance remains low, and no one has ever produced or used an antibacterial soap made from local lime peel. Moreover, there is a lack of published community service initiatives that integrate lime peel extract soap-making training with behavior change communication in Central Java villages [9]. This community service project aimed to address this gap by providing education and hands-on training in formulating and using lime peel extract liquid soap for proper hand hygiene, building upon established principles of community health education [10]. Specifically, the operational objectives were, First, to

improve participants' knowledge about the antibacterial properties of lime peel, second to enhance practical skills in making liquid soap from lime peel extract, third to demonstrate correct 6-step handwashing techniques, and fourth to provide an affordable, locally-produced alternative to commercial antibacterial soaps. This initiative also aligns with Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being) and SDG 12 (Responsible Consumption and Production) by promoting waste reduction and local resource utilization**.**

METHOD

A need assessment was first conducted through unstructured interviews with the local health (*kader posyandu*) and the head of RT 02 RW 09, Jarum Village, Klaten Regency, to identify specific hygiene-related problems and the potential for lime peel utilization. The activity was conducted in RT 02 RW 09, Jarum Village, Klaten Regency. A total of 15 participants, primarily housewives, were involved in the program. Selection was based on voluntary participation and interest in health promotion. The program was executed in two main sessions: (1) Educational Socialization: A theoretical session on the antibacterial properties of lime peel essential oil and its application in liquid soap formulation; (2) Practical Demonstration: Hands-on training in proper handwashing techniques using the prepared lime peel extract liquid soap, following the WHO's 6-step handwashing guide. The demonstration from the leaflet and presentation that the soap preparation method used a cold process. Lime peels were washed, dried, and subjected to a solvent extraction process using coconut oil over low heat to capture the essential oil [11]. This infused oil was incorporated at a 3% concentration into a base liquid soap formulation consisting of Sodium Lauryl Ether Sulfate (SLES), cocamidopropyl betaine, preservative, and distilled water [12].

Data were collected using a post-test questionnaire consisting of six questions designed to evaluate participants' understanding of hand hygiene and lime peel extract benefits. The questionnaire used a binary scoring system (1 for correct, 0 for incorrect). The percentage of correct answers was calculated using the formula in Eq. (1).

$$P = \frac{F}{N} \, x \, 100\% \qquad (1)$$

where P is the percentage of correct answers, F is the frequency of correct responses, and N is the total number of respondents. Knowledge levels were categorized as: Good (76–100%), Moderate (56–75%), and Poor (≤55%).

RESULTS AND DISCUSSION

The community service initiative successfully integrated theoretical education with practical application, focusing on the preparation by demonstration and use of antibacterial liquid soap derived from lime peel extract. As shown in Table 1, the post-test results demonstrated excellent knowledge acquisition among participants. Questions regarding basic handwashing concepts and disease prevention (Questions 1, 2, 3, and 6) received 100% correct responses, while questions about specific handwashing timing and duration (Questions 4 and 5) showed slightly lower but still excellent scores (93% and 86% respectively).

Table 1. Post-Test knowledge assessment results

No	Question	Correct Responses
1	Handwashing cleans hands and fingers using running water and soap	15
2	Handwashing with soap and running water prevents disease	15
3	Proper handwashing prevents disease	15
4	Handwashing should be done before and after eating	14
5	Handwashing should last 60 seconds	13
6	Forgetting to wash hands before eating can cause diarrhea	15

The high correct response rates for questions related to soap preparation (Questions 1, 2 & 3) indicate the effectiveness of the hands-on workshop in transferring technical knowledge in Table 2. The slightly lower scores for Questions 4 and 5, which pertained to the specific timing and duration of handwashing, are consistent with findings from other studies, indicating these specific behavioral cues often require reinforced education [13], [14]. However, the act of physically preparing the soap from the demonstration and then immediately using it for handwashing served as a powerful reinforcement tool, linking knowledge to practice a core principle of behavior centered design [15]. This finding aligns with previous community service reports on handwashing education [9], [10], and specifically supports the effectiveness of herbal soap training for housewives as reported by Alkiyumi [12].

Table 2. Knowledge level categorization

Knowledge Level	Frequency	Percentage
Good	15	100%
Moderate	0	0%
Poor	0	0%

All participants (100%) achieved "good" knowledge level categorization, indicating the effectiveness of the educational intervention. Beyond knowledge gain, the program successfully transferred a practical skill: each participant was able to independently describe the steps of lime peel extract soap production and perform proper handwashing using the prepared soap. This outcome addresses the initial community gap of low self-efficacy in producing health products. From a sustainability and empowerment perspective, the initiative demonstrated several key achievements such as Waste-to-value transformation, previously discarded lime peels were converted into an antibacterial soap ingredient, directly supporting SDG 12 (Responsible Consumption and Production). Capacity building that housewives gained a new skill that can be replicated at home, reducing dependency on commercial soaps and potentially generating supplementary income if scaled up. Local resource utilization is the program avoided reliance on expensive or imported materials, making the intervention affordable and culturally acceptable. The discussion underscores that the success of this initiative was twofold. First, it effectively transferred knowledge about hand hygiene, as quantified by the post-test results. Second, and more significantly, it demonstrated a practical, sustainable model for community health by transforming a common waste product (lime peels) into a valuable health resource. This approach aligns with broader goals of sustainability and community empowerment, moving beyond knowledge transfer to capacity building [16]. It provides a model for transforming passive recipients of health information into active producers of their own health solutions, thereby ensuring longer-term sustainability of the health practices promoted.

CONCLUSION

The community service program successfully enhanced participants' knowledge and practices regarding hand hygiene using lime peel extract liquid soap. All 15 participants (100%) achieved a good knowledge level, and each demonstrated the ability to produce the herbal soap and perform proper handwashing. The integration of theoretical education and hands-on demonstration proved effective in conveying complex health information in an accessible manner. The initiative also succeeded in creating community awareness about the value of local waste (lime peel) as a health resource, thereby supporting SDG 3 (health) and SDG 12 (sustainable consumption). Future initiatives should expand reach to other villages, include training on homemade lime peel extract soap formulation, and incorporate long-term follow-up to assess sustained knowledge and practices.

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