

Hand Hygiene and Soap-Making Workshop at SMA Ricci 1, Jakarta

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Abstract

Contaminated hands are a major route for the transmission of microorganisms and contribute to the spread of infectious diseases, particularly in school environments where close interpersonal contact facilitates transmission. Although awareness of hand hygiene is generally adequate, adolescents' consistent handwashing practices remain suboptimal. Because adolescence is a critical period for establishing lifelong health behaviors, school-based interventions provide an important opportunity to improve hand hygiene knowledge, awareness, and behavioral intention, thereby promoting sustained healthy practices and reducing the risk of communicable diseases. This program aimed to improve students' knowledge of hand hygiene and to provide practical skills through a soap-making workshop at SMA Ricci 1 in Jakarta. The methods included health education via interactive lectures, pre- and post-tests, and a hands-on workshop, with 141 and 71 students attending the educational session and the workshop, respectively. The results showed an increase in the mean knowledge score from 75.25 to 85.60, with 55.32% to 88.65% of students in the "good" knowledge category. Additionally, over 90% of the participants gave high ratings for the workshop's clarity, usefulness, and relevance. The program effectively improved students' knowledge and awareness of hand hygiene while providing practical experience to support healthy hygiene behavior.

Keywords

education; handwashing; soap; workshop



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1. INTRODUCTION

Hand contamination is one of the most common vectors for transmitting microorganisms and plays a major role in numerous infectious outbreaks across healthcare facilities, food industries, and public spaces. Improving hand hygiene compliance is one of the most effective ways to prevent the spread of harmful microorganisms and reduce healthcare-associated infections (HAIs). This has become even more important during the COVID-19 pandemic. As a result, hand hygiene is considered a key indicator of patient safety and healthcare quality worldwide (de Kraker et al., 2022). However, compliance rates remain low, reaching only 9% in some low-income countries and rarely exceeding 70% even in high-income countries (Erasmus et al., 2010; Lambe et al., 2019). Indonesia has experienced significant economic growth over the past two decades, attaining middle-income country status (World Bank, 2026).

Hand hygiene compliance is influenced by knowledge, attitudes, access to facilities, available time, and organizational culture (Seto Sudirman et al., 2023). Schools are important settings for promoting hand hygiene among students. They not only support proper handwashing practices but also help spread health knowledge to the wider community (Clark et al., 2016; McMichael, 2019). This role became even more important during the COVID-19 pandemic, when hand hygiene was recognized as a key public health measure. Although simple, proper hand hygiene has a major impact on public health and can prevent about one-third of infectious disease transmission (Younie et al., 2020).

Although hand hygiene is widely recognized as important, its implementation remains suboptimal (Afewerk & Tamene, 2025; Howell et al., 2026). Barriers to compliance are complex, including behavioral, social, physical, and organizational factors, highlighting a gap between knowledge and practice. In addition, differences between self-reported and observed behaviors suggest the need for interventions that go beyond knowledge improvement to promote sustained behavior change. In Indonesia, challenges to hand hygiene include infrastructural, behavioral, and educational issues. Limited access to clean water, inadequate handwashing facilities in schools, and poor sanitation and waste management systems further hinder effective hand hygiene practices (Juanda et al., 2025; Kusumaningtiar et al., 2024). The study assessed oral and hand hygiene behaviors among 13–15-year-old students in India, Indonesia, Myanmar, and Thailand using survey data from 13,824 participants. It found that many adolescents had suboptimal hygiene practices, including infrequent toothbrushing and inconsistent handwashing before meals, after using the

toilet, and with soap. Key factors linked to poor hygiene included male gender, risky behaviors, low socioeconomic status, psychological distress, and lack of protective factors. Overall, the study highlights generally poor hygiene behaviors and identifies determinants that can guide future interventions (Peltzer & Pengpid, 2014). Previous studies indicate that individuals generally possess adequate knowledge of hand hygiene, yet a significant portion of the population has not paid adequate attention to its application in daily practice (Aguzie et al., 2024).

This gap between knowledge and practice is particularly concerning among school-aged adolescents, who remain vulnerable to communicable diseases transmitted through inadequate hygiene. Previous studies have reported outbreaks or a considerable burden of diarrheal diseases, respiratory infections such as COVID-19, and intestinal parasitic infections among school-aged children and adolescents, demonstrating that infectious diseases continue to affect this population despite the availability of effective preventive measures (Kim & Wu, 2015; Riiser et al., 2020; Roro et al., 2022). Because schools involve frequent close interpersonal contact, they provide favorable conditions for disease transmission while also offering an ideal setting for preventive health interventions.

According to health guidelines, washing hands with soap and running water for 40–60 s is the most efficient and cost-effective method for preventing infection (World Health Organization, 2009). According to a global school-based student health survey, many adolescents aged 13–17 tend to use only water to clean their hands and do not use soap (Jatrana et al., 2021). Data from UNICEF show that approximately 71% of schools lack basic water, sanitation, and hygiene (WASH) facilities (Haris & Indrawati, 2023; UNICEF, 2022). Aside from the limited availability of soap and clean water, many students still do not understand the proper steps of handwashing and the critical times to do so, such as before eating and after using the toilet. The study conducted by Peltzer et al. found that 22.4% of students had poor oral hygiene, brushing their teeth less than twice a day. In addition, 45.2% did not consistently wash their hands before meals, 26.5% did not do so after using the toilet, and 59.8% did not regularly use soap when washing their hands (Peltzer & Pengpid, 2014).

To address these issues, we conducted a community service program at Ricci 1 Catholic Senior High School (SMA Ricci 1) in Jakarta, aimed at fostering clean living habits from an early age. This activity provided health education regarding the importance of hand hygiene and the proper steps for handwashing. Thus, it is expected that a handwashing culture can be sustained, thereby improving prevention and reducing the transmission of infectious diseases.

A soap-making workshop was also conducted, with the students guided by facilitators. This activity not only increased knowledge but also provided practical experience that could cultivate students' interest in pharmacy. Students at Ricci do not have any practical sessions on making hand sanitizer or handwashing soap. By learning how to make hand soap, participants are expected to gain hands-on experience and be reminded of the importance of handwashing.

2. METHODS

An educational workshop was conducted for all Grade 10, 11, and 12 students of SMA Ricci 1 on November 24th 2025, with a total of 148 participants. While the workshop participants consisted of grade 10 students who voluntarily chose to participate in the activity, as well as grade 11 and 12 students enrolled in science subjects. The total number of participants in the education and workshop was 148 students. The intervention was delivered through lectures and supported by an e-flyer. The lecture and discussion lasted one (1) hour, and the workshop lasted one (1) hour. The characteristics of the students are shown in Table 1.

Table 1. The characteristics of the students

The Characteristics		n	%
Gender	Male	87	58.8
	Female	61	41.2
Grade	10	50	33.8
	11	48	32.4
	12	50	33.8

The educational materials were compiled in accordance with WHO standards, including a handwashing duration of 40–60 s and the correct steps. The health education process was conducted in the auditorium. Meanwhile, a hand soap-making workshop was conducted simultaneously in 3 laboratories at SMA Ricci 1, Jakarta. Table 2 lists the formula used for making the hand soap. The resulting soap can be used by students at school and at home as part of sustainability efforts.

Table 2. Formula of the hand soap

Ingredient	Composition (%)
Olive Oil	12.75
Potassium Hydroxide	7.25
Citric Acid	4.00

Sodium carboxymethyl cellulose	1.00
Stearic Acid	0.50
Niacinamide	2.00
Cocamidopropyl Betaine	4.00
Perfume	0.05
Distilled water	add to 100

The hand soap was prepared by first dissolving potassium hydroxide in a portion of distilled water under continuous stirring until a clear solution was obtained. Olive oil was heated separately to approximately 60–70 °C, after which the potassium hydroxide solution was slowly added to the oil while stirring continuously to initiate saponification. The mixture was stirred until a homogeneous soap paste was formed. Citric acid, previously dissolved in distilled water, was then incorporated gradually to adjust the pH. Sodium carboxymethyl cellulose, pre-dispersed in distilled water, was slowly added to increase the formulation's viscosity, followed by stearic acid, which had been melted before incorporation. After the mixture became homogeneous, niacinamide and cocamidopropyl betaine were added while stirring gently and continuously. The formulation was allowed to cool to below 40 °C before adding the perfume to minimize volatilization. Finally, distilled water was added to bring the formulation to the final volume (ad 100%), and the liquid hand soap was stirred until uniform before being transferred into suitable containers (Kurniawati & Paramita, 2022; Pawar et al., 2019).

A pre-test was administered before the presentation of the material, and a post-test afterward, to assess students' knowledge using a questionnaire. The questions were developed based on the educational materials used in the intervention. These materials were obtained from the WHO guidelines on proper handwashing techniques and references on hand soap preparation. The pre-test and post-test questions are as follows:

1. Handwashing is the act of cleaning hands with water + a cleansing agent (soap) or using an alcohol-based hand rub.
 - A. True
 - B. False
2. What is the purpose of using soap to wash hands?
 - A. To reduce germs on the skin of the hand, thereby reducing the risk of disease transmission
 - B. To eliminate the unpleasant odors on the hands

- C. To make the hands smell nicer
- D. To clean the coarse dirt
- 3. What is the primary transmission route for diarrheal diseases?
 - A. Contamination through the fecal-oral route
 - B. Through contaminated air
 - C. Contact with dangerous objects
 - D. Through mosquito bites
- 4. What is the primary route of transmission for acute respiratory infection (ARI)?
 - A. Through consumption of dirty water
 - B. Through contact/droplets from an infected person
 - C. Through the consumption of oily foods
 - D. Through contaminated food
- 5. A virus that causes diarrhea is
 - A. Norovirus
 - B. Influenza
 - C. *Streptococcus pneumoniae*
 - D. SARS-CoV-2
- 6. When is the right time to wash your hands?
 - A. Only before eating
 - B. After sleeping
 - C. Before and after eating, after performing activities, after using the bathroom, and after coughing
 - D. Only after touching the dirty objects
- 7. According to the WHO, how long is the correct duration for washing hands with soap and running water?
 - A. 10–15 seconds
 - B. 20–30 seconds
 - C. 40–60 seconds
 - D. 70–90 seconds
- 8. In Step 5 of proper handwashing, what activity is performed?
 - A. Interlocking the insides of both hands
 - B. Rubbing the palms and between the fingers
 - C. Rubbing the palm of the fingertips in a circular motion
 - D. The left thumb is rubbed in a circular motion in the right hand, and vice versa
- 9. What is the main function of sodium lauryl sulfate (SLS) in hand soap?

- A. Reducing the odor of the soap, making it gentler
 - B. Produces foam and helps remove oil and dirt
 - C. Color addition to the soap
 - D. Increasing the skin's natural oil content
10. Why are non-SLS soaps considered gentler on sensitive skin?
- A. Because it does not produce any foam
 - B. It uses natural fragrance ingredients
 - C. Because it does not excessively strip the skin of its natural oils
 - D. It cleanses more effectively than SLS soap

The pre-test and post-test results reflect students' knowledge levels before and after the educational intervention. The data were used to assess improvements in knowledge following the education. The findings are presented using descriptive statistics. Each correct answer is given a score of 10, whereas an incorrect answer is given a score of 0. Thus, the maximum score a respondent can obtain is 100. The scores obtained are then categorized into three knowledge levels: poor (≤ 55), fair (56–75), and good (≥ 76) (Astuti & Dani Iswati, 2023). In addition to measuring knowledge levels, participants completed an evaluation form to assess the workshop's effectiveness. The workshop evaluation was conducted using three statements, each measured on a 1–5 Likert scale, with 1 indicating "strongly disagree" and 5 indicating "strongly agree".

1. The workshop material was easy to understand and presented clearly.
2. The workshop improved my understanding of hand hygiene.
3. This workshop was interesting, useful, and relevant to everyday life.

The stages of the education and workshop activities are shown in the figure below.

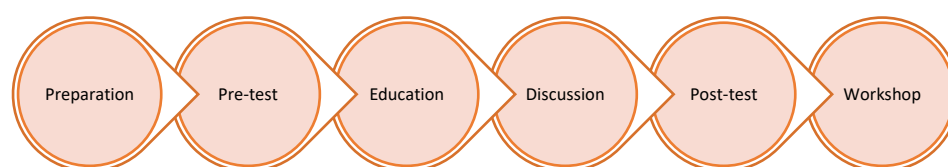


Figure 1. The stages of the education and workshop

3. FINDINGS AND DISCUSSION

3.1 *Hand Hygiene Education*

The educational activity was attended by 148 students, as shown in Figure 2. A total of 141 participants completed the questionnaire in full. Based on the activity evaluation results, there was a significant increase in knowledge after the activity. In

the pre-test, the average score for participants was 75.25 out of 100, with a median of 80 and a fairly wide range, from 30 to 100. The distribution of scores showed that most participants were in the 60–90 point range, with a few still receiving low scores. This indicates that, before the activity began, the participants' understanding of the material varied, and some needed conceptual reinforcement or additional information on hand hygiene. After the educational activity, the post-test results showed a clear improvement. The average score increased to 85.60 out of 100, and the median to 90, with a similar improvement in the 40–100 range. Table 3 shows a dramatic increase in the number of participants receiving high scores (80–100), while only a few received low scores. These improvements indicate that the materials and delivery methods provided during the activity helped participants better understand the concept of hand hygiene.

These findings align with the results of community service activities reported by Lestari et al. (2024) and Sarashy et al. (2023), which found that hand hygiene increased students' knowledge before and after the intervention. This similarity in results reinforces evidence that a systematic educational approach, accompanied by pre- and post-intervention evaluation, is effective in improving students' understanding of the importance of hand hygiene (Lestari et al., 2024.; Sarashy et al., 2023).

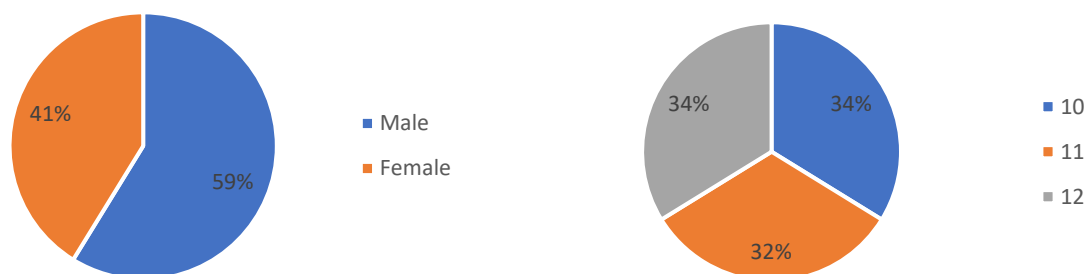


Figure 2. Respondent characteristics based on (a) gender and (b) grade

Table 3. Pre-test and post-test results

Knowledge Level	Pre-test	Post-test
Good	78 (55.32%)	125 (88.65%)
Fair	50 (35.46%)	15 (10.64%)
Poor	13 (9.22%)	1 (0.71%)

Based on the assessment categories in Table 3, the pre-test results showed that the majority of respondents were in the good category (55.32%), followed by the fair category (35.46%), and a small portion were in the poor category (9.22%) (Table 4).

Meanwhile, for the post-test, most respondents were in the good category (88.65%), with the fair category at 10.64% and the poor category at 0.71%. These results indicate that the students understood the material presented and gained additional knowledge after the presentation. Generally, the increase in student knowledge from the pre-test to the post-test indicates that the educational activities were effective.

Table 4. Descriptive Analysis and Statistical Parameters

Descriptive analysis results	Value
Number of Respondents	141 participants
Mean pre-test score	75.25
Mean post-test score	85.60
Mean score improvement	10.35 points
Statistical Parameter	Value
t-value	8.84
p-value	3.65×10^{-15}
Cohen's d (paired)	0.74

The results of this study demonstrated a significant improvement in participants' knowledge of proper hand hygiene after the educational intervention. The mean pretest score increased from 75.25 to 85.60 in the posttest, with an average improvement of 10.35 points. Furthermore, the paired t-test analysis revealed a statistically significant difference between the pre- and post-test scores ($t = 8.84$; $p < 0.05$). The intervention also produced a moderate-to-large effect size (Cohen's $d = 0.74$), indicating that the educational program meaningfully improved participants' understanding of appropriate hand hygiene practices. All participants completed both the pre-test and post-test assessments; therefore, all data were included in the paired analysis (Sullivan & Feinn, 2012).

The improvement in post-test scores may be attributed to the delivery of health education that was clear, interactive, and relevant to the participants' daily activities. Health education plays an important role in improving knowledge by providing information and reinforcing positive health behaviors. In this study, participants better understood the importance of hand hygiene as a preventive measure against infectious diseases after receiving the intervention.

Although the participants already had relatively good baseline knowledge, the intervention still produced a meaningful increase in scores, as reflected by the pre-test mean score. This suggests that even among populations with moderate prior knowledge, health education remains beneficial. The use of structured educational

materials and direct explanations may have helped participants better retain and understand the information provided.

Sutoi et al. conducted a study involving 540 participants between March and November 2024, of whom 186 met the inclusion criteria and were included in the analysis. The median age of participants was 18.5 years. The study found significant improvements in Likert scale scores after the workshops ($P < 0.001$), with no significant differences between sites. Overall, the findings indicate that the workshops effectively enhanced participants' motivation, self-confidence, and both theoretical and practical knowledge (Sutoi et al., 2025).

3.2 Handwashing and Soap Making Workshop

In addition to evaluating knowledge, the handwashing soap-making workshop was assessed using an assessment form completed by 71 students (Table 5).

Table 5. Results of the workshop assessment

Statement	Scale				
	5	4	3	2	1
The workshop material was easy to understand and clearly delivered	45	24	1	1	0
The workshop improved my understanding of hand hygiene.	56	12	2	1	0
This workshop was interesting, beneficial, and relevant to daily life.	51	15	4	1	0

The evaluation results showed that the activity went very well. As many as 97.2% of participants gave a high score (4-5) for understanding the material, while 95.8% gave a high score for increased knowledge of hand hygiene. Furthermore, the usefulness and interest in the activity were assessed very positively, with 92.9% of participants rating it 4-5. This positive assessment agrees with student comments describing the activity as fun, informative, and easy to follow, especially in the practical part of soap-making. Many students reported that the instructions were clear, the facilitator was friendly and patient, and the activity provided a new experience. However, some students provided constructive feedback regarding the practicum's safety aspects. Several participants suggested the need to exercise caution when heating the oil, ensure there are no mistakes in mixing the ingredients, and use personal protective equipment, such as lab coats, to reduce the risk of splashes. This feedback is important for improving the quality of similar activities in the future. Overall, the evaluation results show that the Community Service Program (PKM)

activity not only achieved its educational objectives but also provided a safe, meaningful, and enjoyable practical experience for participants. Documentation of the activity is shown in Figure 3, and the activity poster is shown in Figure 4.

These findings align with Fergina's (2025) report, which stated that a Clean and Healthy Lifestyle workshop combined with educational methods and hands-on practice could increase students' awareness of personal and environmental hygiene and is recommended for ongoing implementation (Anggun Fergina et al., 2025). Similarly, Rahman et al. (2026) demonstrated that the success of hand hygiene educational activities is measured not only by knowledge but also by students' ability to practice the sequential steps of handwashing, which positively impacts student understanding and skills. These results reinforce the finding that a workshop approach involving hands-on practice significantly contributes to the educational process, as it not only enhances conceptual understanding but also strengthens applicable and sustainable learning experiences.



Figure 3. (a) Material education session, (b) workshop session, (c) group photo, and (d) handover of souvenirs to the school



Figure 4. Poster on washing hands with soap

In this program, educational materials were distributed to the school and students as e-flyers. The school is encouraged to display these materials on notice boards, in designated areas, or on official school social media platforms to ensure continuity of health education. Furthermore, the school may establish collaboration with the organizers to implement regular and sustainable educational activities. It is also recommended to include implications for the School Health Unit (UKS) program, school health promotion, practice-based learning, and the development of clean and healthy living behaviors (PHBS).

4. CONCLUSION

The hand hygiene education and soap-making workshop at Ricci 1 High School in Jakarta proved effective in increasing students' understanding of the importance of hand hygiene. The increase in the average score and percentage of students in the "good knowledge" category indicates that the educational method successfully achieved the program's objectives. Furthermore, the workshop evaluation results indicated a high level of participant satisfaction and engagement, ensuring that the program was not only informative but also provided meaningful practical experience. For future activities, similar programs should be implemented sustainably and expanded to other schools to foster a culture of hygiene from an early age. Improvements in laboratory safety, such as the use of personal protective equipment and closer supervision during heating, are also necessary to ensure optimal and safe

implementation. Education can be continued by integrating this program into the School Health Unit (UKS) activities or by displaying flyers on the school bulletin board.

This study had several limitations. First, the activity was conducted in only one school, which may limit the generalizability of the findings to students from different educational settings or regions. Second, the evaluation was limited to short-term outcomes measured immediately after the intervention; therefore, long-term knowledge retention could not be assessed. Third, this study did not include behavioral follow-up observations to determine whether the improvement in knowledge was translated into daily handwashing practices. Therefore, it is recommended that future programs involve more schools, include long-term evaluations, and assess behavioral changes following the intervention.

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