**International Journal of Advanced Health Science and Technology** e-ISSN:2808-6422; p-ISSN:2829-3037
**Homepage:** ijahst.org Vol. 5 no.3, pp. 140-145, June 2025

**RESEARCH ARTICLE** OPEN ACCESS
Manuscript received April 25, 2025; revised May 08, 2025; accepted May 10, 2025; date of publication June 01, 2025
**Digital Object Identifier (DOI)**: https://doi.org/10.35882/ijahst.v5i3.460

**How to cite**: Maulidya Aisyah Kusuma Dewi, Indriatie, Sari Luthfiyah, and Joko Suwito, "Effectiveness of Audiovisual and Roleplay Methods in Enhancing Hand Washing Knowledge and Skills in School-Age Children", International Journal of Advanced Health Science and Technology, vol. 5, no. 3, pp. 140-145, June 2025

# Effectiveness of Audiovisual and Roleplay Methods in Enhancing Hand Washing Knowledge and Skills in School-Age Children

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**ABSTRACT** Hand hygiene, particularly handwashing with soap, is a critical measure in preventing infectious diseases among school-aged children. Despite its importance, improper handwashing behavior remains prevalent in this population, largely due to limited health education. This study investigates the effectiveness of two educational interventions audio-visual media and roleplay in enhancing students' knowledge and practical skills related to handwashing. The research was conducted using a quasi-experimental design with a two-group pre-test and post-test framework. A total of 48 fourth-grade students from MINU Lumpur Gresik were randomly assigned to either the audiovisual or roleplay group. Data collection involved validated questionnaires to assess knowledge levels and observation checklists to evaluate handwashing skills, with assessments performed before and after the interventions. The audiovisual group engaged with a 10-minute animated video detailing handwashing definitions, procedures, and disease prevention, while the roleplay group participated in scenario-based simulation exercises to practice handwashing techniques. Statistical analysis using the Wilcoxon signed-rank test revealed significant improvements in both knowledge and skills post-intervention ($p < 0.001$ for both groups). Furthermore, no significant difference was observed between the two methods in terms of overall effectiveness. The findings demonstrate that both audiovisual and roleplay interventions significantly enhance hand hygiene knowledge and skills among children, with each method effectively supporting different learning styles. These results suggest that integrating both educational strategies into school health programs can optimize hygiene promotion, ultimately reducing infection rates among children. Therefore, health educators and policymakers should consider employing a combination of visual and active learning methods to foster sustainable hand hygiene behaviors in school settings.

**INDEX TERMS** handwashing, health education, audiovisual media, roleplay, school-age children

## I. INTRODUCTION

Hand hygiene, particularly handwashing with soap, remains a cornerstone intervention for preventing infectious diseases, especially among children in school settings. Undoubtedly, proper handwashing can significantly reduce the transmission of pathogens responsible for illnesses such as diarrhea, respiratory infections, and other communicable diseases [1], [2]. Despite the well-documented benefits, poor hand hygiene practices persist worldwide, notably in low- and middle-income countries where access to health education remains limited and behavioral factors hinder optimal practices [3], [4].

Globally, approximately 19% of children engage in regular handwashing with soap, reflecting suboptimal adherence to recommended hygiene behaviors [5]. In Indonesia, recent surveys indicate that only 51.1% of the population practice proper hand hygiene, with even lower rates observed among school-aged children [6]. This deficiency contributes to high incidences of preventable diseases such as diarrhea, which is estimated to cause over half a million child deaths annually in Indonesia alone [7], [8]. The challenge lies not only in providing awareness but also in translating knowledge into sustained behavioral change. Inadequate understanding, poor skills, and misconceptions significantly hinder effective hand hygiene practices among school children [9].

Health education strategies have evolved from traditional didactic approaches to more dynamic, interactive, and engaging methods, aiming to foster behavioral change effectively. Recent studies have demonstrated that audiovisual media such as animated videos and multimedia presentations offer compelling visual and auditory stimuli to enhance understanding and retention [10], [11]. These tools can deliver standardized content repeatedly and conveniently, making them suitable for school-based programs [12], [13].

Parallel to this, active learning techniques such as roleplaying and simulation exercises have gained popularity for their capacity to engage children physically and emotionally, thus improving both knowledge and practical skills [14], [15]. Roleplay leverages experiential learning principles, enabling students to embody hygiene practices in

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 No.3, pp. 140-145, June 2025

real-life scenarios, which can reinforce behavioral adoption [16]. Combining these methods has been suggested to accommodate diverse learning styles, potentially amplifying educational outcomes [17].

Although extensive evidence supports the efficacy of audiovisual media and roleplay individually, limited research exists comparing their relative effectiveness in promoting handwashing behaviors among school-age children in diverse settings, particularly within the Indonesian context [18]. Furthermore, most previous studies focus on short-term outcomes without assessing the sustainability of behavioral changes or exploring optimal integration strategies for these methods [19]. There is also a paucity of research on how these educational strategies influence both knowledge and practical skills simultaneously, and how tailored interventions can enhance overall hygiene practices [20].

Addressing these gaps, this study aims to evaluate and compare the effectiveness of audiovisual media and roleplay-based health education interventions in improving both knowledge and handwashing skills among fourth-grade students in Gresik, Indonesia. By doing so, it seeks to generate empirical evidence for implementing evidence-based, engaging, and sustainable hygiene education strategies in school health programs. This research makes three primary contributions:

1. Empirical comparison of audiovisual and roleplay methods in enhancing hand hygiene knowledge and skills within the Indonesian school context.
2. Insights into how these methods influence behavioral change, supporting tailored health education interventions suited to diverse learning styles.
3. Practical recommendations for integrating multimedia and active learning strategies into school curricula to achieve long-term improvements in hand hygiene practices.

## II. METHODS

This study employed a quasi-experimental research design with a pre-test and post-test control group framework to evaluate the effectiveness of audiovisual and roleplay educational methods on handwashing knowledge and skills among fourth-grade school-aged children at MINU Lumpur Gresik. The primary aim was to assess the differential impact of these educational interventions in enhancing participants' understanding and practical abilities related to proper hand hygiene.

### *A. STUDY POPULATION AND SAMPLE*

The target population comprised all fourth-grade students enrolled at MINU Lumpur Gresik during the data collection period (January 10–13, 2025). Inclusion criteria stipulated that participants had not previously received formal health education specifically related to handwashing with soap (HWWS). The total population was 48 students, which served as the sample for this study. Given the limited population size, all eligible students were included in the research sample, thus eliminating the need for sampling techniques and ensuring comprehensive data coverage. The total sample comprised 48 students, evenly divided into two groups: the audiovisual (intervention) group and the roleplay (comparison) group, each containing 24 participants.

### *B. STUDY DESIGN AND PROCEDURE*

This research adopted a pre-experimental, quasi-controlled approach with allocation based on randomization to prevent selection bias. Participants were randomly assigned to either the audiovisual or roleplay cohort utilizing a simple randomization procedure through coin tossing, ensuring the equal distribution of demographic characteristics and baseline knowledge and skills. The intervention phase consisted of three stages: initial assessment (pre-test), delivery of health education, and post-intervention assessment (post-test). The pre-test involved evaluating baseline knowledge and handwashing skills through structured questionnaires and observational checklists, respectively. Following the initial assessment, participants received the respective educational interventions. The audiovisual group was shown a validated animated video elucidating the six steps of proper handwashing, which was developed in accordance with standards set by the Indonesian Ministry of Health [4]. The roleplay group participated in guided demonstrations involving interactive simulations where students practiced handwashing techniques in peer-group activities. Both interventions were delivered once, lasting approximately 30 minutes per session, under the supervision of trained research assistants and healthcare educators. The post-test was conducted immediately after the intervention to assess the immediate impact on knowledge and skills. Data collection was performed using the same instruments used in the pre-test to evaluate improvements attributable to the educational methods

### *C. MATERIALS AND INSTRUMEN*

The study utilized several validated tools tailored to assess both knowledge and practical handwashing skills:

1. **Questionnaire for Knowledge Assessment:** Consisting of 15 true/false items concerning handwashing procedures, developed according to WHO guidelines and validated through a pilot test with a Cronbach's alpha coefficient of 0.85, indicating high reliability [22]. Correct responses scored 1 point; incorrect responses scored 0, with total scores expressed in percentage form and categorized into 'Good' (76–100%), 'Enough' (56–75%), and 'Not Good' (<56%) [23].
2. **Observation Checklist for Handwashing Skills:** Based on the six-step handwashing protocol stipulated by the Indonesian Ministry of Health [4]. The checklist comprised six items, each scored as 1 (performed correctly) or 0 (not performed). The total skill score was similarly categorized as 'Good', 'Enough', or 'Not Good'.
3. **Educational Materials:** The audiovisual intervention employed a professionally developed animated video demonstrating proper handwashing steps, validated for clarity and accuracy by health education experts [24]. The roleplay involved using handwashing props and guided scenarios to facilitate practical learning.
4. **Supplementary Materials:** Handwashing posters, visual aids, and standardized scripts for roleplay

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 No.3, pp. 140-145, June 2025

demonstrations were used to standardize the educational process across groups.

### D. DATA ANALYSIS

Data analysis was performed using IBM SPSS Statistics version 25.0. Within-group differences in knowledge and skills pre- and post-intervention were evaluated using the Wilcoxon signed-rank test, suitable for non-parametric data and small sample sizes. Between-group comparisons of post-intervention knowledge and skills were conducted using the Mann-Whitney U test to assess the differential effectiveness of the educational methods. A significance threshold of $p < 0.05$ was established for all statistical tests. Effect sizes were calculated to measure the magnitude of observed differences, with Cohen's guidelines applied for interpretation [25].

### G. ETHICAL CONSIDERATIONS

Prior to data collection, ethical approval was obtained from the Polytechnic of the Ministry of Health Surabaya Ethics Committee (Approval No. XYZ-2025). Informed consent was secured from the parents or guardians of all participating children, and assent was obtained from the students. Confidentiality was maintained throughout the study, with data anonymized and securely stored in accordance with ethical standards and data protection regulations [26].

## III. RESULT

This chapter presents the findings of the study entitled 'The Effectiveness of Education Using Audiovisual and Roleplay Methods on Handwashing Knowledge and Skills among School-Age Children at MINU Lumpur Gresik.' The research was conducted at MINU Lumpur Gresik from January 10 to January 13, 2025. The study involved 48 fourth-grade school-age children as respondents.

TABLE 1
Characteristics of Respondents

| Characteristics | Frequency (f) | Percentage (%) |
|---|---|---|
| **Age** | | |
| 9 years | 11 | 23% |
| 10 years | 32 | 67% |
| 11 years | 4 | 8% |
| 12 years | 1 | 2% |
| **Gender** | | |
| Male | 23 | 48% |
| Female | 25 | 52% |
| **Experience of Following Education About HWWS** | | |
| Yes | 0 | 100% |
| Yes | 48 | 0% |
| **Total** | 48 | 100% |

Based on TABLE 1, the characteristics of fourth-grade school-age children at MINU Lumpur Gresik show that the majority were 10 years old (67%), while a smaller proportion were 9 years old (23%), 11 years old (8%), and 12 years old (2%). Regarding gender, most of the students were female (52%), and nearly half were male (48%). In terms of experience, all fourth-grade students at MINU Lumpur Gresik. (100%) had never received health education related to Hand Washing with Soap (HWWS.

TABLE 2
Knowledge Level of School-Age Children About Hand Washing Before and After Receiving Health Education Using the Audiovisual Method at MINU Lumpur Gresik on January 10–13, 2025

| Knowledge | Before | | After | |
|---|---|---|---|---|
| | f | % | f | % |
| Good | 0 | 0% | 24 | 100% |
| Enough | 7 | 29% | 0 | 0% |
| Not Good | 17 | 71% | 0 | 0% |
| **Total** | 24 | 100% | 24 | 100% |

Based on TABLE 2, prior to receiving health education using the audiovisual method, most fourth-grade school-age children at MINU Lumpur Gresik (71%) were in the not good category of hand washing knowledge, while (29%) were categorized as enough. However, following the intervention, all students (100%) achieved the good category in hand washing knowledge.

TABLE 3
Knowledge Level of School-Age Children About Hand Washing Before and After Health Education Using the Roleplay Method at MINU Lumpur Gresik on January 10–13, 2025

| Knowledge | Before | | After | |
|---|---|---|---|---|
| | f | % | f | % |
| Good | 0 | 0% | 24 | 100% |
| Enough | 6 | 25% | 0 | 0% |
| Not Good | 18 | 75% | 0 | 0% |
| **Total** | 24 | 100% | 24 | 100% |

Based on TABLE 3**,** prior to receiving health education using the roleplay method, most fourth-grade school-age children at MINU Lumpur Gresik (75%) were categorized as not having good knowledge about hand washing, while (25%) were in the Enough category. After roleplay-based health education was provided, all students (100%) achieved the good category in hand washing knowledge.

TABLE 4
Skill Level of School-Age Children in Hand Washing Before and After Receiving Health Education Using the Audiovisual Method at MINU Lumpur Gresik on January 10–13, 2025

| Skill | Before | | After | |
|---|---|---|---|---|
| | f | % | f | % |
| Good | 0 | 0% | 18 | 75% |
| Enough | 0 | 0% | 6 | 25% |
| Not Good | 24 | 100% | 0 | 0% |
| **Total** | 24 | 100% | 24 | 100% |

Based on TABLE 4**,** the data show that before receiving health education using the audiovisual method, all fourth-grade school-age children at MINU Lumpur Gresik (100%) had not good hand washing skills. After the intervention, the majority (75%) demonstrated good skills, while a smaller portion (25%) showed enough skills.

Based on TABLE 5, the data show that before receiving health education using the roleplay method, all fourth-grade school-age children at MINU Lumpur Gresik (100%) did not have good handwashing skills. After the intervention, nearly all students (92%) demonstrated good skills, while a small portion (8%) showed enough skills.

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 No.3, pp. 140-145, June 2025

TABLE 5
Skill Level of School-Age Children in Hand Washing Before and After Receiving Health Education Using the Audiovisual Method at MINU Lumpur Gresik on January 10–13, 2025

| Skill | Before | | After | |
|---|---|---|---|---|
| | f | % | f | % |
| Good | 0 | 0% | 22 | 92% |
| Enough | 0 | 0% | 2 | 8% |
| Not Good | 24 | 100% | 0 | 0% |
| **Total** | 24 | 100% | 24 | 100% |

Based on TABLE 6, the data show that there was a significant difference in the knowledge levels of fourth-grade school-age children at MINU Lumpur Gresik before and after receiving health education using the audiovisual method, with a significant value of 0.000 based on the Wilcoxon Signed Rank Test. Similarly, a significant

TABLE 6
Differences in Knowledge Levels of School-Age Children About Hand Washing Using Audiovisual and Roleplay Methods at MINU Lumpur Gresik on January 10–13, 2025 Based on the Wilcoxon Signed Rank Test

| Knowledge | Audiovisual Method | | | | *Roleplay* Method | | | |
|---|---|---|---|---|---|---|---|---|
| | Before | | After | | Before | | After | |
| | F | % | F | % | F | % | F | % |
| Good | 0 | 0 | 24 | 100 | 0 | 0 | 24 | 100 |
| Enough | 7 | 29 | 0 | 0 | 6 | 25 | 0 | 0 |
| Not Good | 17 | 71 | 0 | 0 | 18 | 75 | 0 | 0 |
| **Sig** | .000 | | | | .000 | | | |

difference was also found in the knowledge levels before and after health education using the roleplay method, with a

TABLE 7
Differences in Hand Washing Skill Levels of School-Age Children Using Audiovisual and Roleplay Methods at MINU Lumpur Gresik on January 10–13, 2025 Based on the Wilcoxon Signed Rank Test

| Skill | Audiovisual Method | | | | *Roleplay* Method | | | |
|---|---|---|---|---|---|---|---|---|
| | Before | | After | | Before | | After | |
| | F | % | F | % | F | % | F | % |
| Good | 0 | 0 | 18 | 75 | 0 | 0 | 22 | 92 |
| Enough | 0 | 0 | 6 | 25 | 0 | 0 | 2 | 8 |
| Not Good | 24 | 100 | 0 | 0 | 24 | 100 | 0 | 0 |
| **Sig** | .000 | | | | .000 | | | |

significant value of 0.000.

Based on TABLE 7**,** the data show that there was a significant difference in the hand washing skill levels of fourth-grade school-age children at MINU Lumpur Gresik before and after receiving health education using the audiovisual method, with a significant value of 0.000 based on the Wilcoxon Signed Rank Test. Likewise, a significant difference was also observed in the skill levels before and after health education using the roleplay method, with a significant value of 0.000.

Based on TABLE 8, the Mann-Whitney test results showed a significant value of 0.318 (>0.05), indicating that there was no significant difference between the two groups after the intervention. Therefore, both educational media can be used as effective tools for health education to improve the knowledge of fourth-grade school-age children at MINU Lumpur Gresik regarding handwashing.

Based on Table 9, the Mann-Whitney test results showed a significant value of 0.172 (>0.05), indicating that there was no significant difference between the two groups after the intervention. Thus, both educational media can be utilized as effective methods for health education to enhance the handwashing skills of fourth-grade school-age children at MINU Lumpur Gresik.

TABLE 8
Mann-Whitney Test Results on Knowledge of Fourth-Grade School-Age Children at MINU Lumpur Gresik on January 10–13, 2025

| Mann-Whitney | | | |
|---|---|---|---|
| **Method** | **N** | **Mean Rank** | **Sig** |
| Audiovisual | 24 | 26,42 | ,318 |
| *Roleplay* | 24 | 22,58 | |

TABLE 9
Mann-Whitney Test Results on Handwashing Skills of Fourth-Grade School-Age Children at MINU Lumpur Gresik on January 10–13, 2025

| Mann-Whitney | | | |
|---|---|---|---|
| **Method** | **N** | **Mean Rank** | **Sig** |
| Audiovisual | 24 | 22,19 | ,172 |
| *Roleplay* | 24 | 26,81 | |

## IV. DISCUSSION

### *A. INTERPRETATION OF RESULTS*

The findings demonstrate a marked improvement in the knowledge and practical skills of fourth-grade students at MINU Lumpur Gresik following the delivery of health education interventions using both audiovisual and roleplay methods. Prior to the intervention, the majority of students lacked adequate understanding of proper handwashing procedures. Post-intervention, however, all students exhibited a significant increase in knowledge, with the audiovisual approach being particularly effective among female students who responded well to visual stimuli, consistent with the cognitive development stage described by Piaget [27].

This outcome aligns with prior research that emphasizes the role of age-appropriate educational media in enhancing knowledge retention among children [28]. Specifically, audiovisual content has been shown to cater to children's concrete operational thinking abilities, enabling them to process and remember visual information more effectively [29]. In addition, studies have underscored the benefit of audiovisual media for learners with dominant visual and auditory preferences [30].

The roleplay method also yielded positive outcomes by engaging students in active participation and experiential learning, reinforcing their understanding through direct practice [31]. This aligns with Bandura's social learning theory, which posits that observational learning, imitation, and modeling are integral to knowledge acquisition in children [32]. The statistically significant pre-test and post-test differences indicate that both methods are equally effective, as confirmed by the Mann-Whitney test showing no significant difference in the improvement levels of the two groups.

### *B. COMPARISON WITH SIMILAR STUDIES*

The current results corroborate similar studies which highlight the effectiveness of interactive and multimedia approaches in promoting handwashing behavior among school-age children. For instance, research by Angga et al. found that animated

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 No.3, pp. 140-145, June 2025

video education increased both knowledge and compliance with six-step handwashing among elementary students [33]. Likewise, Suen and Cheung demonstrated that participatory methods, such as roleplay, significantly improved hygiene practices in early childhood education settings [34].

While both methods were effective, subtle differences emerged when considering gender and learning style. Consistent with findings by Fatmawati et al., audiovisual interventions often produce higher engagement among girls due to their affinity for narrative visuals [35]. Conversely, male students tend to benefit more from kinesthetic learning models like roleplay, which emphasize active involvement and mimicry of real-life scenarios [36]. Therefore, blending these methods could provide a comprehensive strategy to address diverse learning needs within classrooms.

Comparatively, previous literature has also identified the limitation of single-session interventions. Studies suggest that repeated exposure and longer duration of health education lead to more sustained behavioral changes [37]. In this study, the effectiveness of both methods could be enhanced by extending the duration and frequency of sessions to strengthen knowledge retention and habitual practice.

### *C. LIMITATIONS AND IMPLICATIONS*

Despite its strengths, this study is not without limitations. The primary constraint lies in the brevity of the intervention delivered only once which may affect the long-term retention of knowledge and skills. As suggested by Simorangkir et al., repeated health education sessions are necessary to reinforce behavioral change, particularly for preventive practices such as handwashing [38].

Additionally, the study was limited to a single school and a relatively small sample size, which may restrict the generalizability of the findings. Future research should include a more diverse sample and assess the sustainability of learned behaviors through follow-up assessments.

The implications of these findings are significant for educators and policymakers. First, integrating both audiovisual and roleplay methods into routine school health curricula can cater to various learning styles and optimize outcomes. Second, training teachers and community health nurses to deliver these interventions effectively is essential. Schools should consider investing in multimedia resources and interactive modules to complement traditional health education.

Moreover, the insights gained highlight the importance of aligning educational strategies with children's developmental stages and preferences. Tailoring content delivery to match students' cognitive abilities and gender-related learning tendencies can enhance engagement and impact. Finally, collaboration between schools, parents, and local health authorities is crucial to ensure that hand hygiene practices are reinforced not only within classrooms but also at home and in the wider community.

## V. CONCLUSION

This study aimed to evaluate the effectiveness of audiovisual and roleplay educational methods in enhancing handwashing knowledge and skills among fourth-grade school-age children at MINU Lumpur Gresik. The findings demonstrate that both intervention strategies significantly improved participants' knowledge and practical skills, with pre-test knowledge levels predominantly categorized as low, and post-test results indicating a shift to good knowledge levels in both groups 75% in the audiovisual group and 75% in the roleplay group as evidenced by the significant p-values ($p = 0.000$). Similarly, handwashing skills showed marked improvement, with no statistically significant difference between the two methods ($p = 0.172$), suggesting that each approach is equally effective. The implications of these findings emphasize the utility of both audiovisual media, which caters to visual and auditory learners by presenting engaging demonstrations, and roleplay, which supports kinesthetic learners through active participation. The study underscores the importance of employing diverse educational strategies tailored to student characteristics for optimal health education outcomes. While the interventions demonstrated promising results, the short duration of the health education session (only once) indicates a need for future research to examine the long-term sustainability of behavioral changes and skill retention. Additionally, exploring the integration of blended teaching methods or repeated sessions may further enhance knowledge and skills. Future studies should also consider larger, more diverse populations to validate these findings and facilitate the development of comprehensive, scalable health education programs that can be implemented across different educational settings. Overall, this research contributes valuable insights into health education strategies for promoting proper hand hygiene, an essential practice in preventing infectious diseases among school children, and provides a foundation for continuous improvement in health promotion initiatives.

## ACKNOWLEDGEMENTS

The authors extend their sincere gratitude to the teachers, school staff, and students of MINU Lumpur Gresik for their enthusiastic participation and cooperation. We also acknowledge the support from the Polytechnic of the Ministry of Health Surabaya in facilitating this research. Special thanks to the research team for their meticulous data collection and analysis efforts, which were vital in completing this study successfully.

## FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

## AUTHOR CONTRIBUTION

Maulidya Aisyah Kusuma Dewi conceptualized and designed the study, conducted the data collection, and performed the statistical analysis. Indriatie contributed to planning the research methodology and provided technical support for data interpretation. Sari Luthfiyah assisted in literature review and drafting of the manuscript, while Joko Suwito supervised the overall research process and ensured academic rigor. All

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 No.3, pp. 140-145, June 2025

authors contributed significantly to the intellectual content and approved the final manuscript.

## DECLARATIONS

### *ETHICAL APPROVAL*

The authors declare that there are no conflicts of interest concerning this research. Ethical approval was obtained from the relevant institutional review board prior to conducting the study, and informed consent was secured from all participants' guardians, ensuring adherence to ethical standards. The research was conducted in accordance with the Declaration of Helsinki, and all procedures maintained the confidentiality and integrity of participant information. This study was supported solely by the resources provided by the Polytechnic of the Ministry of Health Surabaya, with no external funding involved.

### *CONSENT FOR PUBLICATION PARTICIPANTS.*

Consent for publication was given by all participants.

### *COMPETING INTERESTS*

The authors declare no competing interests.

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