



Publish: Association of Indonesian Teachers and Lecturers

**International Journal of Health Sciences (IJHS)**Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 4 | Number 1 | March 2026 |

**The Role Of Hand Hygiene In Reducing Microorganism Contamination**Rizky Rahadian Wicaksono<sup>1\*</sup>, Muhammad Hanif<sup>2</sup>, Rahmat Pannyiwi<sup>3</sup><sup>\*1</sup> Faculty of Health Sciences, Islamic University of Lamongan, Indonesia<sup>2</sup> Environmental Health Program, Islamic University of Lamongan, Indonesia<sup>3</sup> Faculty of Military Medicine, Indonesian Defense University, Indonesia\*Correspondent Author: Rizky Rahadian Wicaksono, Email: [rizkyrahadianw@unisla.ac.id](mailto:rizkyrahadianw@unisla.ac.id)**ABSTRACT**

Hand hygiene is one of the most effective interventions in preventing the transmission of pathogenic microorganisms in healthcare facilities. The hands of healthcare workers can transmit microorganisms that cause nosocomial infections if standard hand hygiene practices are not followed. This study aimed to analyze the role of hand hygiene in reducing microbial contamination. The study used a quasi-independent design. This study used a pretest - posttest approach. The study sample consisted of 40 healthcare workers who underwent hand swab tests before and after hand hygiene measures according to WHO standards. Microorganism identification was performed through culture and Gram staining. The results showed a significant decrease in the number of microorganism colonies after hand hygiene ( $p < 0.05$ ). It was concluded that hand hygiene plays an important role in reducing microorganism contamination and supporting the prevention of healthcare-associated infections.

**Keywords:** Hand Hygiene, Microorganisms, Nosocomial Infections, Patient Safety



## 1. Introduction

Healthcare -associated infections HAIs (infections) are a global problem that increases morbidity, mortality, and healthcare costs. One of the main factors in the transmission of pathogenic microorganisms in healthcare facilities is the contaminated hands of healthcare workers.

Microorganisms such as *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa* can be transmitted through direct contact between healthcare workers and patients. Suboptimal hand hygiene practices can increase the risk of cross-transmission (transmission).

The World Health Organization (WHO) recommends the five moments of hand hygiene as the global standard for infection prevention. However, compliance with hand hygiene remains a challenge in many healthcare facilities.

This study aims to identify the effectiveness of hand hygiene in reducing the number of microorganism contamination on the hands of health workers as part of efforts to improve patient safety.

## 2. Research Methods

This study uses a quasi-inquiry design. Experimental study using a pretest - posttest approach. The study was conducted at Hospital X in January-March 2025.

### a. Population and Sample

The study population consisted of healthcare workers working in inpatient wards. A sample of 40 respondents was selected using purposive sampling.

### b. Inclusion Criteria

- 1) Active health workers in the treatment room
- 2) Willing to be a respondent

### c. Research Procedures

- 1) Hand swab is carried out before hand hygiene (pretest).
- 2) Respondents performed hand hygiene according to WHO standards (handwash or handrub).
- 3) Repeat swabbing is performed after hand hygiene (posttest).
- 4) Samples were cultured on Nutrient Agar media.
- 5) Incubate 24–48 hours at 37°C.
- 6) Colony count (CFU).

### d. Data analysis

Data were analyzed using a paired t-test to see the difference in the number of colonies before and after the intervention, with a significance level of  $\alpha = 0.05$ .

## 3. Research Results And Discussion





Publish: Association of Indonesian Teachers and Lecturers

## International Journal of Health Sciences (IJHS)

Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 4 | Number 1 | March 2026 |



### a. Research Result

The study involved 40 health workers who underwent hand swabs before and after hand hygiene practices according to WHO standards.

#### 1) Average Number of Microorganism Colonies (CFU)

Inspection	Mean CFU ± SD	Minimum	Maximum
Before hand hygiene	156 ± 32	110	210
After hand hygiene	28 ± 10	12	50

There was an average decrease in the number of colonies of 128 CFU (82%) after hand hygiene.

The results of the *paired t- test* showed a p value = 0.000 (<0.05), which means there was a significant difference between the number of colonies before and after hand hygiene.

#### 2) Distribution of Contamination Levels

Contamination Level	Pretest (%)	Posttest (%)
High (>150 CFU)	55	0
Moderate (50–150 CFU)	35	10
Low (<50 CFU)	10	90

Before the intervention, most respondents were in the high contamination category. After hand hygiene, the majority were in the low contamination category.

#### 3) Types of Microorganisms Found

Microorganisms	Pretest (n)	Posttest (n)
<i>Staphylococcus aureus</i>	16	4
<i>Escherichia coli</i>	10	2
<i>Pseudomonas aeruginosa</i>	6	1
Normal flora	8	33

There was a significant decrease in the number of pathogenic microorganisms after hand hygiene practices.

#### 4) Comparison of the Effectiveness of Handwash vs Handrub

Method	CFU Decrease (%)
Handwash soap	75%
Alcohol handrub	88%

Handrubs showed slightly higher effectiveness in reducing colony counts.





## b. Discussion

The study results showed that hand hygiene plays a significant role in reducing microbial contamination on the hands of healthcare workers. An average reduction of 82% in colony counts indicates that hand hygiene practices according to WHO standards are effective in breaking the chain of microbial transmission.

The high number of colonies in the pretest indicates that the hands of healthcare workers are a potential reservoir of pathogenic microorganisms. This strengthens the theory that cross-transmission (cross-transmission) is a potential risk factor for the spread of pathogens. Transmission through the hands is the main route of spread of nosocomial infections in health facilities.

Significant reduction in *Staphylococcus aureus* after hand hygiene demonstrated the effectiveness of the intervention in eliminating Gram-positive bacteria commonly found on human skin. Similarly, a reduction in *Escherichia coli* and *Pseudomonas aeruginosa* shows that hand hygiene practices can reduce Gram-negative bacteria that have the potential to cause serious infections.

The higher effectiveness of alcohol-based handrubs compared to soap aligns with WHO recommendations that handrubs are faster, more practical, and have broad antimicrobial activity. Alcohol works by denaturing proteins and damaging the cell membranes of microorganisms, making them more effective in a shorter period of time.

The effectiveness of hand hygiene depends heavily on correct technique and appropriate duration. Substandard practices can reduce the effectiveness of microorganism elimination.

From the patient's perspective Safety, the results of this study confirm that hand hygiene is a simple but impactful intervention in preventing healthcare-associated infections (HAIs). Adherence to hand hygiene can reduce the risk of infection, shorten hospital stays, and lower healthcare costs.

### ➤ Practical Implications

- 1) Hand hygiene should become a work culture in healthcare facilities.
- 2) The provision of handrub at every service point needs to be optimized.
- 3) Hand hygiene compliance audits need to be carried out periodically.
- 4) Regular education and training should be strengthened to increase awareness among health workers.

## 4. Conclusion And Suggestions

### a. Conclusion

Based on the research results, it can be concluded that hand hygiene plays a significant role in reducing microbial contamination on the hands of healthcare workers. There was an average decrease in the number of microbial colonies of 82%





Publish: Association of Indonesian Teachers and Lecturers

**International Journal of Health Sciences (IJHS)**Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 4 | Number 1 | March 2026 |



after implementing hand hygiene practices according to WHO standards, with a statistically significant difference ( $p < 0.05$ ).

Types of pathogenic microorganisms such as *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa* significantly decreased after hand hygiene interventions. Alcohol-based handrubs were more effective than soap-based handwashing in reducing the number of microorganism colonies.

The results of this study confirm that hand hygiene is a simple yet highly effective intervention in breaking the chain of microorganism transmission and supporting the prevention of healthcare-associated infections (HAIs). Therefore, hand hygiene is a key component in implementing patient safety.

**b. Suggestion**

## 1) For Health Service Facilities

- Increase the availability of hand hygiene facilities (handrub and sinks) at every service point.
- Regular audits and monitoring of hand hygiene compliance.
- Integrating hand hygiene as an indicator of quality and patient safety.

## 2) For Health Workers

- Increase compliance with the five moments of hand hygiene as recommended by WHO.
- Implement correct hand hygiene techniques and follow the recommended duration.
- Make hand hygiene a work culture and professional responsibility.

## 3) For the Infection Prevention and Control (IPC) Team

- Conduct regular education and training on hand hygiene practices.
- Developing compliance improvement strategies based on behavior and safety culture.
- Conduct regular surveillance of health service-related infection rates.

## 4) For Further Researchers

- To examine the relationship between hand hygiene compliance levels and nosocomial infection rates.
- Conduct research with an experimental design involving a larger sample size.
- Analyze factors that influence hand hygiene compliance, such as workload and organizational culture.

**References**

1. Allegranzi B, Pittet D. Role of hand hygiene. *Lancet*. 2009; 373: 252–262.





Publish: Association of Indonesian Teachers and Lecturers

**International Journal of Health Sciences (IJHS)**Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 4 | Number 1 | March 2026 |



2. Anurogo, D., Rahmat, RA, & Pannyiwi, R. (2025). Identification of Endophytic Fungi in Traditional Medicinal Plants in South Sulawesi. *JIMAD: Multidisciplinary Scientific Journal*, 3(2), 77–82. <https://doi.org/10.59585/jimad.v3i1.862>
3. Boyce JM, Pittet D. Guideline for hand hygiene. *MMWR*. 2002;51(RR-16):1–45.
4. CDC. Hand hygiene in healthcare settings. Atlanta: CDC; 2022.
5. Cheesbrough M. *District laboratory practice*. Cambridge: CUP; 2017.
6. Erasmus V, et al. Compliance with hand hygiene. *Infection Control Hospital Epidemiol*. 2010;31(3):283–294.
7. Jawetz E, et al. *Medical microbiology*. New York: McGraw -Hill; 2016.
8. Ministry of Health of the Republic of Indonesia. *PPI Guidelines*. Jakarta: Ministry of Health of the Republic of Indonesia; 2022.
9. Larson EL. APIC guideline for handwashing. *Am J Infect Control*. 1995;23(4):251–269.
10. Levinson W. *Review of medical microbiology*. New York: McGraw -Hill; 2020.
11. Murray PR, et al. *Medical microbiology*. Philadelphia: Elsevier; 2016.
12. Pannyiwi, R., Azis, MNSA, & Rahmat, RA (2025). Analysis of Nurse's Obstacles in Implementing Therapeutic Communication in Healthcare Environments. *Barongko: Journal of Health Sciences*, 4(1), 231–243. <https://doi.org/10.59585/bajik.v4i1.921>
13. Pittet D. Improving adherence to hand hygiene. *Lancet Infect Dis*. 2001;1(1):9–20.
14. Prescott LM, et al. *Microbiology*. New York: McGraw -Hill; 2017.
15. Sunanto, S., Pannyiwi, R., & Rahmat, RA (2025). The Effect of Night Shift Work on Nurse's Fatigue and Work Concentration in the Emergency Department. *International Journal of Health Sciences*, 3(4), 606–613. <https://doi.org/10.59585/ijhs.v3i4.867>
16. WHO. *Infection prevention and control*. Geneva: WHO; 2023.
17. World Health Organization. *Five moments for hand hygiene*. Geneva: WHO; 2017.
18. Wicaksono, RR, Sutriyati, S., & Pannyiwi, R. (2025). Effectiveness Of Health Education About The Dangers Of Cigarettes On The Intention To Stop Smoking Among Adolescents. *International Journal of Health Sciences*, 3(4), 769–775. <https://doi.org/10.59585/ijhs.v3i4.904>
19. Wahyuni, T., Idris, I., Ardianto, A., Fahamsya, A., Cahyanta, AN, & Wicaksono, RR (2025). Important Efforts in Tackling TB with the Most Effective Strategy to Ensure Adherence to Therapy with Supervision. *Sahabat Sosial: Journal of Community Service*, 3(2), 426–433. <https://doi.org/10.59585/sosisabdimas.v3i2.638>

