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Analysis of the Relationship between Knowledge Level and PPI Implementation in the Emergency Room of a Community Health Center

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Abstract

Healthcare-associated infections are a global health challenge, not only as a patient safety issue but also as a major driver of antimicrobial resistance. Efforts to prevent and minimize the occurrence of healthcare-associated infections are called infection prevention and control (IPC). The Emergency Department (ED) has the potential for healthcare-associated infections. This study aims to determine the relationship between knowledge levels and the implementation of Infection Prevention and Control (IPC) in the Emergency Department of Community Health Centers in Padang City. This study used a mixed method research method, which combines quantitative and qualitative research types in one research activity with an explanatory sequential design. The population in this study were all healthcare workers working in the Emergency Department of the Padang City Community Health Center, with a sample of 55 people. The study was conducted in February 2024. The results found that 69.1% of respondents were under 46 years old, 96.4% were female, and 72.7% had a D3 educational background. A total of 61.8% had high knowledge. Compliance with PPI implementation was recorded at 38.2%. There is a significant relationship between knowledge and compliance with the implementation of PPI, health workers in the Emergency Department of the Community Health Center with high knowledge are 4.25 times more likely to comply with implementing PPI. Recommendations for improving compliance with PPI implementation are to formulate PPI policies, implement PPI education and training, and strengthen the implementation of monitoring, evaluation, and reporting.

Introduction

Healthcare-associated infections (HAIs) are a global health challenge, not only as a patient safety issue but also as a major driver of antimicrobial resistance (Irek et al., 2018; Lawal et al., 2025; Chakraverty & Kundu, 2025). Infections resulting from substandard healthcare can lead to increased length of stay, increased complications and mortality, decreased patient productivity, increased operational costs for healthcare facilities, customer dissatisfaction, and a negative public image of healthcare facilities. They can even lead to potential lawsuits against healthcare facilities and healthcare workers (Ministry of Health of the Republic of Indonesia, 2020).

Efforts to prevent and minimize infections resulting from healthcare services are known as infection prevention and control (IPC). Infection prevention and control in healthcare facilities includes healthcare-associated infections (HAIs) and infections originating from the

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community. Healthcare-associated infections are infections that occur in patients during treatment in hospitals, community health centers, or other healthcare facilities (Ministry of Health of the Republic of Indonesia, 2020).

A Community Health Center (Puskesmas) is a first-level health care facility responsible for organizing and coordinating promotive, preventive, curative, rehabilitative, and/or palliative health services within its jurisdiction (Liem & Sembiring, 2024). A Puskesmas functions as a functional organizational unit and provides professional health services in accordance with established standards (Ministry of Health of the Republic of Indonesia, 2024). Emergency services are a form of medical care that must be provided as quickly as possible to patients in critical conditions, with the aim of saving lives and preventing disability (Ugwu et al., 2025; Hick et al., 2021). Emergency patients are individuals experiencing life-threatening conditions, endangering themselves or their environment, experiencing airway, breathing, or circulation disorders, decreased consciousness, or hemodynamic disorders that require immediate treatment (Ministry of Health of the Republic of Indonesia, 2017).

Emergency departments have the potential for healthcare-associated infections. The fast-paced and dynamic nature of emergency care, combined with the sudden arrival of patients, creates a climate that is ripe for infection. The complexity of infection threats in the ED is further compounded by factors such as rapid patient turnover, varying medical conditions, and the urgency of intervention (Sara, 2024). Emergency department (ED) healthcare workers and physicians are at high risk of exposure to common and emerging infectious diseases, as they have close contact with symptomatic patients before a diagnosis is made (Barratt et al., 2020; Chavez et al., 2021; Du et al., 2021).

The relationship between hand hygiene compliance and infection prevention has long been recognized by healthcare workers. Achieving and maintaining high levels of compliance among healthcare workers who interact with patients and their environments is a challenge (Sickbert-Bennett et al., 2016). Healthcare workers in emergency departments often face emergencies that require rapid action, which can lead to a decline in adherence to hand hygiene procedures. Limited time and high workloads can reduce the frequency and quality of hand hygiene (Musu et al., 2017; Ronco et al., Ali et al., 2025).

Accurate and appropriate adherence to personal protective equipment (PPE) use is an integral component of infection prevention and control policies to ensure the safety of healthcare workers. Poor adherence to personal protective behaviors and inconsistent use of PPE have been identified as major causes of nosocomial infection transmission in healthcare settings, and this low adherence is associated with numerous individual, environmental, and organizational factors (George et al., 2023; Lopez & Peters, 2025; Emekolom et al., 2025).

Unsafe injection practices by healthcare workers can endanger both patients and staff, particularly with the risk of adverse events, both infectious and non-infectious (Shahid, 2025; Okonkwo et al., 2025; Omo & Hassan, 2024). This is often caused by incorrect procedures and unsafe environments. Safe injection practices involve precautions aimed at administering injections in an optimal and safe manner. Safe injections must ensure the safety of the recipient, pose no risk to healthcare workers, and produce no hazardous waste for the community. Safe injection practices are a component of standard precautions, which aim to maintain patient safety and protect healthcare providers (Anwar et al., 2019; Ali et al., 2025; Adesina et al., 2022).

A good understanding of the importance of hand hygiene and the correct method is also crucial. Research at Nur Hidayah Hospital, Yogyakarta, found that nurses with low knowledge were five times more likely to be non-compliant with hand hygiene than those with good knowledge (Thirayo et al., 2021; Maryana & Anggraini, 2021). Healthcare workers who understand the

importance of hand hygiene tend to be more compliant with this practice (Sunarni, 2019; Syamson, 2020; Madden et al., 2021).

The incidence of healthcare-associated infections varies across regions. The WHO states that approximately 7% of patients in high-income countries and 15% of patients in low-income countries will experience at least one healthcare-associated infection during their hospital stay (WHO, 2011). The incidence of HAIs in Australia is estimated at approximately 165,000 cases per year (Mitchell, 2017). Other literature estimates the likelihood of someone becoming infected after receiving substandard healthcare is 8-10% (Indonesian Ministry of Health, 2020).

An extraordinary incident due to Burkholderia cepacia infection was found in health facilities where compliance with infection prevention and control was still low in India, resulting in death in 47% of cases (Fomda, et al,. 2022). The COVID-19 pandemic also reflects the failure of the health care system to prevent the transmission of the disease (Abbas, 2021). 2,087 Indonesian health workers died due to COVID-19, the majority of whom were doctors (751 people), nurses (670 people), and midwives (398 people) (Nakes, 2024). Long-term cognitive decline in stroke patients with health care-related infections occurs more rapidly than in stroke patients without health care-related infections (Cole, et al., 2024; Reiss et al., 2022).

HAIs surveillance is necessary to obtain baseline infection data, reduce infection rates, and detect outbreaks of infection in healthcare facilities (Wen et al., 2022). The government has established HAIs surveillance that must be conducted at Community Health Centers (Puskesmas), specifically for urinary tract infections, surgical site infections, phlebitis, post-immunization follow-up events, and dental abscesses. Good implementation of IPC can reduce or suppress these infections. HAIs surveillance is an indicator of IPC performance at Puskesmas. However, currently there is no HAIs data available at Puskesmas in Padang City. This contrasts with hospitals, which have performed quite well in reporting IPC and HAIs, which are reported every six months to the Health Office.

Methods

This study employed a mixed method, combining quantitative and qualitative research in a single study. Quantitative research employed a cross-sectional design, where variable measurements were conducted once at a time to examine the relationship between the independent and dependent variables. Meanwhile, qualitative research employed a phenomenological approach to explore in depth the factors most influential in the implementation of infection prevention and control among emergency room staff at the Padang City Community Health Center (Puskesmas). The population of this study was all 97 healthcare workers in the 24-hour emergency room at the Padang City Community Health Center. The sample size was determined using the Isaac and Michael formula (Sugiyono, 2018). Sample size corrections were made to anticipate potential sample loss, resulting in a sample size of 55.

The sampling technique in this study was multistage sampling. The sampling technique was carried out in stages based on the type of Community Health Center services. In the first stage, samples were taken using purposive sampling, namely Community Health Centers with 24-hour emergency units from 24 Community Health Centers in Padang City. In the second stage, samples were taken from each selected Community Health Center using proportional random sampling, namely by considering the proportion of health workers in the emergency room at each Community Health Center.

Data analysis was conducted in two stages, namely univariate analysis and bivariate analysis using computerization presented in the form of a frequency distribution table. The purpose of univariate analysis is to describe the frequency distribution of respondent characteristics and each independent variable studied, namely the frequency distribution of age, education, knowledge, attitude, and training. Bivariate analysis was conducted to see the relationship between two variables, namely the independent variable and the dependent variable. The type

of statistical test used to determine the relationship between the two variables is the chi-square test with a 95% confidence level and α of 0.05. If the p value <0.05 means there is a relationship between the variables studied.

In the qualitative method, the selection of informants is done through purposive sampling, namely selecting informants who are believed to have broader and deeper knowledge about the problem being studied, and can be trusted as a data source. In this study, the selected informants include: a) Head of Community Health Centers in the work area of the Padang City Health Office b) Community Health Center PPI Team c) Health workers who play a role in emergency services in Padang City.

To ensure validity and reliability in qualitative research, source triangulation was conducted, obtaining the same data from different groups of informants. These informants included the Head of Health Services at the Padang City Health Office and the Head of the Emergency Unit at the Padang City Community Health Center.

Result and Discussion

Respondent characteristics in this study sample include age, gender, and education. The frequency distribution can be seen in the table below:

Table 1. Frequency Distribution of Health Worker Characteristics in the Emergency Room of Padang City Community Health Centers in 2024

Variables	f	%
Age		
<46 Years	38	69.1
≥46 Years	17	30.9
Gender		
Man	2	3.6%
Woman	53	96.4%
Education		
S1	15	27.3
D3	40	72.7
Total	55	100

Based on table 1, it was found that most respondents (69.1%) were under 46 years old, almost all respondents were female (96.4%) and most respondents (72.7%) had a D3 educational background.

The frequency distribution of respondents of Health Workers in the Emergency Room of the Community Health Center Based on Compliance with the Implementation of Infection Prevention and Control in Services in the Emergency Room of the Community Health Center can be seen in the following table:

Table 2. Distribution of Frequency of Health Workers in the Emergency Room of Community Health Centers Based on Compliance with PPI Implementation in the Emergency Room of Community Health Centers in 2024

Variable	f	%
Implementation of PPI		
Obedient	21	38.2%
Not obey	34	61.8%
Total	55	100

Based on table 2, it is known that the majority of respondents (61.8%) did not comply with implementing Infection Prevention and Control measures.

Bivariate analysis describes the relationship between independent variables (age, knowledge, attitude, and training) and the implementation of infection prevention and control in the emergency department (ED) of the Community Health Center (Puskesmas). The results of the bivariate analysis can be seen in the following table:

Table 3. Analysis of the Relationship Between Knowledge and the Implementation of Infection Prevention and Control in Emergency Department Services at Community Health Centers in 2024

Variables	Implementation of PPI						*p-value*	OR (95% CI)
	Obedient		Not obey		Total			
	f	%	f	%	f	%		
Knowledge								
Tall	17	50	17	50	34	100	*0.025∗*	*4,250 (1,182-15,285)*
Low	4	19	17	81	21	100		

Note: ∗P-Value <0.05

Based on table 3, it is known that the ER health workers of the Community Health Center who comply with the implementation of infection prevention and control are greater in the ER health workers of the Community Health Center with high knowledge (50%) compared to the ER health workers of the Community Health Center with low knowledge. The results of the analysis of the relationship between knowledge and the implementation of infection prevention and control obtained a value of p = 0.025 (p <0.05) meaning that there is a significant relationship between knowledge and compliance with the implementation of infection prevention and control, based on the test results obtained an odds ratio (OR) value of 4.250, this means that respondents with high knowledge have a 4.25 times greater possibility of complying in implementing infection prevention and control compared to those with low knowledge.

Knowledge is information that has been processed and organized to gain understanding, learning, and accumulated experience so that it can be applied to problems (notoatmodjo, 2010). Based on the results of interviews conducted with informants, it can be seen how the knowledge of officers regarding the implementation of infection prevention and control is not optimal because they have not received training. The following is an excerpt from the results of interviews with informants:

> *"Because there was training at that time, there was training, but no, not me……. if there wasn't any direct training, there was only the team of three, there was a team that was there, ma'am. There was also a team from the UGD team that was included in the quality team of three, he knew that……." (IF 6)*
>
> *"lack of knowledge... Training should be held, for example, involving emergency room staff. Currently, there are no emergency room staff, while we are the ones who take action in the emergency room." (IF 7)*
>
> *"I first learned about PPI, ma'am, when I was in college, ma'am. I haven't had any training yet. Here, I haven't personally heard about it. But perhaps it's just been through word of mouth from fellow officers like that, so they say that the PPI method is like this, like this, like that." (IF 8)*

Based on the results of a study conducted in nine Community Health Centers (Puskesmas) within the Padang City Health Office, the majority of respondents (61.8%) had a high level of knowledge regarding infection prevention and control. This indicates that most health workers in the emergency unit have understood the basic concepts and the importance of implementing PPI to protect patients, health workers, and visitors to health care facilities. This finding is consistent with the results of a previous study by Syamson (2020) on nurses in the Inpatient Unit of Nene Mallomo Hospital, South Sulawesi, which showed that 51.5% of respondents had good knowledge about infection prevention and control. Research by Assefa (2020) also showed that 70.8% of all health workers (Laboratory Officers, Nurses, Health Workers, and Midwives) in primary health care units in Wogdie District, Northeast Ethiopia had adequate knowledge about infection prevention.

The proportion of compliance with the implementation of infection prevention and control was higher in respondents with high knowledge (50%) compared to respondents with low knowledge (19%). Based on the results of the statistical test, a p-value <0.05 (p=0.025) was obtained, indicating a significant relationship between knowledge and the implementation of infection prevention and control. Officers with high knowledge have the potential to be 4.25 times more compliant in implementing PPI than officers with low knowledge. This is in line with the research of Thirayo et al. (2023), which found a significant relationship between knowledge and compliance with the implementation of hand hygiene as part of the implementation of infection prevention and control. Research by Syamson et al. (2020) also showed a significant relationship between nurses' knowledge and the implementation of nosocomial infection prevention and control among nurses in all inpatient care classes at Nene Mallomo Hospital.

Basic IPC training can improve staff understanding and knowledge of IPC principles. IPC orientation for all employees is part of IPC education and training, which aims to provide knowledge about the basic principles of IPC. Information obtained from staff indicates that this has not been optimally implemented in Community Health Centers (Puskesmas), especially for staff in the Emergency Unit (ED). Research findings indicate that Puskesmas staff's knowledge of Infection Prevention and Control (IPC) in the Emergency Unit (ED) is still uneven. Conditions at Puskesmas indicate that there are still obstacles in the process of increasing the capacity of health workers, especially in terms of access to training and continuing education. Limited access to formal training related to IPC causes some health workers to rely on alternatives such as self-study and informal discussions to improve their understanding. Structured and equitable basic IPC training can improve infection prevention and control efforts optimally. The lack of formal training can result in inconsistent adherence to IPC standards, which ultimately risks the safety of both patients and staff. PPI training that can be accessed equally by all health workers, not only limited to certain representatives, is a form of further effort from the Community Health Center management, but has not been implemented well in the Community Health Center.

Conclusion

Most respondents (69.1%) were under 46 years old, almost all respondents were female (96.4%), and most respondents (72.7%) had a D3 educational background. Most respondents (61.8%) had a high level of knowledge regarding infection prevention and control. There was a significant relationship between knowledge and the implementation of infection prevention and control. Knowledge of Community Health Center staff regarding Infection Prevention and Control (PPI) in the Emergency Unit (UGD) was still obtained unevenly.

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