



Education Level and Work Period as Determinants of Personal Protective Equipment Compliance Among Nurses at Makassar Regional General Hospital

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Abstract. Nurses' compliance with occupational safety procedures is an important factor in maintaining the quality of healthcare services and preventing the risk of accidents and infections in hospitals. Education level and length of service are individual factors that are assumed to influence the level of compliance. This study aimed to analyze the relationship between nurses' education level and length of service and their compliance with occupational safety procedures in hospitals. This study employed a quantitative design with a cross-sectional approach. The population consisted of all nurses working in the hospital, and the sampling technique used was total sampling. Data were collected using questionnaires and observation sheets, and then analyzed using the chi-square test and Fisher's Exact Test with a significance level of 0.05. The results showed that there was a significant relationship between education level and nurses' compliance ($p < 0.05$). In addition, length of service was also significantly associated with nurses' compliance ($p < 0.05$). Nurses with higher education levels and longer work experience tended to have better compliance levels. In conclusion, education level and length of service are significantly associated with nurses' compliance in implementing occupational safety procedures. Therefore, hospitals need to improve continuous training and supervision for nurses to enhance compliance with occupational safety standards.

Keywords: Education Level; Work Period; Compliance; Nurses; Personal Protective Equipment

1. Introduction

Hospitals are healthcare institutions that play a role in providing promotive, preventive, curative, and rehabilitative health services for the community. Healthcare services provided by hospitals are not only focused on improving patients' health status but also on protecting the safety and health of healthcare workers while performing their duties. Workers in healthcare facilities have a high risk of exposure to diseases and infections that may endanger occupational safety and health. One of the common hazards found in hospital environments is the risk of infectious disease transmission, especially among nurses who have a high intensity of direct contact with patients (Kiswara et al., 2020).

Nurses are professional healthcare workers who possess specific competencies in providing nursing care and are responsible for disease prevention efforts, both for patients and for themselves. Nursing personnel are among the groups of healthcare workers with a high risk of exposure to occupational hazards in healthcare facilities. In carrying out their duties, nurses frequently come into direct contact with patients, blood, body fluids, and other infectious materials that may cause occupational diseases. Therefore, the use of Personal

Protective Equipment (PPE) is an important measure to protect themselves and prevent the transmission of diseases, both for nurses and patients.

Hospitals have the responsibility to protect healthcare workers while providing services in order to prevent the occurrence of nosocomial infections among healthcare personnel. One important protective measure is requiring all healthcare workers to use Personal Protective Equipment (PPE) when performing high-risk procedures (Abdulrahman et al., 2023). According to the Ministry of Health of the Republic of Indonesia (2020), Personal Protective Equipment (PPE) refers to devices used by healthcare workers to prevent the transmission of microorganisms from staff to patients. In addition to protecting patients, the use of PPE also aims to protect healthcare workers while performing their duties, thereby minimizing the risk of exposure to infections (Fitriana Dewi et al., 2022).

Although personal protective equipment (PPE) is positioned at the lowest level in the hierarchy of infection control due to its relatively limited effectiveness compared to other control measures and the considerable costs required for its implementation (Syekura & Febriyanto, 2021), PPE remains an essential component in protecting healthcare workers. PPE used by nurses serves to protect both the nurses themselves and their patients from potential exposure to hazardous substances, including chemical, physical, biological agents, and other infectious materials. While PPE cannot completely eliminate the risk of exposure to infectious agents, it functions as a protective barrier that helps reduce the likelihood of transmission from sources of infection (Thaza et al., 2022).

Despite the widespread dissemination of information regarding the importance of PPE, nurses' compliance with its use continues to be a challenge in many hospitals and healthcare facilities. Several factors are known to influence nurses' compliance with PPE use, including educational level and length of work experience. This is supported by a study conducted among outpatient staff at the Regional General Hospital of Karanganyar Regency, which found that both work experience and educational level significantly influence compliance with PPE use (Kusumawardhani & Karsidi, 2024). Similarly, another study reported a significant relationship between work experience and educational level among pesticide-spraying farmers in East Purworejo Village, East Bolaang Mongondow Regency (Mokodompit et al., 2024). Therefore, both work experience and educational background play important roles in ensuring compliance with PPE use among workers.

Educational level contributes to shaping nurses' understanding and awareness of the importance of implementing infection prevention procedures. It influences workers' perspectives and their ability to recognize workplace hazards and identify appropriate preventive measures (Rahmawati et al., 2024). Nurses with higher levels of education generally possess better knowledge regarding occupational risks and the importance of adhering to safety procedures, including the proper use of PPE. However, in practice, it is not uncommon to find nurses with higher educational backgrounds who still demonstrate inconsistent compliance in PPE usage.

In contrast, work period reflects an individual's exposure to workplace safety culture and accumulated professional experience. Nurses with longer work experience may demonstrate higher levels of compliance due to greater experience and habituation to safety procedures. However, decreased compliance may also occur as a result of fatigue, complacency, or neglect of established procedures. Nurses with longer professional experience generally possess a more comprehensive understanding of occupational safety and health practices, enabling them to apply PPE usage more consistently in accordance with

established standards (Cheung et al., 2019). According to Gibson (1997), the longer an individual's work experience, the higher the level of achievement that can be attained. Such achievements are the result of positive work behaviors, including adherence to the use of personal protective equipment (PPE) during work activities. Individuals with longer work experience are expected to have a deeper understanding of their duties and responsibilities, including awareness of the risks and potential impacts associated with their work. This understanding encourages the development of more disciplined work behavior and a stronger orientation toward safety.

This study is also aligned with global health priorities, particularly the Sustainable Development Goals (SDGs). Nurses' compliance with PPE use contributes directly to SDG 3 Good Health and Well-being, especially Target 3.8, which emphasizes the provision of safe, quality healthcare services and universal health coverage. In addition, this study supports SDG 8 Decent Work and Economic Growth, particularly Target 8.8, which focuses on protecting labor rights and promoting safe and secure working environments for all workers, including healthcare professionals. Therefore, improving PPE compliance among nurses is not only a local occupational health concern but also part of a broader global commitment to health and workplace safety.

Evidence from healthcare settings indicates that non-compliance with PPE use remains one of the main causes of incidents involving exposure to infectious materials, needle-stick injuries, and nosocomial infections in hospitals. Therefore, it is important to identify the relationship between educational level and work period with PPE compliance in order to develop more effective strategies for improving occupational safety and risk prevention. Based on this background, it is necessary to conduct a study examining the relationship between educational level and work experience and compliance with the use of personal protective equipment (PPE) among nurses at Makassar Regional General Hospital.

2. Methods

This study employed a cross-sectional research design. The research was conducted at a Regional General Hospital (RSUD) in Makassar City, South Sulawesi. The selection of this location was based on the consideration that the hospital has a relatively high and diverse level of operational activities, making it relevant to the objectives of the study. The study was carried out from August to October 2025 and included direct observations, interviews with nurses, and the collection of data related to the research objectives. The population of this study consisted of all nurses working at Makassar Regional General Hospital, totaling 183 individuals. The sample was selected using a total sampling method, resulting in 183 respondents.

The measurement of PPE compliance was conducted using a combination of structured questionnaires and direct observation sheets. The observation instrument was designed to assess nurses' adherence to standard PPE usage during clinical activities. The types of PPE observed included gloves, medical masks, protective gowns/aprons, and eye protection (goggles or face shields), depending on the procedure being performed. Each PPE component was scored based on actual use during observation, with a dichotomous scale (1 = used appropriately, 0 = not used or used incorrectly). Compliance was then categorized based on the proportion of correctly used PPE items. Nurses were classified as "compliant" if they correctly used $\geq 80\%$ of the required PPE components during observed procedures, and "non-compliant" if the proportion was $< 80\%$.

In addition, the questionnaire was used to support observational data by capturing self-reported compliance behavior and contextual factors related to PPE use. The combined use of observation and self-report aimed to provide a more comprehensive assessment of nurses' compliance with PPE standards. The data were analyzed using both univariate and bivariate analyses. In addition, the Chi-square statistical test was applied with a significance level of $p \leq 0.05$. The results of the analysis are presented in tables and explained narratively to address the research objectives.

3. Results and Discussion

Table 1 presents the results of the analysis of the relationship between educational level and compliance with the use of Personal Protective Equipment (PPE) among nurses at Makassar Regional General Hospital in 2025. This analysis aims to determine whether there is a significant relationship between the variable of educational level and compliance behavior in PPE use as part of the implementation of occupational health and safety practices in the hospital.

Table 1. The Relationship Between Educational Level and Compliance with Personal Protective Equipment (PPE) Use Among Nurses at Makassar Regional General Hospital in 2025.

Educational Level	Compliance with Personal Protective Equipment (PPE) Use						<i>p-value</i>
	Non-Compliant		Compliant		Total		
	n	%	n	%	N	%	
D3	6	7.8	71	92.2	77	100	0.016
S1	3	12.5	21	87.5	24	100	
S2	0	0	4	100	4	100	
Ners	0	0	78	100	78	100	
Total	9	4.9	174	95.1	183	100	

The results of the study showed a significant relationship between educational level and compliance with the use of Personal Protective Equipment (PPE) among nurses at Makassar Regional General Hospital ($p = 0.016$). All nurses with a Master's degree and professional nursing degree (Ners) (100%) demonstrated compliance with PPE use, with no respondents categorized as non-compliant. Educational level is one of the determining factors that influences the formation of individual behavior. Education plays an important role in broadening knowledge and shaping an individual's beliefs and behavioral patterns. In general, higher levels of education are associated with a better ability to understand information and adopt behavioral changes. Conversely, inadequate educational levels may become a barrier to behavioral change (Rahmawati et al., 2022).

These findings are consistent with the study by Khoirunnisa (2025), which identified a relationship between educational level and compliance with PPE use among nurses at Awal Bros Hospital in Pekanbaru. This indicates that higher educational attainment is associated with greater compliance with PPE use. Similarly, a study conducted among workers at public fuel filling stations (SPBU) in South Aceh Regency also found a significant relationship between educational level and compliance with PPE use (Nilawati, 2022). Education is

considered one of the predisposing factors that influence individual behavior. It serves as a fundamental factor in motivating behavior and provides a framework for individual learning processes. Therefore, a person's level of education determines the breadth of knowledge and influences how individuals think, behave, and respond to situations (Rahmawati et al., 2022). Individual knowledge cannot be separated from educational level; the higher a person's level of education, the greater their level of knowledge. Similarly, in relation to PPE use among workers, educational level is associated with the level of knowledge regarding proper PPE usage. Higher educational attainment among workers tends to lead to better compliance and behavior in the use of PPE (Riana, 2021).

Educational level strongly influences workers' perceptions and understanding of the importance of occupational health and safety. Educated workers tend to have a more rational perspective on risks and are better able to make appropriate decisions in work situations that require caution. They are also more receptive to innovations or new policies related to workplace safety, including the proper use of standardized PPE. Thus, an individual's educational background can influence their level of compliance with PPE use. Higher educational attainment generally enhances understanding of professional occupational safety knowledge, particularly regarding the importance of PPE use. Education contributes to the development of better knowledge and perceptions related to the implementation of safety procedures. Individuals with higher educational backgrounds typically possess better literacy skills, enabling them to more easily understand safety instructions, warning symbols, and workplace training materials. As a result, they are more aware of potential risks and hazards associated with improper PPE use (Pahlevi, Anggara, & Imron, 2026).

To improve compliance with PPE use, hospitals are recommended to implement visual reminder systems and PPE checklists in strategic work areas such as nurses' stations, ward entrances, and workstations. These measures can strengthen cues to action, as proposed in the Health Belief Model (HBM). Simple checklists with tick boxes for gloves, masks, protective goggles, and aprons can trigger automatic behavior and reduce forgetfulness caused by high workloads. In addition, periodic audits of PPE compliance with direct feedback to individual nurses and teams are essential for fostering a sustainable safety culture. Weekly audits conducted by occupational health and safety supervisors or head nurses, followed by constructive discussions without a blame-oriented approach, have been shown to be effective in creating an environment of positive accountability and continuous improvement in workplace safety practices. From the perspective of the Health Belief Model, educational level plays a crucial role in shaping individuals' perceived susceptibility and perceived severity toward occupational hazards. Nurses with higher education levels are more likely to understand the risks of infection exposure and the potential consequences of non-compliance with PPE use, thereby increasing their motivation to adhere to safety procedures.

Table 2. The Relationship between Work Period and Compliance with Personal Protective Equipment (PPE) Use Among Nurses at Makassar Regional General Hospital in 2025.

Work Period	Compliance with Personal Protective Equipment (PPE) Use						<i>p-value</i>
	Non-Compliant		Compliant		Total		
	n	%	n	%	N	%	
Senior (≥5 years)	3	2	146	98	149	100	0.002
Junior (<5 years)	6	17.6	28	82.4	34	100	
Total	9	4.9	174	95.1	183	100	

Table 2 presents the results of the analysis of the relationship between work period and compliance with the use of Personal Protective Equipment (PPE) among nurses at Makassar Regional General Hospital in 2025. This analysis aims to determine whether there is a significant relationship between the variable of work experience and compliance behavior in PPE use as part of the implementation of occupational health and safety practices in the hospital.

The results of the study showed a significant relationship between work period and compliance with the use of Personal Protective Equipment (PPE) among nurses at Makassar Regional General Hospital ($p = 0.002$). Nurses with longer work experience demonstrated a very high level of compliance, reaching 98%, with only 2% (3 individuals) categorized as non-compliant. This finding indicates that the longer an individual has worked, the higher the level of compliance with PPE use. This result is consistent with Anderson's theory, which states that the longer a person's work experience, the more skilled they become and the easier it is for them to understand their tasks. Consequently, this increases the likelihood of achieving better work performance and adapting to the work environment, which ultimately enriches overall professional experience. The accumulation of long-term work experience contributes to the development of individual skills, a more efficient understanding of job responsibilities, and improved adaptability to workplace dynamics, which in turn supports progressive optimization of performance (Notoatmodjo, 2012).

These findings are consistent with a study conducted among nurses at Majene Regional General Hospital, which found that work period was significantly associated with nurses' compliance in using PPE (Hermawan, Panggeleng, & Maharja, 2025). Similarly, Jannah (2022) reported that work period is associated with higher job performance and a better understanding of safe work procedures. As a result, experienced workers tend to be more compliant in using PPE compared to new workers who are still in the adaptation stage. This is due to the accumulation of experience, knowledge, and skills obtained over a longer period of employment, making workers more aware of occupational health and safety risks, such as those faced by nurses or shipyard workers. Furthermore, research conducted by Handayani et al. (2022) also found a significant relationship between work period and compliance with PPE use among road construction workers in Banjar District by CV. Adik Karya Konsultan in Pandeglang.

Employee loyalty to an organization can also be reflected in the length of employment, as workers who have served for a long time generally demonstrate higher levels of productivity. One factor influencing compliance is the duration of an individual's work experience; workers with greater experience tend to perform their tasks based on established

work habits, including the consistent use of personal protective equipment (PPE) (Setiawan & Febriyanto, 2020). Work period also contributes to shaping employees' level of knowledge regarding the use of PPE. In general, workers with longer work experience have broader exposure to work situations requiring PPE use, thereby strengthening their understanding of its importance and the correct procedures for its use (Maryam et al., 2024). In addition, work period is closely related to cues to action and self-efficacy. Nurses with longer work experience are more frequently exposed to workplace safety protocols, reminders, and real-life risk situations, which serve as cues to action that trigger compliance behavior. Furthermore, accumulated experience enhances self-efficacy, enabling nurses to feel more confident in correctly using PPE in various clinical situations.

Therefore, the implementation of peer education programs is recommended. Peer education can serve as an effective strategy by involving senior nurses as role models for junior nurses in the correct use of PPE. This approach not only utilizes the real-life experience of senior staff who are already accustomed to safety procedures but also creates a positive imitation effect that accelerates the formation of good habits among junior nurses. This approach can be further strengthened through the establishment of patient safety teams in each work unit, responsible for monitoring and discussing issues related to PPE compliance through regular weekly or monthly meetings. These teams function as structured discussion forums to identify barriers to PPE use, share best practices, and provide constructive feedback, thereby fostering a sustainable safety culture within the hospital environment.

Study Limitation and Future Research

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design limits the ability to establish causal relationships between educational level, work period, and PPE compliance. The results only reflect associations observed at a single point in time. Second, the study was conducted in a single regional general hospital, which may limit the generalizability of the findings to other healthcare settings with different characteristics, such as private hospitals or primary healthcare facilities. Third, although direct observation was used, part of the data relied on self-reported questionnaires, which may be subject to social desirability bias, where respondents tend to report behavior that aligns with expected standards rather than actual practices.

Future research is recommended to explore additional determinants of PPE compliance, including organizational culture, supervision quality, workload, and the availability and accessibility of PPE. Furthermore, longitudinal or experimental study designs are needed to evaluate changes in compliance over time and to test the effectiveness of interventions such as training programs, supervision strengthening, and behavioral-based safety approaches in improving PPE compliance among nurses.

Conclusions

Based on the results of this study, it can be concluded that there is a significant relationship between educational level and work period and compliance with the use of Personal Protective Equipment (PPE) among nurses at Makassar Regional General Hospital. Nurses with higher educational levels and work period tend to demonstrate better compliance with PPE use. This finding indicates that educational background and work experience play important roles in shaping awareness and compliance behavior toward safety standards and

infection prevention practices in hospital settings. Therefore, hospital management is recommended to enhance training programs and continuous education related to PPE use, particularly for nurses with shorter work experience, in order to improve compliance and strengthen the culture of occupational safety in the workplace.

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Conflicts of Interest

The authors declare no conflict of interest.

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