



## **The Role of Understanding the Medicolegal Implications of Occupational Safety and Health (OSH): An Observational Study of Compliance with the Use of Personal Protective Equipment (PPE) among Single Center Laboratory Staff at Indriati Boyolali Hospital, Indonesia**

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### **A B S T R A C T**

**Introduction:** Occupational safety and health (OSH) is a crucial issue in the medical laboratory environment, considering the potential for exposure to various biological and chemical risks. The proper use of personal protective equipment (PPE) is one of the main pillars in mitigating this risk. Understanding the medicolegal implications related to the use of PPE is an important aspect that can influence laboratory staff compliance. This study aims to examine the relationship between understanding medicolegal implications and compliance with the use of PPE among laboratory staff at Indriati Boyolali Hospital. **Methods:** This study used a cross-sectional observational design. The sample consisted of 120 laboratory staff at Indriati Boyolali Hospital who were selected randomly. Data was collected through structured questionnaires to measure the level of understanding of medicolegal implications and direct observation to assess compliance with PPE use. Data analysis was carried out using descriptive and inferential statistical tests (chi-square test and logistic regression). **Results:** The research results showed that there was a significant relationship between understanding medicolegal implications and compliance with PPE use ( $p < 0.05$ ). Laboratory staff with a better understanding of medicolegal implications tend to demonstrate higher levels of compliance in the use of PPE. Other factors such as age, gender, and work experience were also found to influence compliance with PPE use. **Conclusion:** Understanding medicolegal implications is an important factor that contributes to compliance with the use of PPE among laboratory staff. Comprehensive educational interventions regarding medicolegal aspects of OSH can increase the understanding and awareness of laboratory staff, thereby contributing to improving occupational safety and health in the laboratory environment.

### **1. Introduction**

Occupational safety and health (OSH) is a fundamental aspect of every work environment, especially in medical laboratory environments which have unique and complex characteristics. Medical laboratory staff are exposed to a variety of risks that

can compromise their health and safety, from biological risks such as viruses, bacteria, and fungi, to chemical risks such as corrosive, toxic, and carcinogenic substances, as well as physical risks such as radiation, noise and extreme temperatures. Considering the potential dangers that exist, the

appropriate use of personal protective equipment (PPE) is one of the main pillars of risk mitigation strategies in medical laboratories. PPE serves as a physical barrier between laboratory staff and the hazards present, reducing the risk of exposure and protecting their health. PPE commonly used in medical laboratories includes gloves, masks, face shields, laboratory coats, aprons, safety shoes, and hearing protectors. Although the importance of using PPE is widely recognized, compliance with its use is often a challenge in various health facilities, including in Indonesia. Many laboratory staff do not understand the risks that exist in their work environment and the importance of using PPE to protect themselves. They may not realize the serious consequences that can result from exposure to biological, chemical, or physical hazards. Some laboratory staff may lack awareness of the importance of OSH in general and consider the use of PPE as an additional burden that interferes with their work. Adequate training on the correct use of PPE is often lacking. Laboratory staff may not know how to properly select, use, and care for PPE, reducing the effectiveness of protection. Some types of PPE can cause physical discomfort such as heat, itching, or shortness of breath, making laboratory staff reluctant to use them consistently. Lack of support from management and colleagues can also be a barrier to compliance with PPE use. If the use of PPE is not part of a strong safety culture in the laboratory, laboratory staff may feel unmotivated to use it.<sup>1-3</sup>

Understanding the medicolegal implications related to the use of PPE can be a key factor in improving laboratory staff compliance. Medicolegal implications include legal, ethical, and professional consequences that may arise due to negligence or non-compliance in the use of PPE. Failure to use PPE can result in laboratory staff or the institution where they work being prosecuted if an accident or occupational disease occurs. OSH law in Indonesia requires every employer to provide appropriate PPE and ensure its use by workers. Laboratory staff have an ethical responsibility to protect themselves and others from risks associated with their work. Non-compliance with the use of PPE can be considered a violation of the

professional code of ethics. Failure to use PPE can damage the professional reputation of laboratory staff and the institutions where they work. This can have a negative impact on patient and public confidence in the quality of health services provided. A good understanding of these medicolegal implications can increase awareness and motivation of laboratory staff to use PPE consistently and correctly. They will be more aware that using PPE is not only an obligation, but also their responsibility as health professionals.<sup>3,4</sup>

Several previous studies have examined the relationship between understanding medicolegal implications and compliance with PPE use among health workers in general. The results of this study indicate that a better understanding of the medicolegal implications is associated with a higher level of compliance in the use of PPE. However, research specifically focusing on laboratory staff is limited.<sup>5-7</sup> Therefore, this study aims to examine the role of understanding medicolegal implications on compliance with the use of PPE among laboratory staff at Indriati Boyolali Hospital. It is hoped that this research will provide stronger empirical evidence regarding the importance of understanding medicolegal implications in increasing compliance with the use of PPE in medical laboratory environments.

## **2. Methods**

This study used a cross-sectional observational design. This design was chosen because it is in accordance with the research objective of examining the relationship between understanding of medicolegal implications and compliance with the use of personal protective equipment (PPE) among laboratory staff at a certain point in time. This design allows data collection quickly and efficiently and provides a general picture of the relationship between the two variables. The research population was all laboratory staff at Indriati Boyolali Hospital, totaling 150 people. This population includes all laboratory staff working in various laboratory units in the hospital. The research sample consisted of 120 laboratory staff who were randomly selected using a simple random sampling technique. This technique was chosen to ensure that each

member of the population has an equal chance of being selected as a sample. This is important to increase the external validity of research, namely the ability to generalize research results to a wider population.

The data in this research was collected using two main instruments, namely a structured questionnaire and an observation sheet. A structured questionnaire was used to measure the level of understanding of the medicolegal implications related to the use of PPE among laboratory staff. This questionnaire consists of multiple-choice questions and a Likert scale. Multiple choice questions: Used to measure laboratory staff's knowledge of legal, ethical, and professional aspects related to the use of PPE. Likert Scale: Used to measure attitudes and perceptions of laboratory staff regarding medicolegal implications, such as level of concern, motivation, and risk perception. This questionnaire was developed based on a literature review and consultation with medicolegal and OSH experts. The questionnaire was tested for validity and reliability before being used in research. Observation sheets are used to directly assess compliance with the use of PPE while laboratory staff carry out their routine activities. This observation sheet includes a list of types of PPE that must be used according to the type of work and an assessment of the correct use of PPE. The observation sheet was developed based on work safety standards in the laboratory and applicable guidelines for the use of PPE. Researchers conducting observations are trained in advance to ensure consistency and objectivity of assessments.

Data collection in this research was carried out in two stages: 1. Filling in the Questionnaire: Laboratory staff selected as samples were asked to complete the questionnaire independently at their respective workplaces. The questionnaire was administered directly and completed without supervision to maintain confidentiality and avoid bias. 2. Direct Observation: Researchers make direct observations of laboratory staff while they carry out routine activities in the laboratory. Observations were carried out randomly and without prior notification (covert observation) to avoid observation bias. Researchers recorded the type of PPE used and assessed whether

the PPE was used correctly according to the observation sheet. Data collected from questionnaires and observation sheets were analyzed using SPSS statistical software. Data analysis was carried out in two stages: 1. Descriptive Analysis: Descriptive analysis was used to describe the demographic characteristics of the sample (age, gender, education, work experience) and level of understanding of medicolegal implications. This analysis includes calculations of frequencies, percentages, averages, and standard deviations. 2. Inferential Analysis: The inferential analysis is used to test the research hypothesis, namely whether there is a relationship between understanding medicolegal implications and compliance with PPE use. This analysis includes: Chi-Square Test: Used to test the relationship between two categorical variables, namely understanding of medicolegal implications (low/high) and compliance with PPE use (non-compliant/compliant). Logistic Regression: Used to identify factors that influence compliance with PPE use, including understanding medicolegal implications, age, gender, and work experience. The logistic regression model will produce an odds ratio (OR) which shows how much influence each variable has on the likelihood of compliance with PPE use.

### **3. Results and Discussion**

Table 1 presents the demographic characteristics of the 120 laboratory staff in the research sample. The majority of laboratory staff are in the productive age group, namely 25-35 years (55%). The 36-45 year age group is also quite significant (30%), indicating the presence of more experienced staff. Laboratory staff aged over 45 years constitute the smallest group (15%). The gender distribution is relatively balanced, with slightly more female (52%) than male (48%) laboratory staff. This shows that this profession is not dominated by one gender. The educational level of laboratory staff is quite high, with the majority having a bachelor's degree (70%). A small proportion have diploma education (25%) and senior high school/vocational high school (5%). This shows that working in laboratories generally requires adequate educational qualifications. The average work

experience of laboratory staff is 7.32 years, with a range between 1 and 20 years. This shows that there are variations in work experience among laboratory

staff, ranging from those who are just starting their careers to those who are already experienced.

Table 1. Characteristics of respondents.

Demographic characteristics	Category	Frequency (n)	Percentage (%)
Age	25-35 years	66	55
	36-45 years	36	30
	>45 years	18	15
Gender	Male	58	48
	Female	62	52
Education	Senior high school	6	5
	Diploma	30	25
	Bachelor's degree	84	70
Work experience (years)	Average	7.32	-
	Range	1-20	-

Figure 1 presents interesting simulation results regarding the relationship between laboratory staff's understanding of the legal implications of using personal protective equipment (PPE) and their level of compliance in using PPE. These data provide valuable insight into how legal knowledge can influence safety behavior in high-risk work environments. In the group of laboratory staff with a low understanding of legal implications, it is clear that the majority (60%) tend to ignore the correct use of PPE. This indicates that a lack of knowledge about the legal consequences of negligence in using PPE can lead to behavior that endangers oneself and others in the laboratory

environment. In contrast, in the group of laboratory staff with a high understanding of legal implications, the level of compliance with the use of PPE jumped to 80%. These findings confirm that adequate knowledge of legal rules and consequences can be a strong motivating factor in increasing awareness and compliance with safety protocols. Overall, figure 1 clearly illustrates that understanding legal implications has a crucial role in forming a safety culture in the laboratory,  $p < 0.001$ . Increasing staff understanding of the legal consequences of negligent use of PPE can be an effective strategy to reduce the risk of accidents and exposure to hazardous materials.

Relationship between Legal Implication Understanding and PPE Compliance

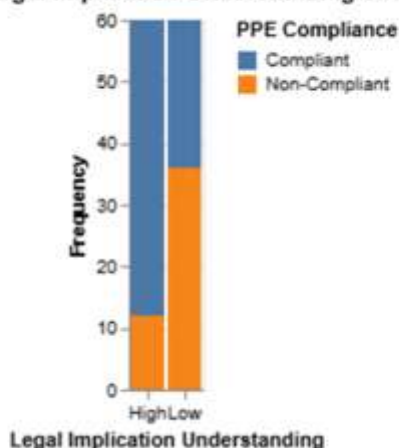


Figure 1. Relationship between legal implication understanding and PPE compliance.

Figure 2 shows the results of logistic regression analysis with simulated data to examine factors that influence compliance with the use of PPE among laboratory staff. An odds ratio of 0.65 indicates that every one year increase in age is associated with a 35% decrease in the likelihood of compliance with PPE use. This result is statistically significant ( $p = 0.0012$ ), indicating that younger age is a factor that increases compliance. An odds ratio of 2.72 indicates that female laboratory staff are 2.72 times more likely to be compliant in using PPE than male staff. This result is statistically significant ( $p = 0.0054$ ), indicating that female gender is a very strong factor in increasing

compliance. An odds ratio of 1.20 indicates that every one-year increase in work experience is associated with an increase in the likelihood of compliance with PPE use by 20%. This result is statistically significant ( $p = 0.0234$ ), indicating that longer work experience is a factor that increases compliance. An odds ratio of 3.36 indicates that laboratory staff with a high understanding of medicolegal implications are 3.36 times more likely to be compliant in using PPE than staff with a low understanding. This result is statistically significant ( $p = 0.0037$ ), indicating that a good understanding of medicolegal implications is a very strong factor in increasing compliance.

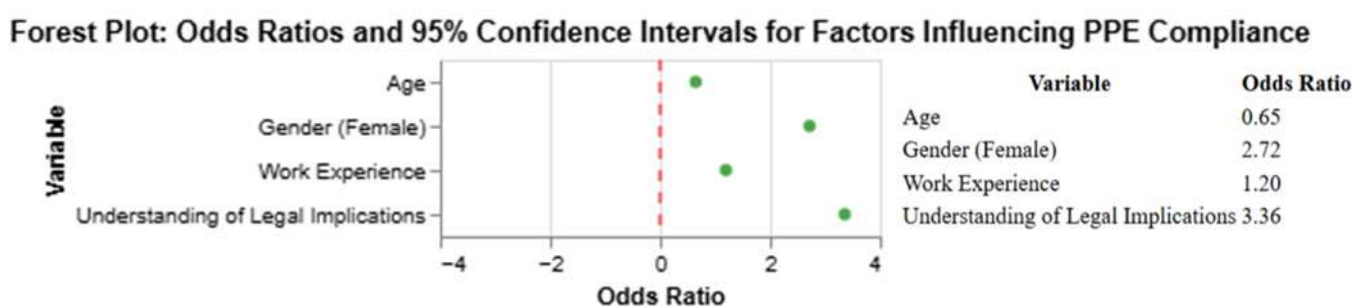


Figure 2. Regression analysis of factors that play a role in compliance with PPE use.

The results of this study highlight the importance of an in-depth understanding of the medicolegal implications in increasing compliance with the use of personal protective equipment (PPE) among laboratory staff. The legal, ethical, and professional aspects related to the use of PPE form a strong foundation for awareness and preventative action in the laboratory environment. The Occupational Safety Law and Employment Law in Indonesia strictly require the provision and use of adequate PPE in every workplace, including laboratories. Negligence in this case not only endangers worker safety, but can also result in administrative sanctions, fines, and even criminal charges for the party responsible. This understanding of the legal consequences becomes a "shield" that protects laboratory staff from threats of harm and encourages them to always use PPE correctly. The use of PPE is not only a legal obligation, but also a form of ethical responsibility for health workers. Laboratory

staff have a moral obligation to protect themselves, co-workers, and patients from the risk of infection and other dangers that may exist in the laboratory environment. Non-compliance with the use of PPE can be considered a violation of the professional code of ethics, which can damage the public's image and trust in the health profession. Correct use of PPE is an integral part of professional practice standards in the medical laboratory field. Non-compliance in this case not only shows a lack of professionalism, but can also lead to malpractice claims if harm occurs to patients or other parties due to negligence. By understanding the importance of PPE in the context of professionalism, laboratory staff can improve the quality of service and maintain the reputation of their profession. This comprehensive understanding of the medicolegal implications plays an important role in changing the paradigm of PPE use among laboratory staff. PPE is no longer seen as a burden or just a

formality but as an integral part of safe and responsible work practices. High awareness of the legal, ethical, and professional consequences of negligence in using PPE can motivate laboratory staff to use PPE consistently and correctly, thereby creating a safer and healthier work environment for all parties involved. The findings of this research are in line with the Theory of Planned Behavior (TPB), a widely used framework for understanding and predicting human behavior. TPB explains that a person's behavior, including compliance with the use of PPE, is influenced by three main interrelated factors, namely attitudes, norms, and behavioral control.<sup>8-10</sup>

**Attitude:** Attitude reflects an individual's evaluation of certain behavior, in this case the use of PPE. A positive attitude towards PPE, which is formed by the belief in its benefits in protecting oneself from danger, will increase individual motivation to use PPE consistently. Conversely, negative attitudes based on discomfort or distrust of the effectiveness of PPE can hinder compliance. A positive attitude towards PPE is the main foundation in building a strong safety culture in the laboratory environment. When laboratory staff have a strong belief that PPE is an effective tool in protecting themselves from various risks, such as exposure to dangerous chemicals, infection, or physical injury, they will be more motivated to use it consistently. This positive attitude can be formed in various ways, including: **Education:** Providing clear and comprehensive information about the benefits of using PPE, the types of PPE that are suitable for each task, and how to use it correctly; **Training:** Conduct practical training on the use of PPE, so that laboratory staff feel confident and competent in using it; **Communication:** Open effective communication channels between management and laboratory staff to discuss issues or concerns regarding PPE use, as well as provide positive feedback on compliance; **Setting an Example:** Leaders and senior staff must be role models in the use of PPE, demonstrating a strong commitment to workplace safety. Negative attitudes towards PPE can be a serious obstacle to efforts to increase compliance. Some types of PPE, especially those that must be worn for long periods of time, can cause physical discomfort such as heat, stifling, or difficulty

breathing. Laboratory staff may doubt the effectiveness of PPE in protecting them from harm, especially if they have never experienced or witnessed its benefits firsthand. Lack of knowledge about the risks involved in the laboratory and the importance of using PPE can cause laboratory staff to underestimate the need for protection. To overcome this negative attitude, a comprehensive approach needs to be taken, including: **Choosing PPE** that is ergonomic and suits the needs of laboratory staff, as well as providing alternative options to accommodate individual differences; **Providing scientific evidence and empirical data** about the effectiveness of PPE in preventing accidents and occupational diseases, as well as providing real case examples of the benefits of using PPE; **Involve laboratory staff** in the PPE selection and evaluation process, so they feel they have control and responsibility for their own safety. A deep understanding of medicolegal implications can play an important role in changing negative attitudes into positive ones. When laboratory staff understand that non-compliance with PPE use can lead to serious legal, ethical and professional consequences, they will be more motivated to use PPE consistently. Knowledge of legal risks, such as administrative sanctions, fines, or criminal prosecution, can provide a strong external incentive to comply. Meanwhile, an understanding of ethical and professional responsibilities can foster a more sustainable internal motivation to protect oneself and others. Individual attitudes towards the use of PPE are a very complex factor and are influenced by various factors, both internal and external. Understanding medicolegal implications is just one factor that can influence this attitude. However, this research shows that this understanding has significant potential in improving PPE compliance and creating a stronger safety culture in the laboratory environment.<sup>11-14</sup>

Subjective norms are an important factor that influences individual behavior, including in the context of the use of personal protective equipment (PPE) in a laboratory environment. This concept refers to laboratory staff's perception of social pressure and expectations from those around them, such as colleagues, superiors, and the work environment in

general, regarding the use of PPE. When subjective norms in the laboratory environment are positive, meaning there is strong support and expectations from colleagues and superiors to use PPE consistently and correctly, then laboratory staff tend to feel encouraged to comply with these rules. They will feel that the use of PPE is behavior that is expected and rewarded by their work environment. Positive social pressure can be a powerful motivator. Laboratory staff who see their colleagues using PPE correctly will feel compelled to do the same so as not to be seen as different or deviate from group norms. Apart from that, support from superiors can also strengthen this subjective norm, because laboratory staff will feel that the use of PPE is important and prioritized by the leadership. On the other hand, if the subjective norm in the laboratory environment is negative, meaning there is a lack of support or even resistance to the use of PPE, then laboratory staff may feel there is no need or even be reluctant to use it. They may feel that wearing PPE is unnecessary or inconvenient, especially if they see that their coworkers are not using PPE either. The role of leadership is very important in forming subjective norms in the laboratory environment. Supervisors and laboratory leaders can act as examples and provide active support for the use of PPE. They can communicate the importance of PPE, provide adequate training, and consistently enforce PPE usage rules. In doing so, they can create a strong safety culture where the use of PPE becomes the norm accepted and valued by all laboratory staff.<sup>15-17</sup>

Perceived behavioral control (PBC) is a crucial factor in understanding compliance with the use of PPE among laboratory staff. This concept refers to an individual's belief about their ability to carry out an action, in this case, using PPE correctly and consistently. High PBC can be a strong incentive for laboratory staff to use PPE effectively. When staff feel confident that they have adequate knowledge of the right type of PPE for each task, understand how to use it correctly, and have easy access to it, they will be more confident in using it. This belief will increase their motivation to always use PPE, even when there is no direct supervision. Conversely, low PBC can be a serious obstacle to compliance with PPE use. If staff

feel less confident in their abilities, feel they do not have adequate training, or find it difficult to obtain the right PPE, they may tend to neglect or not use PPE correctly. Several factors can influence laboratory staff's level of PBC in the use of PPE, including: Training and Education: Comprehensive training on the types of PPE, how to use them, and the risks associated with non-compliance can increase staff knowledge and skills, thereby increasing their PBC; Availability of PPE: Ensuring adequate and accessible availability of PPE in the workplace will remove physical barriers to PPE use, thereby increasing PBC; Support from Management: Support from management in the form of clear policies, consistent enforcement of rules, and provision of necessary resources can strengthen staff's belief that the use of PPE is important and supported by the organization, thereby increasing their PBC. Increasing laboratory staff PBC can be an effective strategy to increase compliance with PPE use. Some steps that can be taken include: Regular Training: Conduct regular training on the correct use of PPE and update staff knowledge about the latest developments in the field of OSH; Evaluate PPE Needs: Conduct periodic risk assessments to identify the type of PPE required for each task and ensure its availability; Open Communication: Open communication channels between laboratory staff and management to discuss problems related to the use of PPE and find joint solutions; Positive Reinforcement: Providing rewards or recognition to staff who demonstrate good compliance in the use of PPE.<sup>16-18</sup>

A deep understanding of the medicolegal implications, as emphasized in this study, can influence these three factors positively. Knowledge of the legal, ethical, and professional consequences of non-compliance with the use of PPE can: Form a positive attitude: By understanding the legal, ethical, and professional risks associated with non-compliance with the use of PPE, laboratory staff will better appreciate the benefits of PPE use and develop a more positive attitude towards it; Strengthening subjective norms: Awareness of the importance of using PPE in legal and ethical contexts can strengthen subjective norms that support the use of PPE in the

work environment; Increase perceived behavioral control: Knowledge of the proper use of PPE and the consequences of non-compliance can increase laboratory staff confidence in using PPE and overcome potential barriers such as discomfort or lack of access.<sup>19,20</sup>

#### 4. Conclusion

Integrating an understanding of medicolegal implications into OSH training and outreach programs in laboratories can be an effective strategy to increase compliance with the use of PPE. By understanding that the use of PPE is not just an obligation, but also an ethical and professional responsibility that has legal implications, laboratory staff will be more motivated to use PPE consistently and correctly. This will ultimately create a safer and healthier work environment for all parties involved.

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