

Factors influencing compliance with personal protective equipment use among manufacturing workers: A literature review

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Abstract

Personal Protective Equipment (PPE) compliance is a crucial aspect of workplace safety in the manufacturing industry. Non-compliance increases the risk of workplace accidents and occupational diseases, which can negatively impact workers' health and productivity. This study aims to analyze the factors influencing PPE compliance among manufacturing workers through a literature review by examining scientific articles retrieved from Google Scholar using keywords such as "Compliance," "Factors," "Personal Protective Equipment," and "Manufacturing Industry." The results show that several factors affect PPE compliance, including education, knowledge, attitude, safety awareness, supervision, policy enforcement, and PPE availability and comfort of PPE. Additionally, a strong workplace safety culture plays a crucial role in reinforcing PPE use. Improving compliance requires a combination of safety training, effective policy enforcement, and providing comfortable PPE. Strengthening these aspects can enhance adherence to safety regulations, reduce workplace hazards, and create a safer working environment in the manufacturing industry.

Keywords: Compliance; Factors; Personal Protective Equipment; Manufacturing Industry

1. Introduction

Occupational Safety and Health (OSH) is a crucial aspect of the manufacturing industry, where production processes involve various potential risks for employees [1]. Personal Protective Equipment (PPE) is one of the vital components in ensuring workplace safety and health. Although PPE is often considered the primary line of defense, in the hierarchy of risk control, it is the last resort after elimination, substitution, engineering controls, and administrative controls. This emphasizes that PPE is used when other control methods are not feasible or not yet fully effective, requiring workers to directly protect themselves. However, compliance with PPE use remains a challenge. For instance, a study at PT Madubaru found that 76.7% of workers were non-compliant in PPE use, while only 23.3% adhered to the regulations [2]. This indicates that obstacles still exist in implementing PPE usage in the workplace.

Workers' compliance with PPE use is influenced by various factors. Research indicates that behavioral factors, such as knowledge and attitude towards PPE use, play a significant role in determining compliance levels. For example, a study found that while 95.0% of respondents had good knowledge and 81.7% had a positive attitude towards PPE use, some workers still had negative attitudes and were less compliant [3]. Moreover, behavior is influenced not only by predisposing factors like knowledge but also by enabling and reinforcing factors, such as training programs [4].

Beyond individual factors, organizational aspects such as the availability and comfort of PPE, as well as supervision and management support, also impact workers' compliance. Studies show that PPE comfort significantly affects compliance (p-value = 0.025), where comfortable PPE encourages better adherence. Conversely, uncomfortable PPE serves as a barrier to compliance, as it may cause discomfort while working [5]. Another study revealed that workers under good

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supervision had an 88% compliance rate, whereas those with minimal supervision were mostly non-compliant (83.3%) [6]. Strict supervision, such as safety patrols, CCTV monitoring, and regular inspections, can increase workers' awareness of adhering to PPE standards.

The role of colleagues and workplace safety culture is equally important. A supportive work environment where coworkers remind each other can significantly enhance PPE compliance [7]. A strong safety culture in a company fosters an environment where PPE use becomes a habit followed by all employees. Research indicates that safety culture has a positive and significant impact on PPE compliance, contributing 44.9% to overall compliance levels [8]. The higher the safety culture, the higher the PPE compliance rate. This underscores the importance of enhancing safety culture through training, motivation, and stricter supervision to significantly improve workers' adherence to PPE regulations.

By understanding the various factors affecting PPE compliance, companies can develop effective strategies to enhance adherence. A comprehensive approach, including regular training, providing appropriate and comfortable PPE, and consistent supervision, can help create a safe and healthy work environment for all employees. Additionally, policies that prioritize workplace safety culture and active involvement from both management and employees can serve as strategic steps in improving PPE compliance.

2. Material and methods

This research is a qualitative study that uses a literature review method with a descriptive analysis approach. The data sources in this study come from national scientific journal articles obtained through Google Scholar using keywords such as "Compliance," "Factors," "Personal Protective Equipment," and "Manufacturing Industry."

The articles used in this study were selected based on inclusion criteria, namely scientific articles published within the last five years (2020-2025). The collected data will be analyzed systematically and then conclusions will be drawn based on the results of the analysis.

3. Results

Based on the collected and analyzed articles, the findings are presented as follows:

Table 1 Result of Literature Review Analysis of Factors Influencing Compliance with Personal Protective Equipment Use Among Manufacturing Workers

Author	Year	Method	Results
Parawansa et al. [9]	2022	Method: Observational analytical study with a cross-sectional approach Location: PT Kerta Rajasa Raya, a manufacturing company that produces Woven Bags and Jumbo Bags in Sidoarjo Sample: 79 workers from the extruder division	There was a weak positive correlation between education level ($r = 0.220$) and years of service ($r = 0.216$) with PPE compliance. Attitude ($r = -0.244$) and knowledge ($r = -0.210$) had a weak negative correlation with PPE compliance
Febryantie Yasmine et al. [10]	2023	Method: Observational analytical study with a cross-sectional design Location: Plastic sack company that produces Jumbo Bag and Woven Bag in Mojokerto Sample: 81 workers from the Extruder, Printing, and Needleloom divisions	Predisposing factors (such as age, education level, work experience, knowledge, and attitude) had a significant positive influence on safety awareness ($p = 0.000$). Safety awareness had a direct positive impact on PPE compliance ($p = 0.000$). However, predisposing factors did not directly affect PPE compliance ($p = 0.513$), suggesting that safety awareness plays a mediating role
Simanjuntak & Arista [11]	2022	Method: Observational analytical study with a cross-sectional design Location: PT. XYZ, Batam (Electronics manufacturing industry)	There is still a lack of worker discipline, and they do not understand the correct way to use PPE. Only 33% of employees had sufficient knowledge about PPE usage.

		Sample: 30 workers from the facility maintenance department	
Iskandar [12]	2022	Method: Descriptive analytical study with a cross-sectional approach Location: PT. SKF Indonesia (Bearing manufacturing industry) Sample: 131 production workers	Attitude ($p = 0.000$, $OR = 5.413$), occupational safety policies ($p = 0.000$, $OR = 4.237$), and supervision ($p = 0.000$, $OR = 4.843$) had strong significant relationships with PPE compliance. Workers who had a positive attitude and worked in environments with strict supervision and well-enforced safety policies were more likely to comply with PPE regulations
Simanjuntak [13]	2022	Method: Observational analytical survey with a cross-sectional approach Location: PT Almasindo, Bogor (Manufacturing industry, Press Shop division) Sample: 150 workers	Supervision significantly influenced PPE compliance ($OR = 8.556$), meaning workers with better supervision were 8.55 times more likely to comply. Policy enforcement was also crucial: 84.9% of workers in companies with strong safety policies complied, compared to only 4.3% in companies with weak policies. Training and supervision were key factors in ensuring compliance
Hendrawati & Putty [14]	2022	Method: Observational quantitative study with a cross-sectional approach Location: PT X (Manufacturing company engaged in concrete printing) Sample: 31 workers	67.7% of respondents (21 workers) had a poor attitude toward PPE compliance, while only 32.3% (10 workers) had a good attitude. The Chi-Square test showed a significant relationship between attitude and PPE compliance ($p = 0.013$), meaning workers with a positive attitude were more likely to comply
Hardiyono et al. [15]	2021	Method: Quantitative descriptive study using multiple regression analysis Location: PT Bukaka Teknik Utama, Balikpapan (Company engaged in engineering building design, construction, and manufacturing in the fields of energy, transportation, and telecommunications) Sample: 35 fabrication workers	Worker knowledge significantly influenced PPE compliance ($t = 4.579$, $p < 0.05$). Availability and comfort of PPE had a positive impact ($t = 1.197$, $p < 0.05$). Supervision also positively influenced PPE compliance ($t = 3.903$, $p < 0.05$)

Compliance with the use of Personal Protective Equipment (PPE) is influenced by various factors, including education, knowledge, attitude, safety awareness, supervision, policy enforcement, and PPE availability and comfort of PPE. Education and knowledge play a crucial role in determining PPE compliance. Parawansa et al. [9] found a weak positive relationship between education level ($r = 0.220$) and years of service ($r = 0.216$) with PPE usage. However, a weak negative correlation was observed between knowledge ($r = -0.210$) and compliance, suggesting that workers with better knowledge may not always adhere to PPE requirements due to other underlying factors. Similarly, Febryantie Yasmine et al. [10] reported that predisposing factors, such as education, work experience, and knowledge, significantly influenced safety awareness ($p = 0.000$), which in turn impacted PPE compliance. Simanjuntak & Arista [11] also identified a lack of knowledge as a major issue, with only 33% of employees demonstrating sufficient understanding of PPE usage, contributing to low compliance rates. Simanjuntak [13] also examined the relationship between knowledge and PPE compliance in an industrial setting. The study found that workers with higher levels of knowledge about workplace hazards and PPE regulations were more likely to comply with PPE requirements.

Attitude is another critical factor affecting PPE compliance. Iskandar [12] found that attitude had a significant positive impact on compliance ($p = 0.000$, $OR = 5.413$), indicating that workers with a positive perception of safety were more likely to wear PPE. Hendrawati & Putty [14] supported this finding, reporting that 67.7% of workers had a poor attitude toward PPE usage, which significantly affected compliance ($p = 0.013$). The relationship between attitude and safety awareness was further emphasized by Febryantie Yasmine et al. [10], who found that safety awareness acted as an intervening variable between predisposing factors and PPE compliance.

Supervision and strict policy enforcement have been proven to enhance PPE adherence. Hardiyono et al. [15] found that worker supervision significantly influenced PPE compliance ($t = 3.903$, $p < 0.05$). Iskandar [12] also reported that supervision ($p = 0.000$, $OR = 4.843$) and occupational safety policies ($p = 0.000$, $OR = 4.237$) had strong positive correlations with compliance, highlighting the importance of consistent monitoring and strict enforcement. Additionally, the availability and comfort of PPE also play a role in determining compliance. Hardiyono et al. (2021) found that PPE availability and comfort had a significant positive effect ($t = 1.197$, $p < 0.05$). Workers were more likely to comply with PPE requirements when the equipment was readily available and comfortable to wear.

Overall, the findings from these studies highlight that PPE compliance is a multifaceted issue influenced by several interrelated factors. Improving PPE adherence requires a combination of safety training, strict supervision, effective policy implementation, and ensuring PPE is both available and comfortable for workers. Strengthening these factors can significantly reduce workplace accidents and enhance occupational safety standards across various industries.

4. Conclusion

The compliance with Personal Protective Equipment (PPE) is influenced by multiple factors, including education, knowledge, attitude, safety awareness, supervision, policy enforcement, and PPE availability. Education and knowledge enhance awareness but do not always guarantee compliance. A positive attitude toward safety significantly increases PPE adherence, while strict supervision and well-enforced safety policies play a crucial role in ensuring compliance. Additionally, the availability and comfort of PPE contribute to workers' willingness to use protective gear. To improve PPE compliance, companies must implement comprehensive safety training, enforce strict supervision, and ensure PPE is accessible and comfortable, ultimately reducing workplace accidents and enhancing occupational safety.

Compliance with ethical standards

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All authors have no conflicts of interest to declare.

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