



Effect of Personal Protective Equipment (PPE) Compliance on Occupational Injury Rates in The Textile Sector of Pakistan

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ABSTRACT

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The textile industry plays a significant role in the economy of Pakistan. However, due to being labour-intensive, this industry subjects its employees to different occupational hazards, such as dust, chemicals, noise and machine-related hazards. While PPE is a vital part of occupational safety, no substantial studies have investigated the effect of PPE compliance on injury prevention in the textile industry in Pakistan. This study investigates the relationship between PPE compliance and injury risks experienced by workers by studying their experiences and perceptions. An interpretive philosophy and a qualitative research method were applied. Data collection was carried out through semi-structured interviews with five textile workers, and thematic analysis was used for data analysis. The results revealed that the factors affecting PPE compliance included equipment availability, comfort, safety training, management support, supervision and safety culture at the workplace. The participants recognized the significance of PPE as a measure for prevention. However, they stated that PPE alone will not be able to prevent occupational injuries in the absence of safety management and hazard control measures.

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Introduction

The textile industry is a vital part of Pakistan's economy and continues to be one of its biggest manufacturing and employment sectors. Textiles make up a significant portion of Pakistan's manufacturing industry output and export proceeds by engaging millions of laborers in spinning, weaving, processing, dyeing, and garment manufacturing plants (Husain & Khan, 2024). However, the labor-intensive nature of the textile manufacturing process makes the workforce susceptible to several occupational risks, which include exposure to cotton dust, chemicals, high noise levels, heat stress, repetitive motion, and machinery accidents. The International Labour Organization (ILO) lists the textile, clothing, leather, and footwear manufacturing industry as industries with considerable occupational safety and health hazards, where control of hazard exposures, worker education on safety, accident reporting, and use of personal protective equipment (PPE) are critical in ensuring prevention of occupational injury and diseases (Miernicka, 2024). Occupational injuries and work-related diseases continue to be a serious public health problem, as estimated by the ILO, nearly 3 million workers perish every year from work-related accidents and disease, whereas millions of non-fatal occupational injuries occur among workers annually (International Labour Organization, 2023).

These statistics emphasize the relevance of the use of preventive workplace safety strategies, especially within the high-risk sector of manufacturing. The use of PPE is viewed as an essential element of occupational risk management due to the fact that it serves as protection from hazards that cannot be effectively controlled using other methods. Nevertheless, the effectiveness of personal protective equipment usage relies on whether it is used by the employees correctly and consistently. Such aspects as insufficient training, uncomfortable conditions of wearing, insufficient supervision, low levels of safety awareness and weak organizational safety culture may undermine compliance and hence the effectiveness of PPE use. PPE compliance in the textile industry is positively influenced by educational and safety awareness interventions (Ada et al., 2025). The occupational safety problems are significant in the textile industries of Pakistan. A survey done on textile industry workers in Karachi brought out significant occupational safety problems that called for improvement in occupational safety practices, awareness among the workers, and prevention methods. Likewise, studies have been done in the Pakistani textile industries, where there has been exposure to hazards such as dust, noise, fires, and dangerous working environments.

Although the significance of PPE is acknowledged, there is a dearth of empirical studies that investigate the impact of adherence to PPE in terms of occupational injuries among textile workers in Pakistan. The majority of the empirical literature available so far has been related to hazard identification, safety consciousness measurement, or occupational health problems; nevertheless, comparatively few studies have examined whether there exists any association between PPE compliance levels and occupational injury rates (Atasoy, Temel & Basaga, 2024). Moreover, Pakistan lacks an effective national surveillance system for occupational injuries since workplace injuries tend to be reported in very low numbers owing to problems in the reporting systems and enforcement capabilities. There is a clear lack of information regarding the importance of PPE practices in reducing the likelihood of occupational injuries. The present study aims to explore the effects of PPE use on the occurrence of occupational injuries among textile workers in Pakistan. This research provides findings that can be used by textile companies, occupational health practitioners, and policy-makers to enhance safety training programs, develop better PPE implementation tactics, and implement injury prevention strategies. It will add value to the literature on occupational health and safety by producing industry-specific data in the context of Pakistan and bridging a significant gap in the research on the impact of worker compliance on injury prevention.

Literature Review

Occupational hazards and injury risks in the textile industry

Occupational challenges in the textile industry include the presence of more than one hazard in the work environment, such as cotton dust, chemicals, noise, physical work activity, and hazards posed by machinery. Despite the extensive literature on the hazards in the textile industry, the gap that exists in the existing literature is the failure to address why accidents happen even though there are various safety measures available. It has been established that injuries in occupations are not only attributed to hazardous work environments but are also related to safety behaviors of workers, organizational commitment, and occupational safety management systems (Oakman et al., 2020; Rizky et al., 2025).

Occupational safety has traditionally been achieved through the elimination of hazards through engineering techniques; however, such a strategy may prove inadequate in labour-based industries where elimination of hazards is not entirely possible. In the manufacture of textiles, where there is constant contact between the worker and hazardous machinery and chemicals, the prevention measures that include the use of personal protective equipment become necessary (Godakanda, Gamage & Amarasinghe, 2023). Nonetheless, Brondino et al. (2025) show that the presence of hazards does not necessarily imply an occurrence of an injury, which implies that there are other factors affecting safety results. This presents a gap in the existing literature since most studies look at occupational risks without considering behavioral factors that determine the application of preventive measures.

Further studies conducted in Pakistan also reveal the necessity of conducting additional research on safety practices in textile industries. In their study, Hussain et al. (2019) highlighted some of the occupational health and safety problems faced by textile industry employees in Karachi, such as low levels of safety awareness and poor preventive measures. Nonetheless, the research was predominantly exploratory in nature, as its aim was to identify safety needs rather than to establish links between safety behaviors and injury outcomes. Hence, while providing important context, the study does not address whether enhancing PPE usage would lead to fewer occupational injuries.

The role of PPE compliance in reducing occupational injuries

The use of PPE can be defined as one of the most important aspects of occupational safety management, as it protects employees from hazards where the complete avoidance of risk cannot be reached through engineering and administrative controls. Nevertheless, recent literature raises doubts about the assumption that having PPE contributes to achieving more favorable results

with respect to safety performance. The efficiency of PPE depends on the correct selection, usage, maintenance, and adherence of employees to safety norms and regulations. According to Verbeek et al. (2020), PPE reduces occupational exposures; at the same time, the research revealed that its efficacy is unclear in cases of poor compliance or incorrect PPE integration into the safety system. According to Ada et al. (2025), numerous personal protective equipment programs operate ineffectively because organizations treat the provision of protective equipment as an important part of security without addressing issues like training, monitoring, and building a culture of safety. Moreover, the use of PPE approaches may inadvertently transfer the burden of occupational safety from organizations to individual employees. Research on occupational safety management indicates that occupational safety is highly dependent on management commitment, workplace policy, and organizational resources rather than the behavior of employees (Tamers et al., 2020). Therefore, compliance with PPE should consider the organizational context that promotes or discourages safety behavior.

Factors influencing PPE compliance among textile workers

PPE compliance is a complicated behavior driven by personal beliefs, organizational settings, and safety management practices within organizations. Although safety training is a tool suggested to promote compliance, it may not lead to behavioral change unless there is an efficient system of safety management in place. According to Bayram, Arpat & Ozkan (2021), safety training affects the safety involvement of employees positively. However, these authors note that safety training is likely to be effective only when combined with appropriate supervision and communication at the organizational level. An additional problem associated with the use of PPE refers to the perceptions of employees regarding PPE usability. Baye et al. (2022) show that discomfort, reduced mobility, inappropriate design, and interference with productivity may discourage the use of PPE. This evidence contradicts approaches that assume that non-compliance is caused by a lack of knowledge or carelessness of workers. Non-compliance may be a rational response of employees to conditions when PPE is problematic in production tasks. Organisational safety climate is another vital determinant of PPE behavior. According to Tauseef & Kundi (2025), employees are more likely to comply with safety protocols if they feel that their employers value safety. However, previous studies have only examined the two determinants separately without exploring how they affect each other and injuries. This gap in knowledge is particularly important when considering industries like textiles where productivity conflicts with safety requirements.

Relationship between PPE compliance and occupational injury rates

PPE compliance has been identified as an important aspect of injury prevention in the workplace; however, the significance of the link between PPE compliance and the injury rate is not clear. Studies have shown that PPE decreases exposure to hazardous work; yet decreased exposure does not always result in decreased injury rates. There are various factors that can influence injuries in the workplace, which include machinery safety, workplace design, experience of the workers, and safety management systems within the organisation (Teym et al., 2026). It thus becomes methodologically difficult to identify the unique effect of PPE compliance on injuries. According to Santos et al. (2025), there is a connection between PPE use and injuries in the workplace. Yet the researchers indicated great variations among different industries based on workplace environments, types of hazards, and ways of measuring PPE compliance. One key issue in existing literature is the use of cross-sectional research and self-reporting of PPE use, which limits researchers' capacity to demonstrate the causality between compliance behavior and injury prevention. The technological methods address several issues that come with PPE assessment using traditional means. Karlsson et al. (2022) found that automated PPE monitoring systems could enhance compliance by giving an objective measure of how protective gear is used. Nevertheless, the technologies have not been fully exploited in textiles and developing countries. Thus, additional research should be done to investigate the effect of PPE compliance on occupational injuries.

Research Gap

There are still some gaps in the literature. Firstly, prior research has focused mostly on workplace risks, safety knowledge, or the availability of PPEs, whereas few have looked into how PPE compliance affects occupational injuries. There is uncertainty about the efficacy of the use of PPE in preventing workplace injuries. Hussain et al. (2019) found some gaps in safety practices among textile workers, but more research needs to be done to prove whether an increase in PPE compliance leads to fewer occupational injuries. The previous literature usually focuses on individual variables such as knowledge and attitude without considering organisational variables, including safety climate, supervision, and management commitment, sufficiently. Considering that PPE compliance depends not only on the workers but also on the workplace system, there is a need for a study employing an integrative approach. Hence, the present study attempts to fill this gap by exploring the relationship between PPE compliance and occupational injuries of textile workers in Pakistan. By connecting PPE behavior to injury outcomes, the study will be able to offer useful evidence on workplace safety interventions, PPE compliance strategies, and occupational health policy development.

Research Methodology

Research Philosophy

In this study, an interpretivist research philosophy has been used to gain knowledge about the perspective of PPE compliance among textile workers. Interpretivism acknowledges that workplace safety practice depends on individual experiences, organizational cultures, and contextual elements and not merely on numeric data (Saunders, Lewis and Thornhill, 2023). According to Creswell and Poth (2018), interpretivism is applicable in qualitative research on human experiences and contexts. Hence, the philosophy was relevant in studying workers' perspectives on PPE adherence. The use of interpretivism was suitable for this study since PPE compliance is based on a number of variables such as workers' awareness of safety issues, risk perception, management support and the nature of workplaces.

Research Design and Data Collection Method

The qualitative research design was chosen in order to get a better insight into PPE compliance behaviors as compared to studying how prevalent such behaviors are. The qualitative approach is especially suitable for studying the complicated phenomena at the workplace that involve meanings and experiences of humans and organizations as factors influencing people's behaviors (Creswell, 2018). While a quantitative survey could estimate the prevalence of the phenomenon, it would not be able to explain the reasons behind this or that behavior of employees. The primary data were collected through five semi-structured interviews conducted with the employees of the textile industry (Kallio et al., 2016).

Interviews have been chosen as the most appropriate means of collecting data since PPE compliance involves personal experiences, which might not be easily captured using closed-ended questions. In interviews, the respondents were able to discuss challenges they faced in terms of availability of PPE, its comfort, training, supervision, and workplace safety culture. However, interviews also have several weaknesses. The respondents are likely to give socially acceptable answers, especially in the context of workplace safety practices and organizational weakness (Dunwoodie, Macaulay & Newman, 2022). Furthermore, there are limitations in terms of a small sample size. Nevertheless, qualitative research does not focus on generalizability but on the depth of analysis; hence, this methodology was most appropriate in analyzing the mechanisms behind PPE compliance.

Sampling Strategy and Participants

The study utilized purposeful sampling due to the fact that the participants were chosen on the basis of their familiarity with textile workplace safety measures. Purposeful sampling is common practice in qualitative research as it gives researchers the ability to choose information-rich participants who can give valuable insights into the research phenomenon (Palinkas et al., 2015). Random sampling would have been inappropriate in this case because people who do not have experience working in the workplace cannot provide enough insight into issues related to PPE. The choice of five participants is an outcome of the exploratory nature of the research. Sample adequacy in qualitative studies depends not on the number of participants but rather on the relevance of information provided (Creswell, 2018). Nevertheless, such a small sample could restrict diversity in viewpoints and could fail to detect differences between different textile organizations, job positions, and levels of responsibility for safety.

Data Analysis Method

Thematic analysis was used to analyse the data collected during the interviews, based on the framework created by Braun & Clarke (2006). Thematic analysis is appropriate for use in such research because it allows identifying patterns in the qualitative data while remaining flexible in terms of interpretation of data. This method was chosen for the current study since it was intended to uncover patterns about PPE compliance, workplace safety procedures, and ways of injury prevention. By coding the data from the interviews, the researcher was able to uncover meaningful concepts that were put together into broader themes. After summarisation of participants' responses, analysis was concentrated on the interpretation of relationships between themes and understanding the influence of both organisational and individual factors on PPE behaviour. According to Braun & Clarke (2022), high-quality thematic analysis requires researchers to move beyond identifying common statements and develop deeper interpretations of patterns within the data. Despite thematic analysis being a useful approach for understanding the intricacies of work experience, it entails subjective judgment on the part of the researcher, leading to interpretative bias. In order to overcome such limitations, themes were systematically generated and continuously cross-checked with the actual interview data.

Ethical Considerations

Ethics have been considered at every stage of the research in order to protect the participants and ensure that the research is conducted in an ethical manner. The participants have been informed of the purpose of the research, that their participation is voluntary, and that they are free to withdraw from it at any time. Ethics have been observed since discussions on workplace safety can involve delicate information. It has become particularly essential for employees not to shy away from discussing the safety issues owing to fear of repercussions in the workplace (Hyatt & Gruenglas, 2023). Anonymity was guaranteed to get honest answers from the participants.

Thematic Table

Main Themes	Sub-themes	Initial Codes
Theme 1: Occupational hazards and workplace safety risks	Exposure to workplace hazards; Nature of occupational risks; Safety challenges in textile operations	Cotton dust, chemicals, machinery hazards, noise exposure, repetitive tasks, unsafe working conditions, workplace accidents
Theme 2: Availability and perceived effectiveness of PPE in injury prevention	Access to PPE; Suitability of protective equipment; Perceived role of PPE in reducing injuries	PPE availability, PPE quality, protective ability, equipment replacement, injury prevention, hazard protection, worker safety
Theme 3: Factors influencing PPE compliance behaviour	Worker attitudes; Barriers to PPE usage; Practical challenges affecting compliance	PPE discomfort, restricted movement, negligence, risk perception, production pressure, inconvenience, lack of motivation, inconsistent usage
Theme 4: Organisational support and safety management practices	Safety training; Management commitment; Supervision and enforcement	Safety education, PPE training, awareness programmes, supervisor support, monitoring, safety rules, organisational commitment
Theme 5: Limitations of PPE and integrated injury prevention approaches	Need for additional safety measures; Workplace safety improvements beyond PPE	Machine safety, hazard elimination, engineering controls, workplace design, administrative controls, safety systems
Theme 6: Strategies for improving PPE compliance and reducing occupational injuries	Improvement measures; Future safety interventions; Worker and organisational recommendations	Better PPE supply, continuous training, stronger monitoring, employee involvement, improved safety culture, policy improvements

Analysis and Findings

Theme 1: Occupational hazards and workplace safety risks in the textile sector

Regarding occupational hazards that employees experience at textile workplaces, all respondents identified that workers are exposed to several hazards such as dust, machines, noise, and chemicals. From the answers of respondents, it can be observed that occupational injuries do not just result from unsafe conditions at work but also from a lack of preventive actions and awareness about safety among workers. Prior studies on this matter have also claimed that occupational risks for textile workers are complicated in nature since continuous exposure to hazards results in injuries (Hoque, Alam & Sammi, 2026).

One participant (P1) reported that:

"In our department, there are various hazards for employees, including cotton dust, injuries from machines, and noise. Sometimes workers become used to these conditions and do not consider them dangerous, which increases the chances of accidents."

Similarly, another participant (P3) mentioned that:

"Most workers know that there are risks, but because production targets are important, safety practices are sometimes ignored. Workers continue their tasks even when conditions are not completely safe."

These findings indicate that occupational injuries depend not only on the presence of hazards but also on the perception of hazards among workers. This finding aligns with Lomotey (2025), who stated that safety behavior is highly affected by the safety climate in the workplace and the interpretation of organizational commitment to safety by the workers.

Theme 2: Availability and effectiveness of PPE in preventing occupational injuries

Respondents reported on both the availability and effectiveness of PPE at workplaces. Most respondents agreed that PPE is an important part of protection against hazards encountered in the workplace; nevertheless, they mentioned some problems with respect to the availability and adequacy of the PPE. Therefore, it is clear that for PPE to be effective, it should not only be available but also adequate.

One participant (P2) stated:

"PPE is helpful because masks and gloves provide protection from dust and injuries, but sometimes the available equipment is not comfortable, or workers do not receive replacements on time."

Another participant (P5) explained:

"PPE can reduce injuries, but it cannot completely protect workers if machines are unsafe or workplace conditions are poor."

According to the results, while the use of PPE is seen as a critical preventative strategy, it is not viewed as a perfect solution for all occupational safety issues. The findings are consistent with Verbeek et al. (2020), who stated that PPE may decrease occupational exposure; it is better integrated into safety management.

Theme 3: Factors influencing PPE compliance behaviour among textile workers

The results indicated that the use of PPE by workers is affected by a number of factors, including behavioral and workplace factors. Discomfort, inconvenience, production pressures and lack of supervision were cited as major factors responsible for non-use of PPE by workers. The above findings disprove the notion that the non-use of PPE is a result of workers' carelessness.

One participant (P4) reported:

"Some workers do not use PPE regularly because they feel uncomfortable, especially when working for long hours. They think it slows their work and affects productivity."

Similarly, P1 stated:

"If supervisors regularly check PPE usage, workers follow the rules more carefully. Without monitoring, some workers ignore PPE requirements."

These results indicate that wearing personal protective equipment compliance involves individual practice and organizational influence. These results corroborate the findings of Baye et al. (2022), who identified the comfort, availability of equipment, and supervision as important elements of the work environment that affect the use of PPE among industrial workers.

Theme 4: Organisational support, training, and safety management practices

According to the participants, organisational support was one of the crucial factors contributing to the promotion of PPE compliance. Almost all the participants indicated that safety training and the participation of supervisors have some influence on employee compliance. However, according to the participants, the safety training sessions are inconsistent and require follow-up.

One participant (P3) explained:

"Training is provided, but sometimes it is only given when workers join. Continuous training and reminders are needed because workers can forget safety procedures."

Another participant (P5) stated:

"Management support is important because workers take safety seriously when supervisors also follow and enforce safety rules."

The findings from these studies indicate PPE adherence is linked to organisational safety culture. Tamers et al. (2020) support the current research findings and argued that for occupational safety to be achieved, there must be organisational commitment and management participation.

Theme 5: Relationship between PPE compliance and occupational injury prevention

According to the interviewees, PPE compliance was one of the factors that contributed to reducing injuries in the workplace; however, they pointed out that PPE could not fully minimize the risk in the workplace. Although PPE minimized injuries, other measures were also required for safety.

One participant (P2) stated:

"When workers use PPE properly, injuries are reduced, especially injuries related to dust and minor accidents. But unsafe machines and poor working conditions can still cause problems."

Similarly, P4 mentioned:

"PPE provides protection, but the company must also improve machines, maintenance, and workplace safety systems."

Findings indicate that personal protective equipment is one of the elements in the occupational safety system. These findings are supported by Santos et al., who stated that while PPE helps to prevent injuries, its effectiveness depends on training and enforcement, among other factors.

Theme 6: Strategies for improving PPE compliance and reducing occupational injuries

Participants discuss several methods for enhancing PPE compliance, such as training, enhancing PPE quality, supervision and worker participation. The results demonstrate that the enhancement of PPE compliance should be achieved through a combination of actions from both workers and management.

One participant (P1) stated:

"The company should provide better quality PPE and conduct regular safety sessions. Workers should also understand that PPE is for their own protection."

Another participant (P5) mentioned:

"Monitoring should be improved because workers follow safety rules when they know management takes safety seriously."

The results reveal that sustainability of compliance with the use of PPE is dependent on behaviour and organizational change. Ada et al. (2025), noted that the success of PPE programs lies in education, provision of adequate equipment and safety in the workplace and not merely the supply of PPE.

Discussion of Findings

The findings of the current study show that the use of PPE significantly influences the prevention of workplace accidents amongst textile workers; however, its effectiveness is dependent on certain workplace and organizational aspects. First, the findings have shown that there are a number of hazards associated with the occupation, such as cotton dust, mechanical hazards, noise, and chemical hazards. Despite the fact that the participants of the study were aware of the workplace hazards and the significance of PPE use, the consistency of wearing protective equipment has been affected by the lack of availability of the equipment, discomfort, production pressures, and insufficient monitoring.

The results that confirm the significance of PPE in terms of reducing workplace injuries are aligned with the results of Verbeek et al. (2020), who stated that PPE is effective in reducing occupational exposure provided that it is properly selected, maintained, and used. In turn, Santos et al. (2025) stated that PPE usage leads to injury prevention; however, its efficacy is influenced by worker training, supervision, and organisational support. The current study adds to the literature by stating that PPE is valued by the textile workers, although its protective effect is minimal if the working conditions do not support its proper usage.

Moreover, this study shows that PPE availability, comfort, and suitability are crucial factors in compliance with safety rules. Workers claim that damaged, uncomfortable or inappropriate protective equipment decreases their intention to wear such devices

consistently. These findings are supported by Baye et al. (2022), who found that PPE usage among industrial workers is determined by the quality of the equipment, its accessibility and perceived usefulness. Consequently, PPE non-compliance is more than an individual issue.

Moreover, the results demonstrate the important significance of safety training, management and supervision in enhancing PPE compliance. The study showed that employees tend to adhere to safety guidelines if supervisors closely monitored the use of PPE and management took workplace safety seriously. This is consistent with Hubert et al. (2025), who argued that safety climate significantly affects the safety behavior of workers.

In addition, the study demonstrated that PPE does not guarantee protection from occupational injuries, as participants identified machine safety, work environment improvement, and other precautionary steps as being equally important. This corroborates Tamers et al. (2020), whose findings suggested that successful occupational safety requires a multi-factor approach that considers workers' behavior, organizational systems and prevention efforts.

Conclusion

This research focused on the influence of PPE compliance on occupational injury prevention in the textile industry. The results show that PPE compliance is a significant factor in preventing workers from occupational hazards. At the same time, it should be noted that the efficiency of PPE compliance depends not only on its presence but also on the employees' intention to use it and the conditions in the organisation. The results showed that the workers in the textile industry are at risk of different occupational hazards such as dust, mechanical, noise, and chemical hazards. While the participants understood the significance of PPE, the factors that affected PPE compliance included equipment availability, safety training, comfort, management involvement, and monitoring of the work environment. It is important to note that PPE compliance cannot be regarded as a personal issue of the employee.

Moreover, the research shows that PPE alone is not sufficient for complete prevention of injuries at the workplace. An integrated safety strategy that includes proper use of PPE along with training, a safety culture, supervision, and workplace improvement is needed to achieve injury prevention. This research adds value to the literature available on occupational health and safety by offering context-based insight on the usage of PPE in the textile industry, along with the lack of empirical studies on PPE compliance and injury prevention in Pakistan. In conclusion, this research shows that for improved compliance with PPE, collective efforts by the workers, the supervisors, and management of the organisation are required. Proper usage of PPE and development of a safety awareness program and safety management system are needed in textile industries.

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