MINH
MALAHAYATI INTERNATIONAL JOURNAL OF NURSING AND HEALTH SCIENCE
ISSN 2620-9152 (Print)
ISSN 2621-4083 (Online)
DOI: 10.33024
Nomor: 79/E/KPT/2023

ARTICLE INFORMATION
Received: September, 9, 2025
Revised: December, 30, 2025
Available online: December, 30, 2025
at : https://e-jurnal.iphorr.com/index.php/minh

Occupational health and safety management: The use of personal protective equipment (PPEs) in Indonesian mechanical workshop

Nurul Aziza*, Febria Listina, Regina Putri Mariantari

Fakultas Kesehatan, Universitas Mitra Indonesia
Corresponding author: *E-mail: nurul@umitra.ac.id

Abstract

Background: A work accident occurs when an incident occurs during an industrial or related work process and results in the loss of time, property, or life. A work accident is an undesirable and often unpredictable event. Every year there are almost a thousand times more non-fatal work accidents than fatal work accidents.
Purpose: To examine how the implementation of the use of Personal Protective Equipment (PPE) by workshop mechanics.
Method: This type of research is descriptive qualitative. Data were collected through in-depth interviews with five informants: one key informant, one source informant, and three supporting informants. Each interview was conducted in one day, with a duration of no more than 30 minutes per respondent, using data analysis triangulation.
Results: PT X has not implemented the use of PPE optimally, as it has not issued warnings or sanctions to its mechanics. The mechanics are also not yet aware of the importance of using complete PPE in carrying out their work. PT X has not conducted monitoring and evaluation of PPE.
Conclusion: The ineffectiveness of the implementation of the use of PPE at PT X is due to the absence of strict regulations and sanctions given to mechanics, the lack of availability of PPE in various sizes for mechanics so that mechanics are less comfortable wearing all-size PPE. It is hoped that PT can enforce strict rules regarding PPE in the company, provide complete PPE and conduct monitoring and evaluation of the implementation of PPE.

Keywords: Implementation; Mechanics; PPE.

INTRODUCTION

Personal protective equipment (PPE) is a tool used by health workers for years to protect patients from microorganisms present in health workers, PPE equipment used by health workers to protect themselves during work includes work clothes that must be worn while working such as, head protection (helmet), gloves (gloves), eye protection (eye protection), face protection (face protection), reflective clothing, shoes, hearing protection (hearing protection) and respiratory protection (masks). Work accidents (WT) and the diseases derived from them make countless victims every year. In addition to impairing work activities, they have significant economic, social and environmental impact. (Rosyanti & Hadi, 2020; Gonçalves & Dias, 2011)

There are 317 million work-related accidents occurring each year worldwide. WA and work-related diseases make 6,300 fatal victims daily, i.e., 2.3 million people die every year as result of work. A work-related accident occurs when it occurs in an industrial or related work process and results in the loss of time, property, or life. A work-related accident is an unwanted and often unpredictable incident (Kristiawan & Abdullah, 2022). According to data, 2.78 million workers die each year due to work-related accidents and diseases. Approximately 2.4 (86.3 percent) of these deaths are due to work-related diseases, while more than 380,000 (13.7 percent) are due to work-related accidents. Every year, there are almost a thousand times more non-

DOI: https://doi.org/10.33024/minh.v8i10.1540

fatal work-related accidents than fatal ones. Non-fatal accidents affect an estimated 374 million workers each year, and many of these accidents have serious consequences for workers' earning capacity (International Labour Organization, 2018).

Hazards threatening the safety and health of metal-mechanic workers are strongly related to the various modalities of work and production management. The physical, cognitive and mental demands at work might translate as disease when they exceed the workers' capacity for recovery (Veiga, Xavier, & Lenzi, 2012). As a rule, the lack of standardized organization of work meeting the productive capacity and available resources - usually influenced by the market demands - alter the rhythm of production, causing changes in the organization of work, with consequent increase of the work-related environmental and psychosocial hazards (Fernandes, Assunção, & Carvalho, 2010).

In 2020 there were 3,355 fatal accidents at work in the EU, with a mere 53 deaths decrease compared to 2019. More than 20 % of all fatal accidents took place within the Construction industry. Similar studies revealed that falls are a primary cause of accidents and the greatest occupational hazard in many countries, thus this will be the focus of this paper (Gavious, Mizrahi, Shani, & Minchuk, 2009, Hu et al., 2011). In 2020, slipping, stumbling or falling was one of the most common causes for non-fatal occupational accidents (17.6 %) and the fatal accidents (13.8 %). At European level, most of the fatal and non-fatal accidents due to fall took place within the Construction industry (Eurostat, 2023).

Law Number 23 of 1992 concerning health stipulates that every workplace must implement occupational health measures to prevent health problems for workers, their families, the community, and the surrounding environment. The use of PPE can be influenced by several factors, such as human factors, the condition of the PPE, and the comfort of the wearer. Correct use of PPE will help reduce the high risk of accidents or occupational diseases. To achieve this, the PPE used must be designed in accordance with studies on ergonomics and occupational Health and Safety (Benu, Roga, & Ruliati, 2022).

Controlling the hazard factors carried out in order to minimize or even eliminate occupational diseases and accidents requires technical and administrative control, but many companies refuse to carry out such control because of the high costs. Therefore, companies strive by recommending PPE as an early protection effort against occupational accidents and occupational diseases and the use of personal protective equipment (PPE) should be the final recommendation for companies in protecting workers from occupational factors and hazards (Ammad, Alaloul, Saad, & Qureshi, 2021).

A significant relationship between work attitudes and workplace accidents. Work attitudes can reflect the knowledge gained and actions taken. A worker's attitude toward the use of PPE is directly proportional to their awareness and knowledge. The better their attitude and behavior, the more aware they are of using PPE at work to maintain their own safety (Edigan, Sari, & Amalia, 2019).

The use of personal protective equipment (PPE) at work can reduce the risk of workplace accidents. Workers who comply with the use of personal protective equipment tend to experience a lower risk of workplace accidents. Not using personal protective equipment (PPE) at work is unsafe behavior and can lead to workplace accidents. The use of Personal Protective Equipment (PPE) is the final stage of the method of controlling accidents and occupational diseases. The significant benefits of using Personal Protective Equipment (PPE) at work do not guarantee that all workers will use it because it turns out that many workers still do not use it. Many factors influence worker behavior that leads to not using personal protective equipment. Therefore, researchers are interested in examining the relationship between knowledge and length of service with the use of personal protective equipment (PPE) in welding workers.

The results of the initial survey and interviews with 5 mechanics at X Company found that accidents often occur in the workplace, both minor and serious accidents. Mechanics at X Company often slip due to fluids from trucks, are punctured by car engines, are crushed by heavy equipment, have prolonged coughing, develop eczema on the skin, are exposed to sparks while welding, are exposed to chemical fluids and in 2024 there were 2 mechanics who were scratched by truck engines which caused stitches on several parts of their legs. This was because the

Nurul Aziza*, Febria Listina, Regina Putri Mariantari

Fakultas Kesehatan, Universitas Mitra Indonesia
Corresponding author: *E-mail: nurul@umitra.ac.id

DOI: https://doi.org/10.33024/minh.v8i10.1540

mechanics never used complete and effective personal protective equipment. At the time of the survey, all mechanics only wore workshop uniforms and flip-flops while doing their work. In 2025 from January to May there were 3 cases of mechanics suffering burns, 5 cases of mechanics suffering engine scratches, and 1 suffered stitches due to a sharp object under the truck.

Based on the accident data obtained, cases of work accidents such as cuts and cuts when checking hand tools into the trellis are due to a lack of knowledge about occupational safety and health (Occupational Health and Safety) where PPE equipment is not used or utilized by workshop employees, this is because employees think wearing PPE slows down work. For accident cases such as falls, this is due to a less careful work attitude due to environmental factors such as slippery work floors and rushing to work when operating tools to meet targets, as well as some workers joking and chatting with their friends. And for eye irritation due to not using complete personal protective equipment, namely during the welding process, it can cause exposure to the heat of the welding flame and over time the eyes of workers can be damaged due to exposure to very bright light from the welding process carried out without glasses. The company does not provide adequate PPE and the lack of awareness of mechanics about the importance of using complete PPE is the result of frequent work accidents in Company X, therefore researchers are interested in taking this research.

RESEARCH METHOD

This study uses a descriptive qualitative approach. Its goal is to uncover facts and circumstances that occurred during the study and present them as they are. Qualitative descriptive research explains and narrates data related to the situation, attitudes, and perspectives within the company regarding the Implementation of Personal Protective Equipment (PPE) use in workplace accidents.

A qualitative approach with purposive sampling was applied as the technique for selecting informants. Informants were deliberately chosen based on specific criteria to ensure that they could provide relevant and in-depth information about the phenomenon under investigation. Data was collected through in-depth interviews with five informants: one key informant, namely the Branch Manager, one source informant, namely Human Resource Development (HRD), and three supporting informants, namely 1 workshop head and 2 mechanics.

In the preparation stage, the researcher conducted a preliminary study and selected PT X as the research location because PT X frequently experiences work accidents, especially among mechanics while carrying out their work. After obtaining permission from the relevant authorities, participants were selected based on inclusion criteria and asked to complete a consent form. In the data collection stage, the researcher conducted structured interviews with informants. In the final stage, the data obtained was processed and analyzed to produce findings relevant to the research focus.

Data analysis in this study was conducted in three stages: Data triangulation, which involved input indicators covering planning the implementation of PPE use; process indicators covering implementation and reporting; and output indicators covering monitoring and evaluation of PPE use. Data presentation included a set of structured information that provided the possibility of drawing conclusions and taking action in qualitative descriptive research. Drawing conclusions interpreted the meaning of the data that had been presented. Between data display and drawing conclusions, there was an existing data analysis activity.

This research has been approved by the Health Research Ethics Committee, Faculty of Health, Mitra Indonesia University, with approval number S.25/154/FKES10/2025, dated May 10, 2025.

Nurul Aziza*, Febria Listina, Regina Putri Mariantari

Fakultas Kesehatan, Universitas Mitra Indonesia
Corresponding author: *E-mail: nurul@umitra.ac.id

DOI: https://doi.org/10.33024/minh.v8i10.1540

RESEARCH RESULTS

Table Characteristics of Participants (N=5)

Participant	Informant Position	level of education	Age	length of work (year)
1.01	Branch Manager	Bachelor	42	3
1.02	HRD	Bachelor	33	5
1.03	Head Mechanic	Bachelor	34	4
1.04	Mechanic	Senior High School	30	3
1.05	Mechanic	Senior High School	28	3

The table shows that the fifth informant is an employee at X Company, namely 1 Branch Manager, 1 HRD, 1 Workshop Manager, and 2 mechanics. With an educational level of 3 undergraduates, and 2 high school graduates. The age range for all informants is 28 to 42 years. And the length of service for all informants is above 3 years.

After data analysis, several key themes were identified as factors causing the ineffective implementation of PPE use at Company X, including (1) Company X was not firm in its policy on PPE use, (2) Mechanics were not comfortable using all-size PPE, (3) PPE was not complete according to the identification of work accidents, (4) there was no monitoring and evaluation of Occupational Health and Safety related to the use of PPE (5) much of the PPE was outdated.

Analysis obtained from interview data indicates a strong relationship between company policy and mechanic behavior regarding the use of PPE. This is indicated by the results of direct observations by researchers who found that almost all mechanics only wear uniforms and sandals when carrying out their work, mechanics do not use special shoes, gloves, glasses, or special wear packs. Most informants reported that there was no firm reprimand from the company against mechanics regarding the discipline of using PPE. This observation is supported by the following statement from one informant:

“It's just a matter of awareness, sis, if you want to use PPE, there are no warnings or letters of warning.” (Informant 1.03).

“There was no official warning, maybe the workshop manager reminded them to wear PPE.” (Informant 1.02).

“There are none because they definitely know the capacity to work” (Informant 1.01).

Mechanical compliance plays a significant role in the implementation of PPE use. Most informants reported feeling uncomfortable wearing PPE. This is supported by a statement from one informant.:

"The shoes are a bit hot, the helmet also makes your head hot, so it's better not to wear it." (Informant 1.04).

“If it's light work, we don't really use it, sis.” (Informant 1.05) The availability of PPE according to risk identification is not adequate, it has been proven to be a factor causing work accidents:

"Slipping is quite common because of oil spills on the floor." (Informant 1.03)

"Eye irritation is often caused by dust around the truck body, but after that, just washing your face is enough." (Informant 1.04)

" I often get bumped, as a mechanic, so it's normal." (Informant 1.05)

The failure to monitor and evaluate Occupational Health and Safety, particularly personal protective equipment (PPE), also contributes to the suboptimal use of PPE. This is supported by informants' statements:

"We do have audits, but they come directly from the central manufacturer. They come maybe twice a year." (Informant 1.01)

"There's nothing from the office itself, sis, most of our focus is on selling." (Informant 1.02)

"Never, sis, if for example there is a broken tool, we just report it straight away." (Informant 1.03).

PPE maintenance is not carried out routinely, resulting in many pieces of PPE being worn out or even damaged. This was discovered when researchers directly observed the special PPE

Nurul Aziza*, Febria Listina, Regina Putri Mariantari

Fakultas Kesehatan, Universitas Mitra Indonesia
Corresponding author: *E-mail: nurul@umitra.ac.id

DOI: https://doi.org/10.33024/minh.v8i10.1540

storage area, where they found that safety glasses were heavily scratched, some helmets were slightly cracked, and some wear packs had holes in them. This is supported by information from informants.

"Because sometimes some mechanics put it in haphazardly, sis, or sometimes they work quickly." (Informant 1.03).

"Yes, because they don't care enough, so they don't have any affection for the item, so they just put it there." (Informan 1.01)

"Maybe because there is no specific standard operating procedure for maintenance and storage, so they don't know what to do when they have finished using it." (Informant 1.02)

"Because the others were like that, I just obeyed sis, they too, when they were finished, just put it in the dumps, there was no one to wipe or wash, so I just went along with it." (Informant 1.05)

DISCUSSION

From the results of interviews with key informants, source informants and supporting informants regarding the Implementation of PPE at PT shows that the planning of the use of PPE at PT Bumen Redja Abadi does not have a fixed SOP regarding the use of PPE in the workplace but there is an SOP that regulates Occupational Health and Safety in general from the Factory or third parties. All mechanics have received Occupational Health and Safety certificates through training provided directly by the factory center which was given before they entered work for the first time. There is still a lack of mechanics getting facilities to participate in training on Occupational Health and Safety because most of the training they participated in was about machines. From the interviews, researchers also found that there is a lack of discipline in the effective implementation of PPE, namely there is no warning if the mechanic does not use complete PPE so that the mechanic only wears a wear pack and flip-flops while working.

Lack of occupational safety training and not using PPE are significant predictors of work accidents among construction workers. Lack of occupational safety awareness and PPE are the first and third leading causes of work injuries among construction workers. Lack of occupational safety training and use of PPE increased the risk of work injuries among construction workers by 5.1 and 3.6, respectively. Furthermore, construction workers who participated in occupational safety training programs and those who used PPE experienced a 3-fold and 1.5-fold decrease in injury prevalence compared to other workers (Jazari, Jahangiri, Khaleghi, Abbasi, Hassanipour, Shakerian, & Kamalinia, 2018; Tadesse & Israel, 2016).

Companies contribute to encouraging OSH stakeholders to prioritize worker fall prevention and protection through the development and implementation of frameworks for action, coordination, cooperation, and knowledge exchange. This research provides evidence of the need to emphasize the promotion of occupational safety and health management in efforts to eliminate workplace accidents due to falls, especially in industries with a high risk of falls (Varianou-Mikellidou, Nicolaidou, Vogazianos, Boustras, Dimopoulos, & Mikellides, 2025).

The systematic activity of safety-driven management to protect employees and control hazards related to health and safety is called safety management (Hanafi, 2018). Furthermore, safety management is more than investigating accidents and hazardous identification (Calway, 2001). Typically, safety management is all about arranging safety training, safety promotion, accident-prevention practices, and the development of safety culture (Kirwan, 1998).

According to researchers, planning the use of PPE in the workplace involves several important steps. First, identify workplace hazards to determine the type of PPE needed. Then, select PPE that meets standards and needs, ensuring it functions properly and is comfortable to wear. Also, plan training on PPE use, proper maintenance, and storage. Finally, conduct regular monitoring and evaluation to ensure the effectiveness of the PPE program.

The results of the study found that the PPE provided by X Company was incomplete because it was not equipped with a reflective vest, face shield, mask or respirator and earmuff. And the size provided by PT was only 1 size so that mechanics who had a large body posture were not comfortable in using the PPE provided by company. There was no special observation or checking of each PPE so that researchers found many dusty protective

Nurul Aziza*, Febria Listina, Regina Putri Mariantari

Fakultas Kesehatan, Universitas Mitra Indonesia
Corresponding author: *E-mail: nurul@umitra.ac.id

DOI: https://doi.org/10.33024/minh.v8i10.1540

helmets, worn gloves and holes, and scratched protective glasses resulting in unclear vision when wearing them.

In the Occupational Safety and Health Law No. 1 of 1970, it provides legal protection to workers who work so that production places and equipment are always in a safe and secure condition for them. In addition, Article 86, paragraph 5 of Occupational Safety and Health, Chapter X of Law Number 13 of 2003 concerning employment, among others, states that every worker has the right to obtain protection for Occupational Health And Safety; to protect worker safety in order to realize optimal work productivity, Occupational Health and Safety efforts are carried out, and the protection referred to is implemented in accordance with applicable laws and regulations. The explanation of Article 86, paragraph 2 states that Occupational Health and Safety efforts are intended to provide safety guarantees and improve the health of workers by preventing accidents and occupational diseases, controlling hazards in the workplace, health promotion, treatment, and rehabilitation (Suma'mur, 1989).

Personal protective equipment, commonly known as “PPE”, as equipment worn to minimize exposure to a variety of hazards, and recommends a battery of protective gear to construction workers. It includes eye and face protection (safety glasses, goggles, or face shields), foot protection (safety shoes), hand protection (gloves), head protection (hard hats) and hearing protection (earplugs/earmuffs) (Occupational Safety and Health Administration, 2005).

The effectiveness of personal protective equipment (PPE) use in the workplace also depends on workers' experience in using it. As identified by Hare and Cameron, workers who are experienced in using personal protective equipment (PPE) on a construction site will know what to do, how to use it, and how to maintain its function. Experienced workers will also have a positive effect on the construction site because these workers will be able to supervise the use of personal protective equipment (PPE) on the construction site by other workers present. This will increase the effectiveness of personal protective equipment (PPE) use on the site where they work (Spillane & Oyedele, 2013).

According to researchers, the general form and model of personal protective equipment (PPE) depend heavily on the results of a hazard analysis, which can indicate which parts of the body are potentially exposed to hazards. The following illustration illustrates the various types of PPE commonly used. PPE is made from a wide variety of materials. Determining the appropriate material must be based on a hazard assessment. If PPE alone is deemed insufficient to protect workers, additional protection, which can be primary or secondary, is necessary. For example, in welding work, workers must wear PPE along with eye and face protection. According to researchers, PPE is a last resort for protecting workers. When selecting PPE, consideration must be given to the appropriateness of the type of PPE to the hazard at hand and its ability to reduce or even eliminate the potential risks.

The research found that X Company rarely reports on PPE, only reporting on sales, machinery, collaborations, and other matters. Reporting is only done if PPE is proven to be damaged, such as a broken helmet or scratched goggles. However, replacing PPE takes a very long time, almost a year for the company to receive new PPE.

Worker protection through various technical efforts to secure the workplace, equipment, and environment is very important. Sometimes dangerous conditions cannot be fully controlled, so personal protective equipment is used. Protective equipment must be comfortable to wear, not interfere with work, and provide effective protection. The PPE used must meet the requirements, namely being comfortable to wear; not interfering with work execution; and providing effective protection against the types of hazards faced (Suma'mur, 2017).

Researchers believe X Company remains very weak in reporting, particularly regarding PPE, as the company focuses on sales and other divisions that drive its performance. During several external audits regarding OHS (Occupational Health and Safety), X Company was reprimanded for its policy system, and OHS observers specifically conducted weekly reports specifically addressing OHS in the workplace.

According to researchers, supervision can influence employee behavior, particularly regarding the use of PPE. This encourages workers to be more consistent in using PPE correctly while performing their duties. According to Ministry of Manpower Regulation No. 09 of 2016, companies are

Nurul Aziza*, Febria Listina, Regina Putri Mariantari

Fakultas Kesehatan, Universitas Mitra Indonesia
Corresponding author: *E-mail: nurul@umitra.ac.id

DOI: https://doi.org/10.33024/minh.v8i10.1540

recommended to conduct optimal supervision to improve compliance with PPE use in the workplace. This includes identifying and requiring PPE requirements to assess worker safety and health, and selecting appropriate PPE, such as protecting against physical hazards, preventing exposure to hazardous materials, and reducing the risk of work-related injuries and illnesses. The use of PPE is mandatory, commensurate with the risks and hazards associated with the job. This aims to ensure safety not only for the worker himself but also for other workers around him.

Research findings indicate that X Company improvement efforts are still minimal, as it rarely conducts monitoring and evaluations related to PPE. Audits have been conducted, but they were conducted by the central (factory) side, and there have been no evaluations or improvements. Therefore, the company has not conducted routine monitoring and evaluations related to Occupational Health and Safety, specifically regarding the implementation of PPE.

Worker protection through various technical measures to secure the workplace, equipment, and environment is crucial. Sometimes, hazardous conditions cannot be fully controlled, necessitating the use of personal protective equipment. Protective equipment must be comfortable to wear, not interfere with work, and provide effective protection. The PPE used must meet the following requirements: comfortable to wear, not interfere with work performance, and provide effective protection against the various hazards encountered (Suma'mur, 2017).

Researchers believe X Company remains very weak in reporting, particularly regarding PPE, as the company focuses on sales and other divisions that drive its performance. During several external audits regarding OHS (Occupational Health and Safety), X Company was reprimanded for its policy system, and OHS observers specifically conducted weekly reports specifically addressing OHS in the workplace.

According to researchers, supervision can influence employee behavior, particularly regarding the use of PPE. This encourages workers to be more consistent in using PPE correctly while performing their duties. According to Ministry of Manpower Regulation No. 09 of 2016, companies are recommended to conduct optimal supervision to improve compliance with PPE use in the workplace. This includes identifying and requiring PPE requirements to assess worker safety and health, and selecting appropriate PPE, such as protecting against physical hazards, preventing exposure to hazardous materials, and reducing the risk of work-related injuries and illnesses. The use of PPE is mandatory, commensurate with the risks and hazards associated with the job. This aims to ensure safety not only for the worker himself but also for other workers around him.

CONCLUSION

PPE implementation at Company X is still not optimal due to incomplete equipment, limited sizing, and discomfort, causing many mechanics to avoid using proper PPE. The reporting system is poorly implemented and mainly limited to damaged PPE, while regular monitoring and evaluation have not been conducted. Audits are only carried out by the central factory and provide general assessments. Companies are expected to supply PPE that meets applicable standards, ensure proper fit and suitability to workplace hazards, provide training, identify PPE needs, enforce compliance with appropriate sanctions, and conduct regular inspections, evaluations, and reporting to ensure PPE remains functional and effectively used.

REFERENCES

Ammad, S., Alaloul, W. S., Saad, S., & Qureshi, A. H. (2021). Personal Protective Equipment (PPE) usage in Construction Projects: A Systematic Review and Smart PLS Approach. *Ain Shams Engineering Journal*, *12*(4), pp. 3495–3507.

Benu, V., Roga, A.U., & Ruliati, L. P. (2022). Hubungan Antara Faktor Predisposisi dan Faktor Pemungkin Dengan Kecelakaan Kerja pada Pekerja Las Listrik di Kota Kupang. *Jurnal Pangan Gizi dan Kesehatan*, *11*(1), 51–63.

Calway, R. C. (2001). Safety and compliance-related hazards in the medical practice: Part 2. *J. Med. Pract Manage*, *17*(1), 28–31

Edigan, F., Sari, L. R. P., & Amalia, R. (2019). The Relationship Between Occupational Safety Behavior and the Use of Personal Protective Equipment (PPE) Among Employees of PT Surya Agrolika Reksa in Sei. *Jurnal Saintis*, *19*(2), 61-70.

Nurul Aziza*, Febria Listina, Regina Putri Mariantari

Fakultas Kesehatan, Universitas Mitra Indonesia
Corresponding author: *E-mail: nurul@umitra.ac.id

DOI: https://doi.org/10.33024/minh.v8i10.1540

Eurostat. (2023). Accidents at Work Statistics. Retrieved from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Accidents_at_work_statistics

Fernandes, R. C. P., Assunção, A. Á., & Carvalho, F. M. (2010). Mudanças nas formas de produção na indústria e a saúde dos trabalhadores [Changes in the forms of industrial production and their effects on workers' health]. *Ciência & Saúde Coletiva*, *15*(Suppl. 1), 541-549.

Gavious, A., Mizrahi, S., Shani, Y., & Minchuk, Y. (2009). Journal of Loss Prevention in the Process Industries The costs of industrial accidents for the organization : Developing methods and tools for evaluation and cost – benefit analysis of investment in safety. *Journal of Loss Prevention in the Process Industries*, *22*(4), 434-438.

Gonçalves, C. G., & Dias, A. (2011). Três anos de acidentes do trabalho em uma metalúrgica: caminhos para seu entendimento [Three years of work-related accidents in a metallurgic plant: ways to its understanding]. *Ciencia & saude coletiva*, *16*(2), 635–646.

Hanafi, W. N. W. (2018). Impact Of Safety Management Practices Enforcement toward Employee Safety in Construction Industry. *Proceedings of the 8th International Economics and Business Management Conference*, 541–549

International Labour Organization. (2018). Improving the Safety and Health of Young Workers. Retrieved from: https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_protect/@protrav/@safework/documents/publication/wcms_625223.pdf

Jazari, M. D., Jahangiri, M., Khaleghi, H., Abbasi, N., Hassanipour, S., Shakerian, M., & Kamalinia, M. (2018). Prevalence of self-reported work-related illness and injuries among building construction workers, Shiraz, Iran. *EXCLI journal*, *17*, 724–733.

Kirwan, B. (1998). Safety Management Assessment and Task Analysis A Missing Link? In Safety Management: The Challenge of Change. *Oxford: Elsevier*, 67-92.

Kristiawan, R., & Abdullah, R. (2020). Faktor Penyebab Terjadinya Kecelakaan Kerja Pada Area Penambangan Batu Kapur Unit Alat Berat PT. Semen Padang. *Journals Mining Engineering: Bina Tambang*, *5*(2), 11–21.

Lette, A., Ambelu, A., Getahun, T., & Mekonen, S. (2018). A survey of work-related injuries among building construction workers in southwestern Ethiopia. *International Journal of Industrial Ergonomics*, *68*, 57–64.

Occupational Safety and Health Administration. (2005). Construction Personal Protective Equipment (PPE) QuickCard. Retrieved from: https://www.osha.gov/sites/default/files/publications/construction_ppe.pdf

Rosyanti, L., & Hadi, I. (2020). Dampak Psikologis dalam Memberikan Perawatan dan Layanan Kesehatan Pasien COVID-19 pada Tenaga Profesional Kesehatan. *Health Information: Research Journal*, *12*(1), 107–130.

Spillane, J., & Oyedele, L. (2013). Strategies for effective management of health and safety in confined site construction. *Australasian Journal of Construction Economics and Building*, *13*(4), 50-64.

Suma'mur, P. K. (1989). *Keselamatan Kerja dan Pencegahan Kecelakaan Kerja*. Jakarta: CV. Haji Mas Agung.

Suma'mur, P. K. (2017). *Higiene Perusahaan dan Kesehatan Kerja (HIPERKES)*. Jakarta: PT Sagung Seto.

Tadesse, S., & Israel, D. (2016). Occupational injuries among building construction workers in Addis Ababa, Ethiopia. *Journal of occupational medicine and toxicology (London, England)*, *11*, 16.

Varianou-Mikellidou, C., Nicolaidou, O, Vogazianos, P., Boustras, G., Dimopoulos, C., & Mikellides, N. (2025). Analysis of fall accidents at work: The case of Cyprus (2010–2019). *Safety Science, 187*, 106871.

Veiga, R. A. R., Xavier, E. A., & Lenzi, F. C. (2012). Uma análise do processo produtivo e das condições ergonômicas do trabalho na Mefaro Indústria Metalmecânica. *Revista Ciência & Exatas Tecnolologia*, *7*(7), 97–106.

Nurul Aziza*, Febria Listina, Regina Putri Mariantari

Fakultas Kesehatan, Universitas Mitra Indonesia
Corresponding author: *E-mail: nurul@umitra.ac.id

DOI: https://doi.org/10.33024/minh.v8i10.1540