REVISTA CIENTÍFICA SISTEMÁTICA

Importance of using individual and collective protective equipment for accident prevention

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ABSTRACT
Personal Protective Equipment (PPE) refers to devices intended for personal use, whose function is to minimize certain types of accidents and offer protection against certain diseases that may arise due to the work environment. This equipment should be used when collective protection measures are not sufficient to eliminate the risks. Occupational accident is defined as any event related to professional practice that results in bodily injury, functional disorder or disease, which may cause death or loss, total or partial, temporary or permanent, of the ability to work.
Despite the presence of several risks in the work environment, the lack of consistency in the use of PPE continues to be one of the main factors that aggravate the severity of work accidents. PPE is extremely important for workers, as they allow them to carry out their activities safely, without compromising their health and physical integrity. Failure to use PPE can result in disastrous consequences, not only for the worker, but also for the employer and society in general. This is due to the increased incidence of occupational diseases and occupational accidents, resulting in negative economic and social impacts.

Keywords: Personal Protective Equipment (PPE), Worker safety, Safety, Environment and Health at Work Management System, Consequence of not using PPE.

INTRODUCTION

Occupational safety is currently a requirement and an essential function for business. The prevention or minimization of work accidents and occupational diseases contributes significantly to companies avoiding material losses, meeting established deadlines, reducing the drop in productivity, and also avoiding high compensation costs for victims and their families (NASCIMENTO, 2021).

According to Chiavenato (2009), safety at work encompasses a set of technical, educational, medical and psychological measures used to prevent accidents. This occurs both by eliminating unsafe conditions in the environment and by instructing or convincing people about the adoption of preventive practices. These measures are not only limited to the interests of workers, but also consider the interests of companies, since the positive or negative consequences will directly impact the finances and credibility of the brand or company.

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We've long heard that work can result in injury, illness, and even death. In 1700, the Italian physician Bernardino Ramazzini published the book "De Morbis Artificum Diatriba" (The Diseases of Workers), in which he identified 53 types of work-related diseases. He also proposed forms of treatment and prevention for some of these diseases. This study earned Ramazzini the title of Father of Occupational Medicine, thus establishing the connection between health and work. Despite these reports and evidence, few protection measures were established, as most victims of work accidents were slaves or people from the poorest strata of society (KONZEN et al., 2020).

With the emergence of the Industrial Revolution, which began as a pioneer in England during the eighteenth century, great transformations occurred throughout society. During this period, there was a significant emphasis on the changes applied to labor relations and the production system. It was at this time that the first PPE began to be introduced into the work routine of the working class, which at the time faced working hours of up to 16 hours. However, despite the recognition of the importance of implementing this protective equipment, the first legislation aimed at accidents and safety in the workplace only emerged some time later. (SILVA et al., 2019).

According to Bozza (2010), occupational accidents are events that occur in an unforeseen or calculated way, and in most cases could be avoided. These accidents can result in the partial or total, temporary or permanent loss of workers' ability to work, and may even lead to death.

The safety factor has always been an extremely relevant issue in all industrial activities, with the aim of reducing risks that threaten the life and physical integrity of workers. Historically, this concern arises naturally, since human beings have instincts to preserve life. Currently, considering that people are generally inserted in organizational environments, such as companies, it is natural that they seek to protect themselves in their daily activities (BALBO, 2011).

The International Labor Organization (ILO) has identified that, every 15 seconds, there is a death due to accidents or diseases directly related to work. In addition, every 15 seconds, 153 workers suffer work accidents. Every day, 6,300 deaths are recorded as a result of accidents or occupational diseases, resulting in more than 2.3 million deaths annually (ZANEL, 2016).

Faced with this reality, many companies, regardless of segment and size, have been concerned with providing workers with safe conditions for the development of their functions. Among these conditions, Personal Protective Equipment stands out, which allows professionals to carry out their work safely, avoiding health risks and preserving their physical integrity.

Following this line of reasoning, it is evident that Personal Protective Equipment is one of the most crucial elements for safety in the workplace. However, its use is often neglected for various reasons, such as lack of awareness of its importance, resistance on the part of workers, non-compliance with standards and regulations, or failure on the part of employers to properly select

equipment. It is recognized that the quality and ergonomics of PPE are fundamental not only for the effectiveness of workers' tasks, but, above all, to ensure their safety.

WORK SAFETY

For Lopes (2010), occupational safety refers to administrative measures adopted with the purpose of reducing or controlling the number of occupational accidents and diseases within a company. These measures aim to protect the physical and mental integrity of workers, allowing them to perform their duties in a healthy and safe manner.

Santos (2009) states that occupational safety is an area that encompasses several sciences and areas such as:

> Occupational Safety, Hygiene and Medicine, Prevention and Control of Risks in Machinery, Equipment and Facilities, Psychology in Safety Engineering, Communication and Training, Administration Applied to Safety Engineering, The Environment and Occupational Diseases, Occupational Hygiene, Legislation, Technical Standards, Civil and Criminal Liability, Expertise, Environmental Protection, Ergonomics and Lighting, Fire and Explosion Protection and Risk Management, Sociology, etc. (SANTOS, 2009).

According to Santos (2009), every company must have a Specialized Service in Safety Engineering and Occupational Medicine (SESMT). This service is composed of a multidisciplinary team that includes professionals such as Occupational Safety Technicians, Occupational Safety Technologists, Occupational Safety Engineers, Occupational Physicians, Occupational Nurses, Occupational Physiotherapists and Ergonomists. This team aims to ensure the safety of all workers in the organization. In addition, it is essential that the company has a Safety, Environment and Health at Work Management System aimed at preventive actions against occupational accidents, capable of identifying, evaluating and controlling the hazards and risks present in the work environment (SANTOS, 2009).

ERGONOMICS

According to Custódio (2006), the term "ergonomics" originates from two Greek words: "ergon" (work) and "nomos" (laws). It is a science that aims to analyze work, its conditions and the interaction of the worker with his activity or function. From this analysis, ergonomics provides the foundation for the development of tools that transform the work environment into a space that simultaneously promotes human well-being and healthy professional performance. In addition, according to the author, ergonomics is closely linked to the quality of life of the worker.

Historically, the term "ergonomics" was coined in 1857 in Poland. However, its practical application dates back to the prehistoric era, when human beings already sought to adapt the

environment to their needs, such as the anatomical modification of tools to facilitate construction or hunting. From the 2nd World War onwards, several scholars and researchers focused on the adaptation of instruments to promote a better interaction between human beings and technology, considering physical, psychological and cognitive aspects. This effort culminated in the creation of the Ergonomic Research Society in 1949, a society dedicated to the study of man in his work environment. These events are considered important milestones in the evolution of ergonomics to the present day, highlighting the growing attention to detail of the work environment, both internal and external, to ensure full compatibility between man, task, machine and environment (CUSTÓDIO, 2006).

Regulatory Standard 17 (NR 17) establishes guidelines to adapt working conditions to the characteristics of workers, with a special focus on ergonomics, safety and health in the workplace. Its purpose is to ensure that all workplace practices, including material handling, workspace organization, and the utilization of equipment and furniture, are designed and implemented in a manner that promotes the physical and mental well-being of workers, reducing the risk of injury and increasing operational efficiency.

NR 17 determines that organizations must carry out ergonomic evaluations to adapt the work to the characteristics of workers, promoting safety and health in the workplace. These assessments can adopt qualitative, semi-quantitative or quantitative methods, and should be integrated into the process of hazard identification and occupational risk assessment. The implementation of these guidelines aims to ensure that all working practices and conditions are designed in a manner that minimizes risk, improves worker well-being, and increases operational efficiency.

PERSONAL PROTECTIVE EQUIPMENT

According to Regulatory Standard 6 (NR 6): "Personal Protective Equipment is considered to be any device or product for individual use used by the worker, intended to protect against risks likely to threaten safety and health at work" (BRASIL, 1978). This means that the legislation establishes PPE as a protective measure that the worker must use to ensure that there are no risks to their health and physical integrity.

According to Almeida-Muradian (2002), the main purpose of PPE is to protect workers' health, reducing the risks associated with exposure to products, equipment and environments that may affect their health. The author also points out that these work tools are extremely important for both the worker and the employer, and must undergo tests and approvals by the competent authority to ensure their effectiveness.

For Montenegro and Santana (2010), the proper use of PPE by workers plays a crucial role in protecting against occupational risks.

> Prevention is a reason for the safety of the individual in the work environment and is of fundamental importance, because, without this prevention, accidents may occur, harming not only the company, but also the worker, his family members and society. (MONTENEGRO and SANTANA, 2010).

According to Almeida-Muradian (2002), employers must understand that protecting the health and physical integrity of their workers should not be seen as an additional cost, but rather as a responsible and strategic attitude. The proper use of PPE brings several significant advantages, such as increased productivity, reduced costs with paid and unworked hours, lower staff turnover, and less involvement in labor issues.

ORIENTATION AND TRAINING

Occasionally, some companies provide PPE to workers without considering the specific context of the work environment or the function performed by the employee. Studies such as those by Pelloso and Zandonaddi (2012) highlight the variety of types of protective equipment, each with specific functions, which must be selected and provided according to the part of the body to be protected.

> Head protection are the front brim, full brim or front brim type protective helmets. For eye protection, wear clear or dark safety glasses. Hearing protection, on the other hand, requires the shell or insert-type ("plug") hearing protector. In respiratory protection we have the disposable air purifying respirator with filter. The protection of the upper limbs is done by protective gloves in scrap, cowhide or rubber. The lower limbs are protected by protective shoes such as leather boots or rubber boots (long shaft). For fall protection with a difference in level, there are parachutist-type safety belts, adjustable safety lanyards, Y types with energy absorbers and fall arrest devices. The safety clothing is the jackets and pants in waterproof fabric. (PELLOSO AND ZANDONADDI, 2012).

Regarding training, Bley (2006) highlights:

> Prevention is a process and not a product, a finished and palpable object. It is a process as it is composed of chains of behaviors of professionals that in the end produce as a result, which is in the case of safety at work, the low probability of accidents occurring after the execution of an activity. (BLEY, 2006).

For Cunha (2006), both guidance and training on the use of PPE are extremely important steps to ensure the correct use of these instruments and, consequently, guarantee the complete protection of the worker. The author argues that it is essential to establish an educational security policy that trains employees, contributing to a more qualified staff able to perform their tasks safely and efficiently, in line with organizational objectives.

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RESPONSIBILITIES AND SANCTIONS

Labor legislation establishes responsibilities for both the employer and the employee in relation to the use of PPE. According to Brasil (2002), it is crucial to understand both obligations to ensure safety and compliance in the workplace.

Employer's obligation:

- Provide employees with the necessary and appropriate PPE for the development of the work, without risks;
- Instruct, guide and train employees and managers on the correct use of PPE and its importance;
- Inspect and require the use of PPE by employees;
- Replace damaged or obsolete PPE.

Worker's obligation:

- Require the employer to provide the necessary PPE for a healthy development of their function;
- Use and maintain the PPE provided

According to Brasil (2002), the sanctions for non-compliance with the obligations regarding the use of PPE are distributed as follows: the employer, if it does not comply with what is established by law, may face penalties both in the criminal and civil spheres, in addition to being subject to fines imposed by the Ministry of Labor. On the other hand, the worker who does not follow the legal determinations is subject to labor sanctions, and may, in some cases, be fired for cause.

INTERNAL ACCIDENT PREVENTION COMMISSION

By regulation, companies with more than 20 employees must constitute the Internal Commission for the Prevention of Accidents (CIPA), whose main objective is the prevention of work-related accidents and diseases, aiming at preserving the health and life of workers (OCCUPATIONAL SAFETY AND MEDICINE, 2008).

As a function of the CIPA, monitoring is highlighted to ensure a safe work environment, encouraging the correct use of PPE and carrying out equipment analysis to identify possible risk points, thus contributing to the continuous improvement of health and safety at work (OCCUPATIONAL SAFETY AND MEDICINE, 2008). In addition, the election of CIPA members takes place annually (PONTELO; CRUZ, 2011).

Regulatory Standard NR-5 establishes that it is the employer's responsibility to provide CIPA members with the necessary conditions for the effective performance of their duties, ensuring the

necessary time for the actions of the members according to the preventive work plan (SAÚDE E VIDA, 2017).

CAUSES OF OCCUPATIONAL ACCIDENTS AND THEIR IMPACTS

An occupational accident is defined as any event that occurs due to work, which may cause bodily injury, functional disturbance or disease that results in death, total or partial loss, temporary or permanent, for the performance of work activities (CHIAVENATO, 2009). A commuting accident refers to one that occurs during the journey between home and work, or vice versa, regardless of the means of transport used by the employee to make this journey.

Among the causes of occupational accidents, Riskex (2017), highlights some of the main factors that can contribute to the occurrence of accidents in the workplace, they are:

- **Lack of Training:** When workers do not receive proper training to perform their tasks safely, the risk of accidents increases. Insufficient knowledge about procedures, equipment, and safety measures can lead to serious errors.
- **Exhibitionism:** Some people may take unnecessary risks to impress colleagues or superiors. This can result in dangerous behaviors, such as ignoring safety rules or not wearing personal protective equipment.
- **Excessive Self-Confidence:** Excessive confidence can lead workers to underestimate risks. They may feel invulnerable and not follow the necessary precautions.
- **Intense Work Pace**: When the pace of work is too fast, workers may make mistakes, neglect safety procedures, or get tired, increasing the likelihood of accidents.
- **Personal Factors of Insecurity:** Some individuals have personal predispositions to risky behaviors. This can include impulsivity, distraction, lack of attention, or a tendency to ignore danger signs.
- **Unhealthy and Hazardous Environments: Workplaces** with unhealthy conditions, such as exposure to toxic chemicals, excessive noise, extreme heat, or lack of proper ventilation, increase the risk of accidents.

Accidents at work and occupational diseases have significant consequences for workers, companies and society at large. Let's explore these losses:

For the Employee:

- **Leave from Work:** When an employee is injured or becomes ill, they need to take time off work to recover. This results in lost productivity and production delays.

- **Physical and Psychological Integrity Affected:** Accidents and illnesses can cause physical and emotional damage. Pain, trauma, and anxiety affect the worker's quality of life.
- **Incapacity for Work**: Some accidents result in permanent or temporary disability. This can harm the employee's career and ability to make a living.

For the Company:

- Reduced Productivity: When an employee leaves, production is affected. This can lead to project delays and loss of efficiency.
- Financial Costs: The company bears the costs of leave, medical treatment, temporary replacement of the employee, and possible compensation.
- Reputational Damage: Frequent accidents can damage the company's image and drive away customers and investors.

For Society:

- **Referral to the National Institute of Social Security (INSS):** When a worker becomes disabled, he is referred to the INSS. This generates costs for the social security system.
- **Economic Impact:** Society bears the indirect costs of accidents, such as medical treatments, rehabilitation, and social security benefits.

OCCUPATIONAL DISEASE

According to Balbo's (2011) definition, work-related illness is classified as that caused by the unique and exclusive conditions where work is performed. On the other hand, occupational disease is generated by the performance of a job that has its own peculiarities.

The Occupational Health Medical Control Program (PCMSO), regulated by Regulatory Standard 7 (NR-7), has as its main objective the prevention, tracking and early identification of factors that may affect work-related health, including subclinical conditions, in addition to the detection of possible cases of occupational diseases or irreversible damage to workers' health (PONTELO; CRUZ, 2011).

At the PCMSO, several types of medical exams are carried out, such as admission, periodic, return to work, change of function and dismissal. In addition, the program includes activities aimed at quality of life, aiming to promote, protect and recover the health of employees (PONTELO; CRUZ, 2011).

FINAL CONSIDERATIONS

The use of Personal Protective Equipment (PPE) and Collective Protective Equipment (EPCs) plays a crucial role in the prevention of occupational accidents. Not only does this equipment protect workers from specific hazards in the workplace, but they are also critical to ensuring their long-term safety and health. The correct implementation and proper use of this equipment not only meet regulatory standards, but also demonstrate the commitment of companies to the well-being of their employees. In addition to reducing incidents, PPE and EPCs promote a safer work environment, increasing productivity and contributing to a positive organizational climate. Investing in awareness, training, and proper maintenance of this equipment is not only a legal obligation, but also a strategic measure to protect lives and preserve the physical integrity of workers.

The careful choice and availability of the appropriate types of PPE, accompanied by effective guidance and training on their correct use, are essential pillars to ensure the safety of workers. Additionally, it is crucial for employers to clearly communicate the legal obligations related to the use of PPE and the potential sanctions for non-compliance, thereby fostering a culture of compliance and safety.

Adopting preventive measures, such as the continuous provision of adequate training and the promotion of a culture of safety in the workplace, are practices that not only reduce the risk of accidents, but also demonstrate the company's commitment to the well-being of its employees. Constant monitoring of working conditions and ensuring the proper use of PPE are fundamental steps to minimize incidents and create a safe and productive work environment.

Raising awareness among everyone involved, from managers to frontline employees, is essential to strengthening safety at work. Mutual collaboration and shared responsibility are keys to achieving this common goal of accident prevention and occupational health promotion.

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