Occupational Health Hazards and Risks Facing Construction and Building Workers

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Abstract:

Construction workers face numerous occupational health hazards, including dusts, fumes, mists, and gases, as well as physical hazards like heat, cold, wind, rain, and ultra-violet rays. These workers are at risk for occupational accidents, occupational poisonings, chronic diseases, musculoskeletal issues, social stress, work-related diseases, injury, and death. The intermittent nature of construction work, heavy workload, and limited social support contribute to increased stress. The World Health Organization (WHO) reports that over half of occupational injuries and deaths worldwide occur among construction building workers. The main causes of construction worker deaths include falls, object strikes, electrocution, and caught-in/between objects. Accurate risk assessment depends on an individual's risk perception and tolerance.

Keywords: Occupational, Hazards, Workers.

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Introduction:

Construction industry is an economic investment, as construction workers represent around 180 million people, or 7% of global employment. The construction sector in Egypt is one of the main contributors to the country's economy and one of its fastest growing sectors, making up about 70% of casual wage workers. However, construction industry is a very hazardous industry where fatal

and non-fatal occupational injuries occur frequently due to the unique environment of the construction industry, human behavior, harsh working conditions, and poor safety management [1].

The main causes of construction workers' fatalities are falls, being struck by objects, electrocution, and caught in/-between hazards. Globally, in 2016, it was estimated that 21% of occupational fatalities were recorded in construction. According to a study conducted in Egypt, approximately 13% of work-related deaths and 18% of occupational injuries were recorded in construction. Occupational injuries and illnesses have a huge impact not only on safety and health, but also on the high economic impact [2].

It has been shown that failure to deal with risks effectively results in cost and time overruns in construction projects. Risk is a calculation of the probability of the hazard to occur and the severity of its consequences. Being able to accurately assess the risk in a situation is, at a personal level, dependent on an individual's risk perception and risk tolerance. Risk perception is the ability of an individual to determine a certain amount of risk, and risk tolerance refers to a person's ability to accept a certain amount of risk. Studying the risk perception of workers is therefore important, as individuals are responsible for the perceived risks in their work environment [3].

When workers are aware of the health and safety risks in their workplace, they can follow safe work practices. Information about workers' current and changing awareness about health and safety hazards, risk perception, and safe work practices can help to understand where prevention strategies should be applied. Unfortunately, construction sites are workplaces with limited access for research; studies at work level represent only 2.28% of all available researches, making it necessary to pay more attention to safe construction environment [3].

Mechanical hazard is the most important occupational hazard in the workplace. It is recognized widely that it has increased the incidents that cause absenteeism from work and lost productivity rate, permanent disability and even death and human suffering caused by harmless for the employee and the employer and society injuries [4].

World health organization (WHO) showed that more than half all occupational injuries and illness among construction building workers. This is because the construction building workers exposed to very specific hazards at workplace, sleep problems, long working hours, working at night, low work experience, high physical activity without exercising at all and not using personal protective equipment, like work at heights, work with power tools, more than one trade and more than one employer/contractor working on a single site with lack of coordination, working in the outdoor elements, contractual work as opposed to permanent employment [5].

About 350 million workers currently work in this industry around the world. While in developed countries approximately 6-10 % of the workers are employed in the construction industry, about 20-40 % of deaths are attributed to this industry. For example, despite the fact that 7.7 % of the workers in the United States are employed in the construction industry, 22.2 % of work-related mortalities occur in this industry [6].

The construction workers are exposed not only to hazardous equipment, machinery and situations but also to work-related diseases due to workplace health problems such as harmful factors including physical factors (noise, vibration, thermal stress), chemical factors (aerosols, gases and vapors) and ergonomic factors (manual handling, improper body positioning, exerting excessive strength and repetitive movements). However, limited studies have been conducted on the

prevalence of work-related diseases among construction workers. Various studies have reported respiratory, ocular, skin, and neurological diseases [7].

The ability of contractors to carry out the hazard identification process in a formal way and document an appropriate safe work procedure is still problematic. Job Safety Analysis (JSA), which is also known as job hazard analysis, is an efficient proactive measure for safety to identify hazards in construction projects [8].

A. Physical hazards in construction project [9]:

Falls: Falls are a leading cause of injuries and fatalities in the construction industry. Workers can fall from heights such as ladders, scaffolding, roofs, or even elevated platforms. According to the Occupational Safety and Health Administration (OSHA), falls are responsible for one-third of all construction-related deaths.

Electrical hazards: Electrical hazards can cause electrocution or serious burns. Workers can come into contact with live wires or electrical equipment that has not been properly grounded. They can also be exposed to electrical hazards during excavation work or when working near power lines.

Struck-by hazards: Struck-by hazards occur when workers are hit by flying objects, such as tools, materials, or vehicles. This can happen when working in areas where heavy equipment is being used or when objects are not properly secured.

Caught-in or between hazards: Occur when a worker's body is caught or compressed between objects, or when a worker is caught in machinery.

Noise: Construction sites can be extremely noisy, which can cause hearing loss if workers are not properly protected.

Vibration: Workers who operate vibrating machinery or equipment may develop hand-arm vibration syndrome, which can cause pain, numbness, and loss of dexterity in the hands and arms.

Falling objects: Construction sites often involve the use of cranes, hoists, and other lifting equipment. Workers on the ground may be struck by falling objects, which can cause serious injuries or even death.

Pinch points: Pinch points are areas where a worker's body or clothing can be caught between moving parts of machinery or equipment. This can cause severe injuries, such as crushed or amputated limbs.

Heat Stress: Workers who are exposed to hot and humid conditions may develop heat stress, which can lead to heat exhaustion, heat stroke, and even death. Construction workers who perform tasks such as welding, roofing, and paving are at a higher risk of heat stress.

Cold Stress: Construction workers who work in cold environments, such as in winter, may develop cold stress. This can cause frostbite, hypothermia, and other cold-related illnesses.

B. Chemical hazards in construction projects [9]:

Lead: Lead can be found in various building materials, including paint, pipes, and solder. Exposure to lead can lead to damage to the nervous system and kidneys.

Asbestos: Asbestos was commonly used in insulation, roofing, and other building materials until the 1970s when its dangers became more widely known. Exposure to asbestos can cause lung cancer, mesothelioma, and other respiratory diseases.

Silica: Silica is a common mineral found in construction materials such as concrete, brick, and mortar. Inhalation of silica dust can lead to silicosis, a respiratory disease that can cause permanent lung damage.

Volatile Organic Compounds (VOCs): VOCs are chemicals found in many construction materials, including adhesives, paints, and sealants. Prolonged exposure to VOCs can cause headache, dizziness, and respiratory problems.

C. Mechanical hazards in construction projects [9]:

1- Manual handling.

2- Improper body positioning.

3- Exerting excessive strength and repetitive movements.

D. Psychological hazards in construction projects [9]:

E. Biological hazards in construction projects [9]:

Exposure to mold and fungi: Mold and fungi can grow on damp building materials and can cause respiratory problems and allergies in construction workers. This can be particularly hazardous in areas with poor ventilation.

Exposure to bacteria and viruses: Through contact with contaminated materials or surfaces, as well as through contact with infected individuals. This can lead to illnesses such as tuberculosis, Methicillin-resistant Staphylococcus aureus (MRSA), and hepatitis A.

Exposure to pests and vermin: Construction sites can attract pests such as rodents, which can carry diseases and cause damage to building materials.

Exposure to toxic plants: Poison ivy, poison oak, and poison sumac can cause skin irritation and allergic reactions.

Exposure to animal waste: From nearby farms or animal facilities, which can lead to the spread of diseases such as E. coli and Salmonella

There are some occupational diseases in construction & building process and their numbers in occupational diseases list as follow:

Diseases caused by lead toxicity (010101): due to pipes &paints exposure.

Occupational hearing loss (010201): due to noise exposure

Pneumoconiosis (silicosis) (020101): due to cement &sand dust inhalation

Musculoskeletal disorders (0203): due to improper body position during work.

Post-traumatic stress disorders (020401): after exposure to an accident.

Chronic eye inflammation & ulcers (020502): due to inoculation of cement & sand particles in eyes.

Varicose veins (020503): due to prolonged standing.

Direct inguinal hernia (020504): due to carrying heavy objectives.

Causes of construction workers' deaths

The main causes of construction workers' deaths are falls, being struck by objects, electrocution, and caught in between objects. Globally, in 2016, it was estimated that 21% of occupational deaths were recorded in construction workers [2].

According to the UN's ILO, these are the causes of deaths on construction sites:

1. FALLS

Falls are among the most common causes of deaths on construction sites, and include incidents such as falling off scaffolding, ropes, or ladders (ILO, 2020).

2. ELECTROCUTION

Electrocution is typically caused by workers coming in contact with overhead power lines and wiring without appropriate gear. In fact, working close to machines, equipments, and tools that are connected to power lines may also be fatal due to the lack of circuit interrupters. (UN's ILO, 2019)

3. CRUSH INJURIES

Debris from buildings materials such as cement, sand, and steel fall on workers due to poor installation. [11]

4. CAUGHT in BETWEEN-INJURIES

In the past, global construction sites have seen incidents of limbs getting stuck between the components of various construction equipment. These injuries are called caught-between, or 'caught in between', incidents. Such issues may be caused by, for instance, the use of a hammer, with a fingernail or finger getting damaged in the process, or more serious incidents of workers getting caught between heavy equipment such as tractors or loaders [12].

5. CRANE COLLAPSE

Crane collapses can occur if the equipment has not been installed or fitted out correctly.

Additionally, crane collapses may also cause damage to human and material assets in the construction site's surrounding area [12].

6. CONSTRUCTION SITE FIRES

At times, construction site fires may be caused by the carelessness of workers or supervisors. Fires may start or spread due to the prominence of items such as fuel and wood on site. Additionally, welding equipment, if left unattended near combustible materials, can also contribute to a site fire [10].

7. SLIPS AND TRIPS

According to Workplace Health and Safety Queensland, there are various factors that contribute to the risk of slips and trips. Slips usually occur when there is a loss of grip between the shoe and the floor. Trips occur when a person's foot hits a low obstacle in the person's path, causing a loss of balance [13].

8. EXHAUSTION

Fatalities may be caused due to exhaustion and stress. Overwork can also lead to sleep deprivation and fatigue [14].

9. HEAT STROKES

According to ILO, heat-related health risks can cause heat stroke, heat exhaustion, poorer chemical tolerance, fatigue, poorer cognitive function, increased risk of injury, dehydration, increased burden of respiratory and cardiovascular diseases, cataract, skin and eye cancer, and weakened immune function [10].

The hierarchy of control

It is a system for controlling risks in the workplace. The hierarchy of control is a step-by-step approach to eliminating or reducing risks and it ranks risk controls from the highest level of protection and reliability through to the lowest and least reliable protection. Eliminating the hazard and risk is the highest level of control in the hierarchy, followed by reducing the risk through substitution, isolation and engineering controls, then reducing the risk through administrative controls. Reducing the risk through the use of protective personal equipment (PPE) is the lowest level of control [15].

Using the hierarchy of control [16]:

1. Eliminate the risk

The most effective control measure involves eliminating the hazard and its associated risk. For example, you can eliminate the risk of a fall from height by doing the work at ground level.

Employers can also eliminate hazards and risks by removing the hazard completely. For example, removing trip hazards on the floor or disposing of unwanted chemicals eliminates the risks they create.

2. Reduce the risk through substitution, isolation or engineering controls

If it is not reasonably practicable to eliminate the hazards and associated risks, minimize the risks by:

Substitution

Substitute the hazard with something safer. For example:

Use a cordless drill instead of an electric drill if the power cord is in danger of being cut.

Use water-based paints instead of solvent-based paints.

Isolation [16]

Isolate the hazard. For example:

Use concrete barriers to separate pedestrians and employees from powered mobile plants.

Use remote controls to operate machines.

Install guard rails around holes.

Engineering controls

An engineering control is a control measure that is physical in nature, including a mechanical device or process. Examples of engineering controls include:

Mechanical devices such as trolleys or hoists to move heavy loads.

Guards around moving parts of machinery.

Speed-governing mechanisms

3. Reduce the risk using administrative controls

Administrative controls are work methods or procedures designed to minimize exposure to a hazard. For example:

Developing procedures on how to operate machinery safely.

Limiting exposure time to a hazardous task

Using signs to warn workers of a hazard.

4. Reduce the risk using personal protective equipment (PPE)

PPE refers to anything workers use or wear to minimize risks to their health and safety:

Earmuffs and earplugs

Goggles (Protect eyes from dust, reduce the risk of rubbing dust into eyes with the hands).

Respirators (Use a respirator mask specifically designed to filter out concrete dust, like the N95 mask or those with a higher protection level. Ensure it fits snugly on the face to prevent the entry of unfiltered air)

Face masks

Hard hats

Safety harnesses

Gloves

Safety footwear

PPE limits exposure to the harmful effects of a hazard but only if workers wear and use the PPE correctly.

Using administrative controls and PPE to reduce risks does not control the hazard at the source. Administrative controls and PPE rely on human behavior and supervision and used on their own, tend to be least effective in minimizing risks [16].

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