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Common Patterns Of Occupational Injuries Dealt With By Saudi Red Crescent Paramedics

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Abstract:

This research aims to highlight the common patterns of occupational injuries dealt with by paramedics of the Saudi Red Crescent Authority, by analyzing the nature of these injuries, the characteristics of the injured, and the work environments in which occupational accident rates are higher. Work-related injuries are among the most prominent challenges facing various professional sectors, due to their direct impact on workers' health and production efficiency, in addition to the pressure placed on emergency and ambulance response systems. The research relies on the descriptive approach by collecting data from field records and ambulance reports that were dealt with during a specific time period, with the aim of identifying the most common types of occupational injuries, such as falls, lacerations, fractures, burns, back injuries, in addition to injuries resulting from exposure to chemicals or sharp devices in the work environment. The research also addresses the factors that contribute to these injuries, including poor adherence to safety procedures, lack of training, and unsuitable environmental or technical conditions. The research also focuses on the quality of first aid interventions provided by paramedics at the scene of the accident, and the extent to which the speed of response affects the health outcome of the injured worker. The challenges faced by paramedics in dealing with occupational injuries are also discussed, such as the lack of information available on site, or the hazardous working environment upon arrival. This research is expected to contribute to providing a clear picture that will help enhance occupational safety programs, raise the readiness of ambulance teams, and propose effective mechanisms to reduce occupational injuries, thereby supporting the protection of workers and improving the quality of ambulance response within the Kingdom of Saudi Arabia.

Keywords: Occupational injuries - Saudi Red Crescent - Emergency paramedics - Injury patterns - Emergency medical response - Workplace accidents - Occupational safety - Field intervention - Pre-hospital care - Work environment.

- Introduction

The Saudi Red Crescent Authority's ambulance teams play a vital role in the Kingdom's emergency healthcare system, responding to a wide range of accidents and injuries that may occur in various environments. Given the industrial and urban development the Kingdom is witnessing, paramedics .frequently encounter specific types of occupational injuries arising from high-risk work environments They do not merely provide first aid; they represent the crucial line between stabilizing the patient's condition and its deterioration in the critical minutes following an accident. This demands a high level of competence and precise knowledge in dealing with the complex nature of these injuries. The occupational ,environments requiring Red Crescent intervention vary, including construction sites, industrial facilities large factories farms, and logistics locations. Among the most common types of injuries they handle are falls from heights, which often result in multiple fractures and injuries to the spine and head. Injuries resulting from heavy machinery and equipment are also common, ranging from amputations to deep

,lacerations that require advanced procedures to control bleeding and manage shock. In addition paramedics encounter cases of burns resulting from contact with chemicals or high temperatures in factories, or exposure to suffocation and inhalation of toxic gases. These cases require specialized treatment .protocols to assess the airway and circulatory system Bloodshed2,8

Furthermore, the knowledge of Saudi Red Crescent paramedics regarding these common patterns of occupational injuries is not merely an addition but a fundamental requirement for the success of the rescue operation The specialized response includes the ability to immobilize the injured person, deal efficiently with potential spinal cord injuries, and use appropriate tools in difficult work environments. This accumulated experience directly contributes to reducing the mortality rate and the likelihood of long-term disability for the injured, which confirms the preventive and therapeutic role played by paramedics in maintaining the safety of the workforce in the Kingdom and highlights the need for continuous training on the latest techniques for dealing with workplace injuries8

Discussion

- **The concept of occupational injuries and their definitions**

Occupational injuries refer to any physical, mental, or functional harm suffered by a worker or employee as a result of an accident or sudden event during or due to the performance of their work. The basic concept .is based on a direct causal relationship between the work environment or job duties and the injury sustained These injuries include both visible physical injuries such as fractures, wounds, and burns, as well as more complex injuries such as concussions or internal damage that may result from a fall or impact. The purpose ,of defining these injuries is to determine liability, provide necessary medical care for the injured person and ensure they receive due compensation according to labor and social security laws. We can clarify the legal and institutional definition of occupational injury, which is defined more precisely to include specific cases, as defined by the International Labour Organization Occupational injury is defined as any injury or illness that occurs or develops as a result of exposure to specific hazards in the workplace. In most national legislations, including the Kingdom of Saudi Arabia, it is usually defined as an accident that occurs to the worker during and because of work. It also includes accidents that occur to the worker while moving from his residence to his workplace and vice versa, provided that the route is normal, direct and uninterrupted for personal reasons The legal definition also includes deaths that result directly from this occupational accident 9,1

Therefore, it is essential to distinguish between occupational injuries and occupational diseases An occupational injury is a sudden, accidental event whose timing can be precisely determined such as a fall from scaffolding. In contrast, an occupational disease is a chronic health condition that develops gradually and slowly over a long period due to repeated and prolonged exposure to hazardous factors in the workplace, such as exposure to toxic dust leading to silicosis or excessive noise leading to hearing loss ,Both fall under the umbrella of occupational health and safety hazards, but the methods of diagnosis, proof and compensation differ for each. Therefore occupational injuries are rarely caused by a single factor, but rather are the result of a complex interaction between unsafe factors and unsafe actions. Unsafe factors include defects in the work environment such as faulty equipment, poor lighting, or inadequate safety barriers, while unsafe actions represent incorrect human behaviors such as failure to use personal protective equipment Or working at excessive speed or not following approved safety procedures 9,2

To ensure the activation of legal protection and compensation, accurate documentation of the injury is of paramount importance. Paramedics and responsible authorities must document the nature of the injury, the exact location and time of the accident, the surrounding circumstances and witness testimonies. This documentation forms the backbone of accident investigations and the determination of corrective measures necessary to prevent its recurrence in the future1,5

- **Classification of occupational injuries in different work environments**

The first classification is based on the nature of the injury, where occupational injuries can be classified according to their severity and the type of damage they cause. This classification is important for determining the treatment protocol and compensation for minor injuries These are injuries that do not ,require the worker to be absent from work after receiving initial treatment such as superficial scratches minor bruises, or cuts that can be dealt with at the on-site clinic Despite their simplicity, these should be recorded for future prevention. Injuries that require absence are those that are severe enough to necessitate the worker's absence from work for a full day or more after the day of the accident, such as fractures, severe sprains and lacerations, or moderate burns. This classification is the most common in occupational safety reports Catastrophic injuries or fatalities are the most severe types of injuries and include death resulting from the accident or injuries that lead to total or partial permanent disability, such as amputation or paralysis This type requires an immediate and thorough investigation by official authorities. The second classification is based on the occupational environment and type of activity. Injuries are also classified according to the specific sector or work environment in which they occurred, as risks and causes vary from one environment to another. This includes construction and building injuries that These injuries are mostly ,caused by falls from heights, such as falls from scaffolding or roofs, falling materials or tools from above electrical injuries resulting from handling exposed wiring, and also injuries in manufacturing and factories that This includes amputation injuries resulting from unprotected moving machinery such as presses or cutting machines, chemical and thermal burns, repetitive strain injuries from repetitive mechanical movements, and injuries in the healthcare and services sector These include needlestick injuries, injuries from contaminated sharp instruments, back injuries resulting from lifting patients, and injuries resulting from violence by patients or visitors10,8

The third classification is based on the cause of the accident. This classification focuses on the mechanism or event that led to the injury and is very useful in risk analysis and developing prevention measures. It includes contact and exposure injuries that occur as a result of direct contact with a hazard source such as ,Burns from fire or chemicals, poisoning, suffocation, inhalation of toxic gases or vapors, electric shocks and also stress and motion injuries resulting from muscular effort or incorrect movement such as muscle .strain or pulling while lifting heavy loads, slip and fall injuries, and impact and force injuries that This occurs as a result of the worker colliding with a stationary or moving object such as Fractures and head injuries resulting from a worker colliding with a vehicle or falling object, or crush injuries resulting from a part of the body being trapped between two objects2,5

Factors leading to occupational injuries

The factors leading to occupational injuries are usually classified into two main groups: unsafe conditions and Unsafe actions interact with each other to create a fertile environment for accidents, and we can explain these factors as follows

Unsafe environmental and physical conditions are defined as any defect or deficiency in the physical or engineering work environment that makes it a potential source of danger. These factors are beyond the direct control of the worker and fall under the responsibility of management to rectify. Common examples of such conditions include equipment and machinery malfunctions, such as the absence of protective .barriers ,On the moving parts of machinery, or the presence of damaged and unusable equipment and tools and engineering and environmental defects This includes poor lighting or ventilation, excessive noise and vibrations, uneven or oily floors, spills that can lead to slips and falls, and poor storage and organizationImproper stacking of materials or clutter and debris in work corridors obstructs movement and —causes tripping and collisions. Other contributing factors include unsafe human actions and behaviors errors performed by workers or supervisors during work and under their direct personal control—which are among the most common causes of workplace accidents. Examples include ignoring safety procedures such as not using personal protective equipment Such as helmets, gloves, or safety harnesses when working at heights and working incorrectly or recklessly through Operating a machine without authorization, using equipment in a manner not intended for itattempting to clean or maintain machines while they are running

instead of disconnecting the power, incorrect positioning, and straining through Standing in an incorrect position or lifting, pushing, and pulling loads that exceed the body's carrying capacity causes strain and muscular and skeletal injuries8,6

In addition to secondary organizational and human factors, besides direct circumstances and actions, there is a range of organizational and human factors that indirectly contribute to increasing the likelihood of accidents, including lack of training and experience Inadequate training of employees on safe work methods and how to deal with job-specific risks psychological and organizational pressures such as stress and lack of concentration resulting from work pressures, long working hours, and sleep deprivation, or a management culture that overlooks safety violations to increase productivity, as well as personal factors The worker's health condition may include fatigue, illness, poor match between job requirements and the worker's abilities, and the worker's unsuitability for the job. Ignoring these factors leaves the work environment vulnerable to the interaction between unsafe conditions and unsafe actions leading to an accident 5,4

- **Common patterns of occupational injuries in Saudi Arabia**

The most common patterns of occupational injuries in Saudi Arabia are those associated with high-risk sectors such as construction and manufacturing. The largest proportion of occupational injuries recorded in the Kingdom occur in sectors characterized by high levels of physical risk and the use of heavy machinery and equipment. The construction sector leads the list of sectors that record the highest number .of injuries annually, followed by the manufacturing sector, and then the wholesale and retail trade sector In these environments, the most common injuries are impact and crushing injuriesWhich are Resulting from handling heavy machinery, body parts becoming trapped between solid objects, and fall injuries Whether it's a fall from heights at construction sites, a slip and fall at the same level in factories and warehouses, or chemical and thermal injuries such as exposure to hazardous materials or burns in industrial environments common patterns also include the prevailing injury mechanisms: mechanical forces and falls When examining the direct cause and the injury mechanism, clear patterns emerge that are repeated in reported workplace injury data Also Exposure to mechanical forces is the leading cause of injuries in the Kingdom. This pattern includes injuries resulting from the improper use of cutting, grinding, or scraping tools, and collisions or contact with moving machine parts often leading to deep wounds, fractures, or amputations Falls are the second most common type of injury and include fractures, sprains, and head and spinal injuries. Traffic accidents resulting from workers commuting to and from work or during external work assignments also constitute a significant proportion of total injuries 9,1

In addition to the prevailing patterns in the service sectors and stress injuries, where industrial sectors focus on acute injuries, other common patterns emerge in the service sectors, such as health professions and ,service professions, such as musculoskeletal stress injuries, especially back, neck and shoulder injuries which are very common among service professions that require manual lifting, such as carrying patients or uncomfortable and stressful working positions for long periods. In addition, service professions and healthcare workers face the risks of needlestick injuries, which are occupational injuries that require emergency procedures to prevent infectious diseases. These sectors also record an increase in work-related health problems, such as work-related stress, which confirms that occupational injury is not limited to direct physical damage only2,5

Therefore, the Kingdom of Saudi Arabia relies on a comprehensive preventive strategy to reduce occupational injuries, overseen by key entities such as the General Organization for Social Insurance National Council for Occupational Safety and Health These measures focus on three main areas Legislation and oversight include the implementation of occupational hazards regulations and intensified field visits and inspections of facilities to ensure compliance with safety standards, particularly in the construction and manufacturing sectors. The focus is on engineering and behavioral factors, requiring employers to provide a safe working environment install safety barriers for machinery, implement locking, hanging, and labeling systems, and provide personal protective equipment High quality to reduce exposure to mechanical and

environmental hazards, and most importantly, continuous awareness and training of workers and supervisors on safe practices, reducing unsafe actions, and obligating companies to conduct periodic medical examinations for workers in high-risk professions, which has clearly contributed to achieving a tangible decrease in the rates of work injuries recorded during recent years6,1

- **Thermal and electrical injuries and their occupational impact**

Thermal injuries, or burns, in the workplace result from contact with high heat sources such as flames, hot liquids or objects, or high-temperature steam. They can also result from chemical substances that cause chemical burns. The occupational impact of these injuries is determined by the degree and depth of the burn. First- and second-degree burns may only require short rest while third-degree burns lead to complete destruction of the skin and tissue layers and may require surgical intervention or skin grafting, as well as long periods of absence from work These injuries may also leave permanent deformities and lead to partial or complete loss of function in the affected limbs, posing significant challenges to the worker's ability to resume their professional duties at full efficiency, especially if their job requires precise manual skills Electrical injuries occur when electric current passes through the human body and are among the most dangerous types of occupational injuries in the electricity, construction, and industrial sectors6,8

The danger depends on the intensity of the current, the voltage, and the path the current takes within the body. Electrical injuries are classified into two main types Electrical burns which are deep and destructive at the points of entry and exit of the current, may not show their true intensity on the surface. The electric shock often causes a disturbance in the heart rhythm ventricular fibrillation, or cessation of breathing, and may lead to immediate death. In addition the electric current causes strong muscle contractions that may lead to fractures or injuries to the spine as a result of falling or being thrown6,9

Accordingly, the occupational impact of thermal and electrical injuries goes beyond the health cost to include economic and psychological effects on the worker and the facility, in addition to the costs of treatment and compensation, as major injuries lead to permanent or temporary disability that affects the worker's productivity. To reduce these risks, occupational safety procedures require the use of appropriate personal protective equipment such as gloves and insulating shoes, the application of procedures for ,disconnecting and securing electrical power before maintenance, and the provision of first aid points eyewash stations, and emergency facilities in places exposed to the risk of chemical burns, which confirms the importance of applying engineering prevention measures and behavioral training for workers3,7

- **Fall and slip injuries in workplaces**

Slips, trips, and falls are among the most common occupational accidents worldwide and pose a significant challenge in all work environments. These injuries occur as a result of loss of balance while walking or moving Slipping occurs due to walking on wet, oily surfaces or surfaces covered with materials that reduce friction, while tripping occurs As a result of the foot colliding with invisible or scattered obstacles on the ,ground, such as cables, uneven edges, or leftover tools, these injuries often lead to sprains in the joints especially the ankle and knee, and fractures in the upper limbs as a result of trying to support the body with the hands, or head injuries if the impact is strong and sudden. Preventing these injuries requires keeping the floors clean, providing adequate lighting, and good site management8,5

,Falls from height are among the most serious occupational injuries and are very common on construction building, and maintenance sites, as well as in operations involving access to high places. A fall from a height occurs when a worker falls from a higher level to a lower one, such as from a ladder, scaffolding, or the roof of a building. The risk of injury is directly proportional to the height of the fall and the force of the impact, and the consequences are often catastrophic Common patterns of these injuries include on Multiple fractures of the lower and upper limbs, serious spinal injuries that may lead to paralysis, and traumatic head injuries that may result in death. To prevent this, strict adherence to a fall protection system

is essential This includes the use of safety barriers, safety nets, and personal fall prevention systems such as safety belts, as well as periodic inspections of ladders and scaffolding8,7

- **Heavy machinery and equipment injuries**

,Heavy machinery and equipment injuries are among the most serious accidents in the manufacturing mining, and heavy industries. These injuries primarily result from direct contact with moving machine parts or points of engagement and cutting. Common patterns include amputation This is where part of the limb is usually severed, usually the fingers or hand, as a result of entrapment at the point of rotation or shearing, and crush injuriesThese occur when a part of the body is compressed between hard, strong surfaces, resulting in widespread destruction of tissues, muscles, and blood vessels. Cuts and puncture wounds resulting from sharp tool edges or flying materials from machines often have serious consequences and require urgent surgical intervention and long-term rehabilitation6,1

This category includes injuries resulting from heavy equipment and vehicles such as forklifts cranes, and bulldozers at construction and storage sites. The prevalent patterns here are collision and pedestrian accidents, where workers or passersby are struck by a moving heavy vehicle leading to severe limb or head injuries, which may be fatal, as well as rollover or fall accidents through Equipment tipping over due to overloading or unstable ground poses a risk of injury to the operator or those around him like The fall of ,suspended or transported loads from cranes and equipment onto workers is a risk. To prevent these injuries emphasis is placed on providing engineering protection barriers for stationary machinery and strictly enforcing maintenance procedures and power disconnection Drivers should be trained on safe driving practices at work sites, including the use of warning signals and the separation of heavy equipment traffic areas from pedestrian traffic areas 9,7

- **Exposure to chemicals and toxic gases**

,The risks of exposure to chemicals are widespread in many sectors, particularly chemical industries laboratories, cleaning operations, and manufacturing. Exposure occurs in several ways, most notably ,through skin absorption, ingestion, or direct eye contact. Common types of injuries include chemical burns ranging from mild irritation to complete tissue and organ damage, such as to the eyes, and poisoning resulting from the body absorbing large quantities of the toxic substance. The occupational impact of these injuries may be immediate and acute or may manifest long-term as chronic occupational diseases such as kidney or liver failure. To prevent exposure, strict adherence to safe chemical storage practices and the provision of safety data are essential And the use of specialized protective equipment such as safety glasses and chemical-resistant gloves 10,7

Exposure to toxic gases and fumes is one of the most serious injuries in work environments such as enclosed spaces Industries that produce byproducts such as hydrogen sulfide or carbon monoxide pose a :primary risk of inhalation, as these gases reach the lungs directly and affect the body in two ways Asphyxiating gases, such as nitrogen or carbon monoxide , displace oxygen in the blood or surrounding ,environment, leading to rapid loss of consciousness and death due to oxygen deprivation; and toxic gases such as ammonia and chlorine, which cause acute and direct damage to the respiratory system, leading to pulmonary edema (fluid accumulation in the lungs) and difficulty breathing. Therefore, paramedics must handle these incidents with extreme caution, as the response often requires the use of independent breathing apparatus Before entering the contaminated area, immediately ventilate the site and provide oxygen to the victim7,8

- **The role of Saudi Red Crescent paramedics in dealing with occupational injuries**

The primary role of Saudi Red Crescent paramedics is to respond quickly and immediately to workplace .accident reports, as the first minutes after an injury are critical and directly affect the victim's condition Upon arrival at the accident site, the paramedic begins by assessing the site's safety to avoid becoming another victim, and then proceeds with the initial assessment For the injured person, using approved care

protocols to assess airway function, breathing, and circulation, this assessment includes determining the nature of the occupational injury such as a fall, amputation, or burns, and immediately immobilizing life-,threatening injuries such as stopping severe bleeding and carefully handling any suspected spinal injuries which are common in falls and collisions. The role of the paramedic goes beyond providing basic first aid to include advanced pre-hospital care In complex occupational injuries, paramedics implement the necessary procedures to stabilize the injured person before transport. These procedures may include Stabilizing fractures using splints, managing pain, providing oxygen to those with respiratory injuries or .shock, and initiating intravenous fluids to replace lost fluids in cases of bleeding or severe burns Paramedics also possess the necessary skills to deal with cases of exposure to chemicals or electricity through rapid decontamination procedures and safe separation of hazard sources, if possible, ensuring that the injured person arrives at the health facility in the best possible condition9,7

Therefore, the role of the paramedic is not limited to the therapeutic aspect only, but extends to the logistical ,and procedural aspect, where the paramedic accurately documents all the details of the accident, the injury and the care that was provided. This documentation is important because it forms part of the medical record of the injured person and is used later in occupational safety investigations and determining insurance entitlements. In addition, paramedics are responsible for effective coordination with receiving hospitals by informing them in advance of the type and severity of the injury to prepare the emergency team, as well as coordinating with civil defense and police authorities when dealing with accidents that require complex rescue and evacuation operations in work environments1,10

Methodology

This research relies on the descriptive approach to analyzing common patterns of occupational injuries dealt with by paramedics of the Saudi Red Crescent Authority, through a comprehensive systematic review of previous studies related to the field of occupational injuries and ambulance response in work environments.

The research gathers data and information from published research and scientific reports that dealt with the topic of occupational injuries, with a focus on studies that discussed the most common types of injuries, risk factors, and the role of ambulance teams in dealing with these cases. These studies are analyzed with the aim of identifying general trends, similarities and differences between the results, and inferring the most frequent patterns in different work environments.

The aim of relying on previous studies is to form an accurate descriptive picture of the nature of occupational injuries without interfering with variables, while highlighting the accumulated scientific knowledge in the field, and using it as a basis for analyzing the local situation in the Kingdom of Saudi Arabia.

The descriptive approach also includes comparing the results obtained from global and regional scientific literature, to draw general conclusions that can be applied to the reality of occupational injuries dealt with by Saudi Red Crescent paramedics, in order to provide evidence-based recommendations to enhance occupational safety and improve the quality of ambulance response.

Results and recommendations

Results

- The study revealed the frequency of multiple injuries and fractures in accidents of falling from height and collisions with heavy machinery, which necessitates prioritizing spinal stabilization and assessing internal bleeding
- The study showed that amputations of limbs or parts thereof as a result of exposure to unsecured cutting and rotating machines are prominent outcomes in the industrial sector which necessitates advanced emergency procedures to deal with the amputated limb

- The study showed that third-degree burn injuries are common as a result of electrical accidents or exposure to hot chemicals in factories, and these cases require intensive management of the airway and circulation due to shock Resulting from the loss of fluids and proteins
- The study revealed shortcomings in the implementation of fall protection measures
- The study explained that chemical exposure within confined spaces Suffocation or poisoning incidents often reveal deficiencies in pre-entry gas measurement protocols and the failure to use independent breathing apparatus By the workers, which doubles the risk
- The study explained that occupational injuries in remote locations or within large industrial facilities present challenges in access or difficulty in accurately locating the injured person, which necessitates improving the location system and prior coordination with safety officials in the facilities

Recommendations

- Advanced programs for managing occupational injuries must be developed, and specialized training units must be included in paramedic training programs that focus on dealing with specific occupational injuries, such as managing crush syndrome, primary care for amputated limbs, and emergency decontamination procedures
- Periodic simulation exercises should be conducted in environments similar to work sites including enclosed spaces, heights, and proximity to machinery, to enhance safe evacuation skills Applying techniques for restraining and lifting injured people within the limits of occupational safety
- The need for training on the paramedic protection system and the activation of mandatory training programs for paramedics on the use of self-ventilators Identifying hazardous materials To protect ambulance crews while dealing with toxic gas and vapor incidents
- A standardized protocol must be developed that directly links Red Crescent operations rooms with safety officials In large industrial facilities and major contractors, to ensure that paramedics are provided with a risk map .To the location before arrival
- The study recommends establishing mobile ambulance units equipped with advanced tools to deal with heavy industrial injuries, including specialized immobilization equipment and amputation first aid kits, and distributing them in areas with high industrial density.
- Continuous epidemiological studies should be conducted, and periodic analysis of data collected from Red Crescent incidents should be carried out to identify occupational injury hotspots in the Kingdom and to update preventive intervention priorities based on the results of these studies
- Work injury data recorded by Red Crescent paramedics must be linked to the General Organization for Social Insurance system To facilitate the classification of injuries and the activation of compensation claims in an immediate and transparent manner.
- The need to train paramedics to submit safety observation reports After dealing with the incident to identify unsafe conditions or unsafe actions that can be corrected to prevent a recurrence of the incident in the same facility

Conclusion

This study aimed to identify the most common patterns of occupational injuries dealt with by paramedics .in the Saudi Red Crescent Authority and to analyze the factors affecting their occurrence during field duties The study included multiple axes, including the types of injuries their locations and nature, and the results of the study showed the most common occupational injuries dealt with by paramedics during field duties

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