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Precautions for the Prevention of Mine Accidents and Related Respiratory Emergencies

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Abstract

Mine accidents and related respiratory emergencies can be prevented. Employers and governments have responsibilities to protect employees from mine accident-associated respiratory emergencies. Effective ventilation in the mines, usage of new mining technologies, and education of employees are the primary routes. Use of the personal protective equipment is valid when general precautions are not adequate.

KEYWORDS: Respiratory emergencies, preventing, precautions

In general, the occurrence of mine accidents and related respiratory emergencies are associated with the outdated systems and technologies that are used in mines. It has been suggested that compared to conventional methods, using new technologies reduces the number of injured people as a result of accidents. It has been noted that systematic training programs that are implemented to improve occupational safety in order to reduce accidents are effective. Expert opinions corroborate that the deaths resulting from accidents are caused by a lack of application of occupational health and safety. It is considered that the reasons for accidents and deaths are infrastructure and technological problems such as problems in the ventilation system, lack of escape routes, insufficient personal protective equipment. It is emphasized that these are avoidable problems and are caused by the lack of control and enforcement in terms of occupational health and safety [1].

In the manual prepared by International Labour Organization (ILO), "Underground Coal Mining Safety and Health 2009, the measures pertaining to occupational health and safety in underground mining were discussed in detail [2]. Acute inhalation injuries occur from accidental explosions, fires, and blasting techniques that are used in underground coal mining. Methane and carbon monoxide (CO) are the most common toxic inhalant agents in coal mining. ILO manual recommends safe working systems and implementation of engineering control measures to eliminate risks. Despite these measures, if the risks still remains, using personal protective equipment is recommended.

In order to prevent acute inhalation injuries, employers have substantial responsibility for the most frequently used personal respirators. Provision and periodic maintenance of respirators and training of the workers are among these responsibilities. Having respirators in proper size and model and their disinfection are essential. For escape from coal mines, if instead of a personal rescuer, a less protective, filter type personal rescuer or a gas mask is used, this device should also provide protection against carbon monoxide for at least one hour. Mine manager should provide a sufficient number of portable devices that can detect the presence of methane, carbon monoxide, and oxygen in the mine air.

Workers and their representatives should be informed regarding the toxicological properties of substances, protective technical measures, safe working methods, protective equipment, and emergency procedures to compensate exposure. Training should be given before the incidents that lead to the release of respirable substances and their formation. Educational activities should also include first aid.

In the mine, if the number of workers in a shift exceeds the figure permitted by national laws or regulations, there should be a first aid center with the appropriate requirements. The first aid center should be on the ground located on a separate place that is not used for other purposes, appropriately close to the main entrance of the mine, equipped with an untroubled entrance that provides an access for people carrying a stretcher. Except for a registered nurse or people who have completed an approved first aid training course, no one should be appointed by the manager in the first aid center.

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First aid training should include the following functions:

a) Shock therapy and resuscitation

b) Wound review and evaluation

c) Making dressings

d) Medical and surgical status review and evaluation

e) Disconnecting people who were in a live circuit on an electronic device and treating their electric shock and serious bodily injuries

f) Providing emergency treatment and referring the patient to a hospital

g) Maintaining simple records.

It is useful to examine true stories while discussing the measures to be used in the prevention of mining accidents. In a publication written by Hopkins, the causes of an accident that had occurred in Moura mine, Australia (1994) were examined [3]. The accident occurred as a methane gas explosion, and 11 workers died. As a result of official investigations, the management was reported to be at fault. Researchers listed the incorrect application of the process leading to the mine accident as a result of the analysis of audit reports;

- The mistaken belief "This accident would not happen here" has not led to provide any necessary measures. It is known that in coal mines, coal that is in contact with air slowly heats and spontaneously ignites. Mine managers assumed that this was a normal process which could be seen in every mine and since they predicted (!) an explosion would not take place before a certain incubation period (here 6 months), they caused an accident waiting to happen,

- "To ignore the warning signs" is another lack of management. Pre-accident high carbon monoxide levels were linked to the technology used in mines by the management, and it was an invitation to disaster,

- Another form of management error-related accidents is to approach intermittent danger signals as normal. For instance, in Moura, labor safety representatives connected high levels of CO to misreading and/or malfunctioning of the measuring devices or exhaust pollution caused by a diesel-powered vehicle passing by in that area at that moment instead of taking it as a danger signal,

- Disregarding the odor caused by toxic gas production in mines has also led to the accident. The odor emitted is similar to flammable coal tar or petrol smell. Although inspectors had detected such an odor before the accident, senior officials argued that no odor was present, and, in another case, that the odor was related to grease barrels,

- Finally, managerial resistance shown in withdrawal of workers from the hazardous area had led to fatal accidents.

The analysis of Moura accident should be taken as an example for Soma also.

Pulmonary specialists should discuss their part on the implications of Soma disaster. Pulmonary specialists working in coal mining areas should know the following:

1- Knowledge regarding acute inhalation injuries as well as diagnosis and follow-up of pneumoconiosis and diagnosis, treatment and follow-up of CO and methane gas poisoning;

2- Should be actively involved in the organization of treatment and follow-up of acute inhalation injuries in primary care (first aid unit in the mines, ambulance, health center), secondary care (the emergency departments of the hospital, thoracic diseases centers, etc.), and private healthcare centers (hyperbaric oxygen centers, fixed or portable);

3- Through associations and other organizations, workplace physicians must take an active role in occupational health and safety elements, education of the miners' representatives, and employers in terms of health and safety in mines. The organization of the screening of chronic CO poisoning, training, and notification of workers might be carried out jointly by workplace physicians, pulmonary specialists, and emergency service specialists. The encouragement and education of the workplace physician in terms of selecting and using the ideal respirator is also a proper cooperation field.

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