

# Occupational Health Scenario in Mines: An Indian Perspective

Sachin C. Narwadiya

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## Abstract

The present review focuses on the various problems of miners' health. The health-related issues discussed in the article were current and burning issues for the public health fraternity. We all must be aware of the problem well to have solution of the problems of miners'. The rapidly changing scenario of mining industry the world over and specifically in our country has introduced many newer health hazards at workplace while the traditional health hazards such as dust, noise etc. in mines are yet to be fully controlled. These hazards will pose new challenges in the field of occupational health for occupational health professionals as well as mining technologist and will require comprehensive health surveillance of workers for occupational diseases. However, the fact remains that despite efforts by the Government of India, due importance is yet to be given by the mining industry for detection of adverse effect on health of workers. Many cases of notified diseases as well as other occupational diseases are either not diagnosed or not reported to the statutory authorities. There is urgent need and scope for improvement in this area.

India has a unique blend of big and small, manual, and mechanized, opencast, and underground mines. Coal of practically all ranks occurs in India except peat and anthracite. There are about 650 working coal mines which provide direct employment to about 8,00,000 persons. India is largely self-sufficient in most minerals which include barytes, bauxite, chromite, dolomite, fluorspar, gypsum, iron ore, kyanite, limestone, manganese ore, magnesite, sillimanite, etc. There are about 8000 metalliferous mines in the country which provide direct employment to about 2,00,000 persons. In addition, there are thousands of small and seasonal mines which are not included in mine statistics and about which very little information is available. In the oil sector, there are about 50 oil projects excluding offshore installations beyond territorial waters. These oil mines employ about 55,000 persons.

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**Author's Affiliation:** Scientist 'D', Department of Health Research, Vigyan Prasar C24, Qutub Institutional Area, New Delhi 110016, India.

**Corresponding Author:** Sachin C. Narwadiya, Scientist 'D', Department of Health Research, Vigyan Prasar C24, Qutub Institutional Area, New Delhi 110016, India.

**E-mail:** snarwadiya@gmail.com

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## INTRODUCTION

The National Mineral Policy 1993 opened the industry for both private sector participation and foreign direct investment. The strategies adopted for rapid expansion of mining activities include increased mechanization, adoption of new technologies in Indian geo-mining conditions and assimilation of latest scientific innovations in the concerned areas.<sup>1</sup>



The National Mineral Policy 2008 has not only emphasized the increase in productivity and output of various minerals but also sustainable development of mineral industry and protection of workers and environment from adverse effects of mining.

### ***Dust Related Diseases***

Incidences of sandstorms have increased in recent years and there is evidence that these dusts can move across long distances. Sand dusts have different adverse effects on health, but one of the most important of them is pulmonary disease. After inhalation of dust, many dust particles are moved to the airways. Dust particles can be sensed by airways epithelial cells, activate macrophages, dendritic cells and innate immune cells and then initiate responses in various populations of specific immune cells such as T helper cells subsets (Th1, Th2, Th17), T cytotoxic cells and B cells. Initiation of inflammatory immune responses, activation of immune cells and releases of many cytokines, chemokines and other inflammatory molecules, have variable pathologic effects on lung in different respiratory diseases.<sup>3</sup>

The dust related disease, mainly Coal Worker's Pneumoconiosis in Coal Mines and Silicosis in Non-Coal Mines remain major occupational diseases in mine workers. With increasing mechanization of mining operations and introduction of heavy machineries, the dust levels are likely to increase if proper dust control measures are not taken. This will increase the risk of pneumoconiosis and other related diseases among mine workers. Surveys conducted by various institutions have shown that in many of the mining operations dust level are higher than statutory permissible level.

### ***Noise Induced Hearing Loss***

Increased mechanization of mining operations and use of heavy earth moving machinery has increased the risk of noise induced hearing loss among mine workers. The noise level in mining operations such as drilling, crushing, screening, blasting, etc. are far higher than the recommended levels for noise. The surveys conducted by various institutions have shown that noise exposure levels among workers in almost all mining operations are higher than recommended limit of 90 dB(A) in some of the operations the noise levels are as high as 115 dB(A) with peak levels often crossing 140 dB(A). A recent survey conducted in one of the metal mines has shown that almost 75% of the mine workers had evidence of Noise Induced Hearing Loss and personal exposure to noise in some of the workers was as high as 25000%.

The problem of noise is likely to increase further with increasing mechanization of mining operations and there is need to pay urgent attention to noise control measure and to start hearing conservation programs for mine workers.<sup>2</sup>

### ***Vibration Hazards***

The introduction of heavy earth moving mechanization, high-capacity dumpers, etc. have increased the hazards of whole-body vibrations among operators and helpers working on these machines. Similarly, use of large diameter drilling machines and handheld drilling machines such as jack hammer drills expose workers to the hazards of hand arm vibrations. Exposure to whole body vibration in operators of loaders, excavator, bulldozers, graders, etc. can adversely affect health of the workers. Vibration also tends to interfere and reduce performance in complex tasks including effect on vision. Vibration also causes fatigue and effect functions of other body systems. Long term exposure to whole body vibrations is known to cause backache and other degenerative spinal disorders.

The effects of hand arm vibrations are very well known and people using handheld drilling machines are at high risk of developing Musculoskeletal Disorders involving joints of hand and arm. The hand arm vibrations are known to cause neurovascular disorders such as Raynaud's Phenomenon.<sup>4</sup>

### ***Diesel Fumes***

Use of locomotives and other transport machinery in underground mines using fossil fuel is being recognized as an important health hazard in underground and deep opencast mines. The diesel fumes emitted in exhaust of automobiles contain oxides of sulfur and nitrogen in addition to carbon monoxide and polyaromatic hydrocarbons. These are known to cause irritation and other ill effect including cancers. Significant amount of carbon monoxide has been known to accumulate in underground mines using automobiles.

### ***Occupational Stress and Cardiovascular Diseases***

With increasing complexity of the job due to introduction of new technologies and increased level of skill with emphasis to increases productivity, the psychological and physiological stress on workers has increased considerably. There is increasing evidence that the coal miners are at higher risk of developing cardiovascular diseases and chronic

low-level exposure to carbon monoxide, irregular episodic physical stress, shift work etc may be important contributing factors.

### ***Sudden Death at Work***

Analysis of cases of natural death at work by DGMS recently has revealed that more than 80% of deaths are due to cardiovascular causes mainly in the form of heart attacks. The incidence is 3-4 times higher in coal mines in comparison to non-coal mines and even among coal mines the underground coal mines have incidence 3 times higher than opencast mines. In some of the coal companies the incidence rate is almost 10-15 times more than others. Prima-facie it appears that difficult and arduous working conditions are contributing factors in these companies.

### ***Musculoskeletal Disorders***

Musculoskeletal disorders such as backache, joint pains, cervical spondylitis, etc have somehow not received due attention among miners although they probably contribute to highest morbidity and absenteeism among miners. Difficult and ergonomically unsuitable postures as well as tools in mining are probably responsible for majority of the musculoskeletal injuries. In developed countries musculoskeletal disorders are responsible for almost 40% of loss time injuries. There is no reason to believe that this is any different in our country and attention needs to be paid to this important issue.

### ***Prevention and Control of Silicosis in Mines and Mineral based industries***

Silicosis remains the most important occupational lung disease of workers engaged in Metalliferous Mines. The surveys conducted by DGMS and various agencies indicate that only few cases are notified to DGMS for various reasons, and many more cases of Silicosis go undetected and undiagnosed from organized as well as unorganized sectors. The issue has been brought to the notice of other Government agencies and has also been raised in the Parliament on several occasions. Petitions are pending before the Hon'ble Supreme Court of India and National Human Rights Commission for effective steps to prevent and control Silicosis in mines and other industries. However, there has been lack of concerted efforts in this direction as there is no central agency entrusted with this difficult and onerous task.

### ***Hazard monitoring at workplace in mines.***

Under Regulation 124 of Metalliferous Mines

Regulations, 1961, Airborne Respirable Dust levels need to be monitored periodically at least once every six months at various workplaces in mines where the dust hazard is likely. The enforcement agencies due to infrastructural and manpower constraints find it difficult to enforce the Airborne Respirable Dust monitoring standards and crosscheck compliance with permissible levels. Director General of Mines Safety through technical circular has also recommended monitoring of noise levels, evaluation of noise dose profile of workers and noise mapping of noisy areas and evaluation of mine machinery for health risk due to vibration and ergonomic assessment before introduction into mines.

### ***Equipment's Induced Vibration and assessment of ergonomic risk in mining machinery.***

Increasing use of Heavy Earth Moving Machineries (HEMMs) especially in Open Cast mines has increased the risk of Whole Body and Hand Arm vibration among operators and other mine workers. The 10th Conference on Safety in Mines has recommended Vibration Surveys of mining machinery before their introduction in the mining operations and Ergonomically assessment as per ISO standards. The studies conducted by the NIMH have shown that in majority of HEMMs, especially dumpers and dozers, the whole body vibrations pose significant health risk to the operators.<sup>5</sup>

### ***Musculoskeletal Disorders and development of prevention strategies.***

Till recently it was believed that Musculoskeletal Disorders among mine workers were due to age related changes over the years. However, increasing numbers of studies have established that prevalence of Musculoskeletal Disorders among miners is related to the working condition in the mines. In many countries, Musculoskeletal Disorders are the prime cause of morbidity absenteeism and Lost Time Injuries among mine workers.

### ***Development of human resources in detection of occupational diseases and hazard monitoring.***

Pneumoconiosis, with special reference to Silicosis remains an important occupational lung disease for the mine workers and many cases remain undetected and diagnosed. The major cause of failure to detect cases of silicosis is the poor quality of health surveillance program and

training of medical officers in detection of Silicosis. The 8th and 9th Conferences on Safety in Mines have recommended training of medical officers in use of ILO Classification for health surveillance and detection of cases of Silicosis. The Institute in collaboration with DGMS can undertake regular training programs for medical officers in detection of Silicosis and use of ILO classification. It could also start certification program for PME medical officers so that they are proficient in use of ILO classification.

## CONCLUSION

The various ailments in mines were increasing. Proper safety is need during the mining process. Safety at various levels of operation can be ensured by the employer to save the lives of workers. The employees working in mines have less life expectancy as compared to those not working in such critical conditions. Regular monitoring of the health of miners' and their proper treatment is the responsibility of the employers of mines. The mining sector is growing in use of latest technology, more output of minerals but environmental sustainability also needs to be taken care while

doing mining.

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