REVIEW ARTICLE

Pneumoconiosis- an ignored occupational lung disease and Pulmonary Rehabilitation to improve the health related quality of life

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Mining generates impurities which are released into the air from operations such as drilling, blasting, shovelling, and tipping. The mining sector in India is one of the largest employers, with around four per cent of the workforce (1).

Global burden of disease studies estimates pulmonary disease as the third leading cause of death worldwide, with increased mortality among workers seen with chronic exposures to silica dust (2). Pulmonary disease is also the second major cause of DALY. Pneumoconiosis caused by the inhalation of certain types of dust is a grave complication for workers involved in mining (3). It is progressive in nature and is irreversible (5) with no available treatment modalities (4).

In India, various states are involved in the mining sector, of which Rajasthan, Gujarat, Madhya Pradesh and Andhra Pradesh are the major ones. About 10 million workers are exposed to silica in India. The mean age of death due to silicosis is 35 years in India. Silicosis has high morbidity and mortality and has no specific cure to date. It also leads to a spectrum of other diseases. (6, 7)

Pneumoconiosis is a group of interstitial lung diseases that develop due to inhalation of certain dust, causing a tissue reaction to develop in the lung. Since workplace exposure plays a pivotal role in the development of this condition (8), it falls under the category of occupational hazards. Pneumoconiosis can be fibrotic or non-fibrotic, with silicosis, coal workers' pneumoconiosis, and asbestosis falling under the former category (9).

Accurate assessment of the disease burden is challenging. There are multiple reasons for that, like poor maintenance of records and time lag between exposure and diagnosis and poor understanding of their relationship (10). More than 2 million workers have an experience of occupational exposure to silica dust all over the world (11). Among the exposed, male workers make up the bigger chunk, signifying the greater pool of male gender in that occupational workforce with more exposure to silica dust (11).

Time and again, there have been epidemics of silicosis all around the world. The worst of all such epidemics happened in West Virginia in 1930-1931, in which more than 400 workers died due to silicosis during the construction by drilling rocks, and around 1600 of them surmounted to condition.

The risk of the development of disease is directly proportional to years of exposure. It was found that exposure of around 30 years led to the development of silicosis in 12%. (12)

In India, the states and union territories that are under the tight grip of this dreadful disease are Gujarat and Rajasthan in Western India; Haryana, Uttar Pradesh, Bihar and Chhattisgarh states in the Northern part of India; and Jharkhand, Orissa and West Bengal in its Eastern part. About 10 million workers are exposed to silica in India. The prevalence of silica dust ranges from 3.5% in ordnance factories to as high as 54.6% in the slate-pencil industry. This wide gap is explained by several factors, such as different work environments, exposure duration and job demands, which

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leads to exposure to highly variable silica concentrations. (13)

In Rajasthan, mining is a high revenue-generating sector in the state. That, along with inadequate Governmental policies and laws, had led to pneumoconiosis emerging as an epidemic in the state. More than 80% of the deposits of sandstone in India lie in Rajasthan, and here, a large number of mines are spread in 19 out of 33 districts. The state of Rajasthan has one of the largest numbers of workers in building and construction industries in unorganized sectors. DMRC Jodhpur carried out a study in 1992-94, reporting that 9.9% of sandstone workers have silicosis. (14) According to the Silicosis Grant Disbursement of the Government of Rajasthan, the total number of reported cases in Jodhpur till February 2022 was 34210. (15)

Silicosis has three main forms of presentation, with the chronic form being the most common and the other two being accelerated and acute forms. The chronic form develops from long-term (>20 years) exposure to low dust levels. It causes inflammation in the lungs and lymph nodes of the chest, and difficulty breathing is the most common symptom. The accelerated form develops with larger amounts of exposure over 5-15 years. The acute type results from even shorter exposure to very large amounts of dust, causing a dip in blood oxygen levels. (16)

There is no potent treatment for silicosis (silicotuberculosis) and asbestosis, prevention is the effective primary strategy, and a correct, timely diagnosis plays a pivotal role. (17) Mean age of death due to silicosis is 35 years in India. Pneumoconiosis has high morbidity and mortality and has no specific cure to date. (18) It also leads to a spectrum of other diseases like tuberculosis. Among miners, there is a prevalence of silicotuberculosis as well. However, since the symptoms of chronic silicosis are usually non-specific, diagnosing it becomes a challenge.

Despite all the efforts, pneumoconiosis still persists to be an incurable disease, with silicosis as one of the major occupational health illnesses all around the world. International agency for research on cancer (IARC) has classified crystalline silica as a carcinogen to humans. It has the potential to progress into physical disability (19).

Pulmonary rehabilitation as a treatment option is recognised for chronic obstructive lung disease to improve exercise performance and quality of life, whereas very little information, is available on pulmonary rehabilitation as a cost-saving method in already under-compensated workers suffering from occupational respiratory disease. Pulmonary rehabilitation as an intervention includes exercise training, behavioural change along with social support designed to improve physical as well as psychological outcomes in patients suffering from chronic respiratory disease. There is evidence of pulmonary rehabilitation as an intervention method in patients with chronic respiratory disease to reduce dyspnoea and improve exercise performance (20)(21) with a reduction in need for healthcare utilisation and improvement of functional capacity (22).

Pulmonary Rehabilitation has found its widespread application in COPD with demonstrable improvement in health-related quality of life and functional and maximal exercise capacity (23). Management of the condition should include a comprehensive approach, including symptomatic treatment, complication/combination treatment, and rehabilitative treatment to reduce pain, delay the progression of the disease, and prolong the life of the patient (24).

Pulmonary rehabilitation consists of various components, including diaphragmatic breathing exercises, aerobic exercises, glossopharyngeal breathing exercises (GPB), postural drainage and pursed-lip breathing exercises (25). Impaired exercise tolerance is common in chronic lung diseases like pneumoconiosis. Along with airflow limitation and reduction in lung volume, skeletal muscle weakness is common. There is inactivity and loss of functional capacity in daily life, which can be improved by an increase in physical performance. Endurance and resistance training are capable of improving exercise capacity and muscle strength. Endurance and resistance training go hand in hand and work synergistically on exercise tolerance. Besides dyspnea, exercise capacity is also limited due to diminished leg effort, which in turn is due to diminished muscle strength and exercise tolerance.

Pulmonary rehabilitation is effective in providing improvement of functional capacity and reducing health care utilisation in occupational respiratory diseases (25). Very little information is available, especially on its use in occupational lung diseases, and more studies should be

encouraged to find its use to improve the help of those suffering from this incurable disease.

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