



## INCIDENCE OF SILICOSIS AND SILICOTUBERCULOSIS IN COAL AND STONE INDUSTRY IN THE STATE OF CHHATTISGARH

### Pulmonary Medicine

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### ABSTRACT

Silicosis is an occupational disease reported in silica, stone & mining industry. No proper report on workers in industries using silica in stones and coal has been done from Chhattisgarh till date. Detailed history, lung functions and chest x-ray were done. Diagnosis was made on the basis of radiology & history. Data analysis was done with the help of the statistical package for social sciences software. The Chi-square test was used for determining the relationship between qualitative data and descriptive statistics was used where required. Out of the total 16 reported cases, 13 had respiratory symptoms. Radiological abnormalities were noted in all. Lung functions revealed obstruction in 25%, restriction in 12.5 %, while mixed ventilatory defects in 62.5% subjects. 16 cases of silicosis and silicotuberculosis were reported. They had high respiratory morbidity (81.25%), cough and dyspnea being predominant symptoms. Duration of exposure correlates with radiological findings and increased incidence of silicosis.

### KEYWORDS

silicosis, silicotuberculosis, coal mining, stone crusher.

### INTRODUCTION

Silicosis is a form of pneumoconiosis caused by inhalation of crystalline silica dust reported in silica mill workers, stone and coal miners. Silicosis is a preventable disease and thus, eliciting occupational exposure history is essential in the diagnosis. Primary prevention in the form of dust control measures at work place and secondary measures such as use of protective masks and respirators by the workers can reduce the incidence of silicosis.<sup>[1]</sup>

In the state of Chhattisgarh, coal and stone usage in industrial sector is very common. No proper study has been taken to evaluate the effects of silica dust exposure in workers and thus, we undertake this prospective study to evaluate workers from various sectors with exposure to silica dust like sand blasting, coal mining, water and electricity factories using coal and find any correlation between duration of exposure, history of tuberculosis, age or sex

### AIMS AND OBJECTIVES

To study the cases of silicosis and silicotuberculosis in workers from various sectors with exposure to silica dust and find any correlation between duration of exposure, history of tuberculosis, age or sex .

### MATERIALS AND METHODS

The study was conducted in the department of TB and Chest department BHIMRAO AMBEDKAR MEMORIAL HOSPITAL, RAIPUR.

### Inclusion criteria

Individuals who have worked in a factory using silica containing coal or stones and consenting to participate in the study were included.

### Exclusion criteria

Age <18 years  
Pregnant women  
Physically/mentally challenged individual

### Methodology

A total of 64 workers who fulfilled our inclusion criteria agreed to be a part of the study. Detailed clinical history and physical examination with detailed occupational history was obtained by the faculty of the chest department that included specific details regarding symptomatology, daily working hours at the mill, number of years at the mill, type of coal/ stone used, smoking history, and history of pulmonary tuberculosis. Sputum was examined for Mycobacterium tuberculosis by smear examination or molecular methods. Chest radiograph and spirometry were done in the subjects. Workers with abnormal chest Xray underwent high resolution CT of the chest.

### Interpretation of findings

Silicosis was labelled on the basis of radiological diagnosis confirmed

on HRCT. Those subjects with features suggestive of silicosis who were found to have sputum tests positive for Mycobacterium Tuberculosis were labelled as silicotuberculosis. Spirometry was interpreted by a chest physician.

### Statistical Analysis

Data analysis was done with the help of the statistical package for social sciences software. The Chi-square test was used for determining the relationship between qualitative data and descriptive statistics was used where required.

### RESULTS

10 cases of silicosis and 6 cases of silico tuberculosis were studied. Duration of occupational exposure ranged between 4 to 22 years. Radiological abnormalities were noted in chest X-ray and HRCT. 13 (81.25%) of the workers had respiratory complaints. 10(77%) complained of cough, all 13(100%) had dyspnea, 3 (23%) had wheezing, and 2 (15.4%) had chest pain.

**Table 1 Respiratory morbidity**

RESPIRATORY SYMPTOMS/ SIGNS	NUMBER OF WORKERS	PERCENTAGE(%)
COUGH	10	77
DYSPNOEA	13	100
WHEEZING	3	23
CHEST PAIN	2	15.4
PFT	10	62.5
OBSTRUCTION	2	20
MIXED/ restrictive	8	80

However, the frequency of reported cough and dyspnea did correlate with duration of exposure ( $p < 0.05$ ) Since silicosis and its association with mycobacterium infections is known, detailed history regarding tuberculosis was obtained. 6 (37.5%) had a history of taking treatment for tuberculosis and 6(37.5%) were found to be sputum positive of tuberculosis. Of them 10 patients had developed tuberculosis after they had started working at the mill.

All the 16 workers had abnormal X-ray findings that included miliary shadows in 8 (50%), parenchymal calcification in 2 (12.5%), fibrosis in 6 (37.5%), infiltration/ consolidation in 5 (31.2%), hyperinflation 8(50%) and cavitation 5(31.2%).

The number of patients showing abnormal shadows on X-ray increased with duration of exposure. ( $P < 0.05$ ) High-resolution CT scan was done in all 16 patients. The findings on HRCT included calcified lymph nodes in 1 (6.2%), parenchymal nodules in 2(12.5%), miliary shadows in 8(15%), fibrotic scarring in 6 (37.5%), pleural thickening in 2(12.5%), emphysema/air trapping in 2(12.5%).

Lung functions were done on 10 workers who were sputum smear negative for acid fast bacilli. Lung functions revealed obstruction in 20% subjects, while mixed ventilatory defects/ restriction in 80% subjects (Restriction and mixed defects couldn't be evaluated due to lack of lung volumes and DLCO). No correlation was found between duration of exposure and lung function abnormalities.

In the study, 4 (12.5%) subjects were smokers, 2 (12.5%) were reformed smokers, and 10(62.5%) were non-smokers. On analysis of smoking status and incidence of respiratory morbidity, it was found that even among the non-smokers 8(80%) had respiratory symptoms, 8(80%) had abnormal auscultatory findings, 9 (90%) had abnormal HRCT, 9 (90%) had abnormal lung functions.

## DISCUSSION

Silicosis is a pneumoconiosis that occurs in three forms depending on the duration and amount of exposure to silica.

In the state of Chattisgarh, coal and stone usage in industrial sector is very common. No proper study has been taken to evaluate the effects of silica dust exposure in workers and thus, we undertake this prospective study to evaluate workers from various sectors with exposure to silica dust like sand blasting, coal mining, water and electricity factories using coal and find any correlation between duration of exposure, type of industry, history of tuberculosis, age or sex .

Silicosis causes irreversible fibrosis and damage to the lungs, hence there is a pressing need to detect risks in the unorganized sectors so as to implement primary and secondary preventive measures.[1]

Respiratory illnesses ranging from irritant symptoms to allergic rhinitis, dyspnea and cough have been reported in workers exposed to silica dust even in coal using industries. [2] Persons exposed to silica dust present with productive cough and dyspnea and may also have lower flow rates on lung functions.[3] In our study, 10 out of the 16 workers (77%) complained of cough, 13(100%) had dyspnea, 3 (23%) had wheezing, and 2 (15.4%) had chest pain. In all, 81.2% of the workers had respiratory symptoms. Obstruction on lung functions was noted in 20% of surveyed workers.

Chronic silicosis occurs usually after 10 or more years of low-grade exposure, however accelerated silicosis can occur after 5 years of exposure to higher concentrations or freshly fragmented silica.[4]. 62.5 % had more than 10 years of exposure at workplace. The incidence of silicosis is known to increase with increased duration of exposure and greater cumulative exposure.[5]. The total duration of exposure showed a positive correlation with proportion of workers having abnormal auscultatory findings ( $P=0.05$ ), presence of miliary shadows on chest radiograph ( $P<0.05$ ) and HRCT abnormality ( $P<0.05$ ).

The findings on HRCT included calcified lymph nodes in 1 (6.2%), parenchymal nodules in 2(12.5%), miliary shadows in 8(15%), fibrotic scarring in 6 (37.5%), pleural thickening in 2(12.5%), emphysema/air trapping in 2(12.5%).

No correlation was found between duration of exposure and lung function abnormalities. ( $p>0.5$ ).

Higher incidence of mycobacterium infections is seen in patients with silicosis.[6]

In this study, 37.5% had past history of tuberculosis, while 6 (37.5) were on treatment for the same at the time of study. Of them 62.5% developed tuberculosis after they had started working at the industry thus reinforcing the co-relation between the two conditions.

Although smoking is a known confounding factor in development of silicosis and obstructive airway disease due to silica exposure,[6,7] this study revealed significant respiratory morbidity even among non-smokers with 80% reporting respiratory symptoms, 80% with abnormal auscultatory findings, 90% with abnormal HRCT, 90% with abnormal lung functions.

## CONCLUSIONS

This prospective study indicates a high incidence of silicosis amongst coal mill and stone blasting workers .The incidence of silicosis increases as duration of exposure to silica increases. Most common radiographic findings included miliary lesions showing a higher incidence with greater duration of exposure.

Importance of health education amongst workers regarding use of protective gear and dust control measures at workplace needs to be emphasized considering the fact that silicosis can only be prevented and not treated.

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