ORIGINAL RESEARCH PAPER

Respiratory Medicine

ANALYSIS OF CLINICO RADIOLOGICAL PROFILE OF RESPIRATORY INVOLVEMENT AMONG SAND MINE WORKERS IN EASTERN RAJASTHAN

KEY WORDS: Silicosis ,Progressive Massive Fibrosis ,Occupational Lung Diseases,Tuberculosis

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ABSTRACT

BACKGROUND: Silicosis is caused by the inhalation of fine particles of crystalline silicon dioxide (silica).Quartz is the most common form of crystalline silica but is less fibrogenic than tridymite or cristbalite. Occupations such as mining, quarrying, and tunnelling are associated with silicosis. People who work in jobs where they exposed to silica bits are at risk for silicosis. Exposure to silica dust is also known to predispose to Pulmonary Tuberculosis, Chronic Airflow Limitation, Lung Cancer, Renal Diseases, etc.

AIMS AND OBJECTIVES: To analyse clinico-radiological profile of respiratory involvement in stone mines workers with the help of digital chest x-ray and PFT changes.

METHODS: This was an open label, Cross Sectional study was conducted in the New Medical College and Hospital, Kota on the sand mine worker, over a period of one year from Aug 2015 to July 2016 On 250 subjects.

RESULTS: Most common age group were in the age group 41-50 years which is 33.2%, Mean age of study population was47.38±10.23 Categorization of small opacities shows that 54.8% of subjects belong to category 0,category 1 was seen in 16% and category 2 in 13.2%and category 3 was found in 16% of the subjects. Spirometric analysis showed the parameters like FEV1, FVC, and FEV1/FVC% had a negative correlation with silica exposure duration .There was a linear relationship between silica exposure duration in year and FEV1%.

CONCLUSION: We conclude from our study that many workers engaged in stone mining may be suffering from silicosis and associated diseases.

INTRODUCTION

Stone and crushing are out in many parts of India and majority of these mines are located either in remote or rural areas adjacent to the cities. A large number of workers are employed in unorganized small scale stone mines and crushing units. The working conditions in most of the stone mines may not qualify satisfactory standards in terms of health and safety standards. Quarrying and crushing operations generates large amount of fine dust particles containing plenty of free silica in the range of 20-70% depending on the nature of stone[1].

Silicosis is a chronic lung disease as a result of breathing silica dust in work sites .Exposure to silica dust is also known to predispose to Pulmonary Tuberculosis, Chronic Airflow Limitation, Lung Cancer, Renal Diseases, etc.Occupational health research in India it is suggested that the prevalence of silicosis amongst stone quarry workers was 21% and that in stone crusher was 12% [1].

The risk of developing pulmonary tuberculosis is reported to be 2.8 to 39 fold higher for patients with silicosis than for healthy controls[2,3]. Person with silicosis have a relative risk of developing extra pulmonary tuberculosis that is 3.7 times that of non silicotic workers [2]. Practice of Mining and metallurgy were started much earlier in India than that in Europe, but first cases of silicosis in this country were described in the 1940s among the gold miners of Kolar field by Caplan and Burden[4].

Silicosis is caused by the inhalation of fine particles of crystalline silicon dioxide (silica)[5]. Quartz is the most common form of crystalline silica but is less fibrogenic than tridymite or cristbalite[6]. Tuberculosis and carcinoma are potential serious complications of silicosis[8].

AIMS AND OBJECTIVES :

To analyse clinico-radiological profile of respiratory involvement in stone mines workers with the help of digital chest x-ray and PFT changes

MATERIALS AND METHOD:

This was an open label, Cross Sectional study was conducted in the New Medical College and Hospital, Kota on the sand mine worker, over a period of one year from Aug 2015 to July 2016.

Study Population:

A total of 250 subjects working in sand mines in eastern Rajasthan who were randomly selected and recruited for this study in the age.

Inclusion Criteria:

We have included Subjects within age group 20 to 65 years. Patients presenting with long term occupational dust exposure.

Exclusion Criteria:

1. Age below 20 years and above 65 years.
2. Patients with history of any lung disease before joining the occupation.
3. History of chronic obstructive pulmonary diseases and chronic restrictive lung diseases group of 20 to 65 years.

The study was approved by Institutional Ethical committee. A clinical diagnosis of Silicosis had been considered in any patient having progressive exertional dyspnoea who has been working in sand mines for a long time. Physical examination and investigations will be done to rule out exclusion criteria and detect other co morbidities. Age, gender, weight and height of the patient were noted. HIV and

usual routine blood investigations were done. Computerized data logging Spirometer for recording the pulmonary function tests have done.

Radiological Imaging were done.The chest radiographs of subjects were evaluated as per ILO classification of Radiographs of Pneumoconiosis, 2000 under standardized condition.

Statistical analysis of the data was performed using the statistical package for the social science (SPSS) program. Results were expressed as mean ± standard deviation. Chi squre test for estimating P value, correlation coefficient (r), were done.

RESULTS :

Most common age group were in the age group 41-50 years which is 33.2%, than 28% cases found between age group 51-60 years and minimum patient found in age group 21-30 years which was only 5.6%.We observed that 90% patients were male and only 10% patients were females. Mean age of study population was47.38±10.23. . In Silicosis it was 48.43± 8.77 and in Non-Silicosis it was 46.51± 11.26. Mean duration of exposure for study population was17.272 ±7.4471 . For silicosis patients average duration of exposure was 21.991 ± 6.82.

Maximum study cases were undernourished with a total mean BMI of 18.397 ± 2.174.There was no correlation between BMI of silicosis cases and non-silicosis (t value 1.810,p; 0.072). Out of 250 cases28 were non-smokers. Among 225 males and 25 females 20 and 8were non-smokers respectively.

Categorization of small opacities in Xray chest as 0,1,2,3 was done and our study shows that 54.8% of subjects belong to category 0,category 1 was seen in 16% and category 2 in 13.2%and category 3 was found in 16% of the subjects.

Out of 113 silicosis diagnosed cases 9 cases showed progressive massive fibrosis in which 2 cases came under category A and 7 cases came under category B. 5 cases of PMF were observed in workers having exposure of >30 years, followed by 4 cases in workers having 21-30 exposure of years. Statistical significance of association between duration and occurrence of PMF, exposure categories were tested by Chi-square test, resulting into a P-value of <0.001 significant.

Work exposure in mines of silicosis subjects were significantly high compared to Work exposure in mines of non-silicosis subjects (t value -11.116, p :< 0.001). Association between duration of exposure and ILO categorisation found a P-value of < 0.001 indicating statistically significant association between duration and ILO category.

Other important findings in chest radiographs include 25 cases having radiological evidence of Pulmonary Tuberculosis. In 13 subjects there was evidence of silicosis associated with pulmonary tuberculosis, hence forth termed as Silico-tuberculosis

Spirometric analysis showed the parameters like FEV1, FVC,and FEV1/FVC% had a negative correlation with silica exposure duration .There was a linear relationship between silica exposure duration in year and FEV1%.

Table: Comparing spirometric parameters in silicosis with non-silicosis cases

Parameter	Silicosis Absent (Mean±SD)	Silicosis Present (Mean±SD)	t value	P value
FEV1	73.813±17.08	44.376±20.177	12.491	<.001
FVC	71.716±15.26	46.779±19.82	11.233	<.001
FEV1/FVC	107.15±13.42	100.5±22.12	2.90	0.004

Spirometric parameters were significantly low among silicosis subjects than in non silicotic subjects .there was no significant correlation between spirometric indices with categories of silicosis .

DISCUSSION:

This is an open label, comparative, analytical and cross sectional study done in the Department of Respiratory Medicine, New Medical College Hospital, Kota during period Aug 2015 to July 2016. On the basis of history, clinical examination and various investigation 250 study cases who working in sand mine were taken from Respiratory medicine OPD.

Most common age group were in the age group 41-50 years which is 33.2%, than 28% cases found between age group 51-60 years and minimum patient found in age group 21-30 years which was only 5.6%. Chaudhury et al[9]. found in his study that about 77% were in the age group 15–35 years whereas only 3.3% people were in the age group 60 years and above. Shortness of breath was the most common symptom in more than 90% cases 2nd most common symptom observed in our study was cough.We found that longer duration of exposure to free silica is significantly associated with higher prevalence of silicosis Steenlandet al[10] in study study corroborates the fact that longer duration of cumulative exposure to free silica is associated with higher prevalence of silicosis. Kashyap S K[11] also had done an environmental and medical survey in sand stone mines located in lalitpur district of Uttar Pradesh revealed that The average duration of dust exposure for development of silicosis was 12 to 15 years. We also found in our study that maximum undernourished patients in sand mine workers. 60% of sand mine workers (150 out of 250) were underweight concluded that undernourishment is common in sand mine workers. Choudhury et al[9]in his review study found that more than half of the male workers were underweight.

Prevalence of silicosis in present study was 45.% . Choudhary et al[9] in their study found prevalence of 69.1 % , National Institute of Miners' Health(Karauli) [12] found prevalence of 50 % in their study .

The prevalence of silicosis increased with increasing number of years of work in mines, as seen in the study, 40.86 % of persons developed silicosis who had work history of 11-20 years. 86.53 % of persons developed silicosis having work history between 21-30 years and the highest 100 % of persons developed silicosis who had worked for more than 30 years in stone mines. In our study we found that the occurrence and stage of silicosis was directly related to years of work in stone mines.73 subjects had silicosis of category 2 or higher indicating advance stage of the disease. The cases of Progressive Massive Fibrosis were of category A or B. Progressive Massive Fibrosis also were directly related to years of work in stone mines.

National institute of miner's health had done a study in Dholpur district[13] in silicosis suspected cases and evaluated the chest radiographs of 154 subjects with the history of work in stone mines have showed that 38.4% of subjects have evidence of silicosis of which 7.5 % had Progressive Massive Fibrosis.

Out of 113 silicosis cases 13 cases had radiological features of Pulmonary Silicotuberculosis. Hnizdo E, Murray J[14] showed that the risk of developing pulmonary tuberculosis is proportional to the severity of the silicosis and the intensity of cumulative exposure to dust.This study was in concordance with our study .

We found that the lung function was significantly associated with duration of dust exposure and also those patients with silicosis had significantly lower FEV1, FVC, FEV1/FVC values

than those with non-silicosis (P < .05).

Ghotkar et al[15] found in their study that the impairment of lung function was significantly associated with increasing age, duration of dust exposure, smoking status and presence of chronic obstructive airways disease on radiological appearance. At linear regression analysis duration of silica exposure were significant determinants of forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC) and FEV1 to forced vital capacity (FVC) ratio respectively similar study was also done by Ooiet al[16].

CONCLUSION

We conclude from our study that many workers engaged in stone mining may be suffering from silicosis and associated diseases. We can diagnose silicosis in early stages by regular health check-ups and screening of mine workers with the help of digital chest x-ray and PFT. Smoking, low socio-economic status and poor physical built are common with stone mine workers. We should increase the protective standards of the mines and should provide or make awareness for health insurance for the workers working in the mines.

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