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RESEARCH ARTICLE

PREVALENCE OF SILICOSIS IN SANDMINE WORKERS IN KOTA: A CROSS SECTIONAL STUDY

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ABSTRACT

Background: High prevalence of silicosis and associated comorbidities were seen in sandmine workers in kota. **Aims**: The present study analyse the clinico-radiological profile of respiratory involvement in sandmine workers of Kota with the help of digital chest xray and PFT findings. **Study design:** This is an open label cross section study conducted in NMCH, Kota among 250 randomly selected sandmine workers in the age group of 20 to 65 years over a period of one year from August 2015 to July 2016. **Materials and methods:** 250 selected subjects were recruited for chest xray and PFT .Xrays were evaluated for the presence or absence of opacities in the lung field and PFT parameters like FEV1,FVC and FEV1/FVC were evaluated. **Stastical analysis:** SPSS was utilised for descriptive stastics and logistic regression. **Results:** 113 out of the 250 patients were diagnosed with silicosis based on clinical, radiological and PFT findings. Prevalence was found to be 45.2 percentage .many additional comorbidities like pulmonary TB, COPD and malnourishment were also noted among sandmineworkers. Majority of the patients diagnosed had an exposure history of more than 10 years Smoking was found to be an additional risk factor during our study probably contributing to the comorbidities mentioned above. **Conclusion:** Study revealed a strong relationship between duration of exposure and radiological and PFT findings in silicosis and the inadequacy of protection measures employed at the work site along with lack of awareness about personal protection devices and education about the possible morbidities amongst the workers.

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INTRODUCTION

Silicosis is a fibrotic disease of lung caused by occupational exposure to silica through inhaled route. In the modern day manufacturing process, silica is an inevitable component. It is the predominant component of earth's crust and constitute 20 to 100 percentage of sandstone, granite and slate. Occupational exposure to 0.5 to 5 micrometre sized silica particles is associated with mining, quarrying, drilling, tunnelling and sandblasting. This also poses a health hazard to stone cutters and those engaged in pottery and foundry. Quartz, cristobalite and tridymite are the main crystalline forms of silica which have been implicated in silicosis. Chronic, accelerated and acute constitute the chronological classification of silicosis based on the duration of exposure. No specific treatment is available for this disease at present. Exposure to silica also predisposes to tuberculosis, lung cancer, chronic airflow limitation and renal diseases. Very few studies are available regarding the prevalence of silicosis in sand mineworkers. Majority of them are cross-sectional studies representing the surviving population. Sickness absenteeism at the time of survey also underestimates the overall morbidity. This study was conducted in NMCH, kota amongst sand mine workers who visited the respiratory medicine op d for their ailments.

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

Subjects and methods: This is an open label, cross sectional study conducted in the New Medical College and Hospital, Kota among sandmine workers over a period of one year from Aug 2015 to July 2016.

Sample Size: 250 cases

Study Period: One year

Study Population: A total of 250 subjects randomly selected and recruited for this study in the age group of 20 to 65 years.

Ethical Approval: The study received approval of the ethics review committee of New Medical College and Hospital, Kota (Date: 25/7/2016, Letter No: F.3 ()/Acad./Ethical comm./MCK/2016/421). Written informed consent will be obtained from each of the patient after explaining them about the study.

Inclusion criteria: Subjects within age group 20 to 65 years with long term occupational dust exposure.

Exclusion Criteria

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

Study procedures and measures: Physical examination and routine investigations were done to avoid the exclusion criteria and detect other comorbidities. Computerised data logging spirometer for recording the PFT and chest xrays were performed. Written informed consent was obtained from each patient after complete explanation of the study. The study also received approval from the ethics review committee of new medical college, kota.

Chest xray & PFT: 250 subjects selected by inclusion criteria were recruited for chest xray and PFT.xrays were evaluated for the presence or absence of small/large opacities in the lung fields and PFT parameters like FEV1, FVC & FEV1/FVC were monitored.

Analysis: Statistical analysis of data was performed using the spss. results were expressed as mean+/- standard deviation. Chisquare test was also utilised for estimating the p value and correlation coefficient

RESULTS

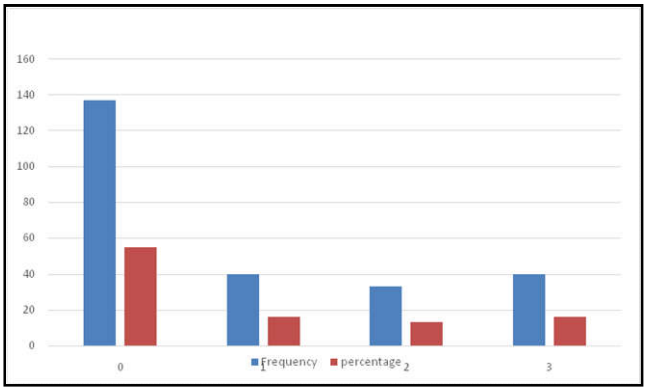
Demographic profile: Among the study profile, there were 225 males and25 females with most number of cases falling in the age group of 41-50 (33.2%).28% cases belong to the age group 50-60 with least number of patients in the age group 21-30.Out of 250 subjects,113 were confirmed with silicosis and age & sex distribution correspond with the above findings**.**

Exposure history: More than 70% of workers were found to be working for more than 10 years with 16 workers having an occupational history of more than 30 years. Exposure history was found to be greater in silicotic subjects than nonsilicotic subjects**.**

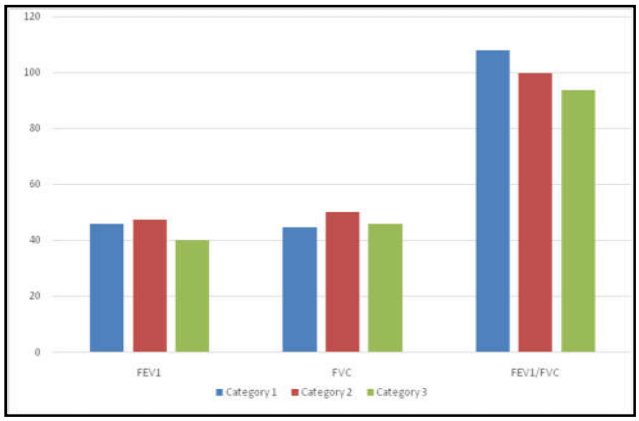
Symptoms & signs: Most patients had symptoms since 6 – 10 years.Most common symptom was shortness of breath in 90% followed by cough,chest pain and hemoptysis.Pallor and clubbing were the predominant clinical signs seen in 33.2% & 29.6% respectively.BMI was found to be decreased in 60 percent of subjects with no significant difference between silicotic and nonsilicotic subjects. Crepitations were found in majority of subjects compared to rhonchi.

Size and shape	Frequency	Percentage
p/p	67	26.8
q/q	46	18.4

Chest xray & PFT: Among the 113 confirmed cases,chest xray revealed 'p' type opacities in 67 cases and 'q' type opacities in 46 cases with 9 cases showing progressive massive fibrosis.Chisquare test performed to find out association between exposure and category of pneumoconiosis resulted in p value of <0.001 indicating significant correlation between duration and ILO category. In the PFT studies parameters like FEV1,FVC & FEV1/FVC had a negative correlation with silica exposure duration and their values were found to be significantly low in silicotic patients.



PFT parameter	Minimum	Maximum	Mean	SD
FEV1%	10	96	60.50	23.62
FVC%	9.0	99.0	60.44	21.41
FEV1/FVC	40.00	132.80	104.17	18.149



Study	Prevalence of silicosis
Choudhary *et al*(1)	69.1%
National institute of miners' health(karauli)(2)	50%
National institute of miners' health(dholpur)(3)	38.4%
Present study	45.2%

However no correlation was found between spirometric indices and different categories of silicosis.

Smoking history: Among the 250 subjects, 20 males & 5 females were nonsmokers.

Coexisting tuberculosis: Out of 113 silicosis cases, 13 subjects had evidence of silicotuberculosis.

DISCUSSION

113 out of the 250 patients were diagnosed with silicosis based on clinical, radiological & PFT findings. Prevalence was found to be 45.2%.Many additional comorbidities like pulmonary TB & malnourishment were noted among sandmine workers. Majority of the patients diagnosed had an exposure history of more than 10 years.Smoking was found to be an additional risk factor contributing to the above mentioned comorbidities. Hnizdo E, Murray J. (1998)(8**)** studied more than 2,000 gold miners over 27 years, showed that the risk of developing pulmonary tuberculosis is proportional to the severity of the silicosis and the intensity of cumulative exposure to dust. The workers with high silica exposure have more likely to develop tuberculosis than low silica exposure. Menezes AMB *et al.* (1998) conducted a study in Brazil and investigated the risk

	Ooi *et al*.(2003)	Steenland *et al.* (1995)	Churchyard GJ *et al.* (2004)	Leung CC *et al.* (2005)	Present study
Duration of silica exposure	28.2 ± 9.1	20.8 ± 8.7	21.8 ± 5.3	23.6 ±9.4	21.99 ± 6.82

Spirometric parameters	Leung *et al.* (2005)	Ooi *et al.* (2003)	Present study
FEV1%	85 ± 24	68.1 ± 24.8	44.376±20.177
FVC%	95.8 ± 18.7	82.1 ± 16.6	46.779±19.82
FEV1/FVC%	70.7 ± 13.6	60 ± 16	100.5±22.12

factors for tuberculosis in the city of Pelotas (located in the state of Rio Grande do Sul). All cases diagnosed between 1994 and 1995 were paired with controls in the general population. Rock quarrying showed an increased risk (4.7 times higher), whereas living less than 2 km from a rock quarrying site. The study also revealed a strong relationship between duration of exposure and radiological & PFT findings in silicosis which in turn urge for the utilisation of these modalities as a screening tool amongst the sandmine workers. The study also highlight the inadequate protection measures employed at the work site along with the lack of awareness about personal protection devices like respirator masks and education about the possible comorbidities amongst the workers. These poverty stricken workers are forced to ignore their health issues in order to earn their daily bread

Conclusion

Workers engaged in sand mining suffer from silicosis and associated diseae. It can be diagnosed in early stages by regular health checkups and screening of sandmine workers with the help of digital chest xray and PFT. Medical services, rehabilitation and smoking cessation programmes should be provided to these persons. Protective standards of mines should be raised and awareness of health insurance to mine workers should be made.

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