Original Research Article

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A study to assess the pulmonary functions in a cement ware house workers near railway station, Nishatpura, Bhopal

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ABSTRACT

Background: It is unfortunate enough that cement industry workers despite of so many awareness campaigns, unable to seek protection against dust of cement and thus bound to face respiratory problems. In developing countries no legitimate bindings regarding protection of such workers though cement industry is one of the largest industries.

Methods: Non probability sampling done in which cases taken from cement workers and control taken from nearby residents matched for age gender and smoking status of participants.

Results: When studied for the restrictive and obstructive respiratory problems it was found 2.82 times and 4.71 times higher in cases respectively. When cases studied for duration of working against disease developed, it was found that 61.81% developed obstructive pulmonary disorder and proportion increased from 23.63% to 30.80 as the work span increased from 0-5 years to 5-15 years respectively. When it has been observed for restrictive pulmonary disorder, it has been increased from 3.6% to 5.4%.

Conclusions: It has been observed that workers have either obstructive pulmonary dysfunction or normal pulmonary functions and on increasing the duration, number of workers with restrictive pulmonary function increases proportionately.

Keywords: Pulmonary functions, Cement warehouse workers, Bhopal

INTRODUCTION

Few studies have been carried out on acute effects of cement dust exposure. The worldwide community especially, the people in developing countries is, facing increasing risks of respiratory diseases due to production of smoke & dust in different occupational & industrial sectors. The health risks posed by inhaled dust particles are influenced by the duration of exposure and the biological responses exerted by the particles. Cement industry is one of the largest manufacturing industries

and its workers are exposed to dust at various manufacturing and production processes.¹

This is unfortunate enough that despite of the advances in medical stream and so many awareness campaigns being run by government in respective countries, this specific problem has not been acknowledged. The workers in cement factories and warehouses are bound to work in the conditions in which they are not meant to be. They do not know the simple steps of protection and guidelines maintained for the ventilation at work place.

Respiratory problems and health hazards associated with the cement warehouse workers are further on the aggravating side in lack of education by employer. Or the strict actions or compulsions not bound by the hired authorities for maintaining health protective standards. In a poorly ventilated area, it is possible that the respiratory issues would be likely to worsen more. Considering their poor level of education, it seems that warehouses may not respond appropriately to avoid inhalation of noxious substances by the workers, which may predispose to health related complications on continuous and repeated exposures.

This is inhuman on the part as the employers and the concerned authorities are taking advantage of their ignorance. Mostly the workers engaged in this work are smokers, so the effect is further aggravated.

With the occupational safety and health Act of 1970, Congress created the occupational safety and health administration (OSHA) to assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance.² OSHA covers most private sector employers and workers.

Almost a long list of disorders pulmonary ones are associated with air borne dust and that too most of them due to occupational exposure. Long-term contact of skin with cement results in inflammatory changes or, in some cases, in chemical burns. Etiological factors of inflammatory skin changes are allergenic elements (Cr, Ni, Co) and irritating agents found in the cement.³

Cement and mineral dust seems to be major risk factor for respiratory disorders. The reason to conduct this study is that very few studies have been done on the issue of actual cement exposure and risk of respiratory disorders thus developed.

Objective

The objective of the study was to detect proportion of impaired pulmonary functions and to correlate their prevalence with the duration of exposure among the cement ware house workers near central railways, Nishatpura, Bhopal.

METHODS

Study design

Case control study.

Study population

55 workers, aged more than 18 yrs, from cement warehouse and 55 persons from nearby general population (not exposed to cement dust in past) matched in, age and smoking status with the exposed workers.

Study area

Cement warehouse near central railways in Nishatpura, Bhopal.

Study period

June to August 2015

Sampling method

Non-probability sampling method was adopted.

Inclusion criteria

Inclusion criteria were working >5 years or more, irrespective of smokers and non-smokers and willing to participate were taken for the study.

Exclusion criteria

Exclusion criteria were workers with history of respiratory and non-respiratory problems like allergy, asthma before the employment, severely ill workers refused to give consent.

Study tool

Semi structured questionnaire, spirometry.

Each completed questionnaire coded on pre-arranged coding by the principal investigator to minimize errors. Data were entered in MS excel windows 2007 and analyzed by Epi – info 7.

RESULTS

All the workers were male so controls were also taken male having age between 18 to 53 yrs (mean age 28 yrs, SD 9.2s). Most of them were Hindu by religion.

Table 1: Comparison of demographic characteristic of the cement-exposed workers and unexposed (control) group.

Group	Exposed	Unexposed
parameters	(cases)	(control)
Age (yrs)	28 (9.2 SD)	29 (9.3 SD)
Gender	Male-55	Male-55
Height (cm)	166±2	165.6±2
Weight (kg)	57±3	57.6±3
Smoking status	Smoker 34	Smoker 29
	Nonsmoker 21	Nonsmoker 26

Table 2 shows that most of the workers worked during 1st five years in which most of the workers have either obstructive pulmonary dysfunction or normal pulmonary functions and on increasing the duration, number of workers with restrictive pulmonary function increases proportionately.

Table 2: Distribution of cases according to their lung function by spirometry.

Exposure	Normal	Obstructive	Restrictive
0 to 5 yrs	10	13	2
5 to 15 yrs	4	17	3
>15 yrs	1	4	1

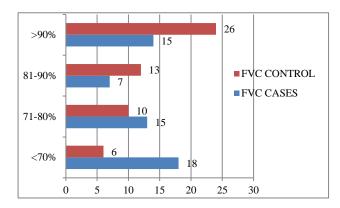


Figure 1: Forced vital capacity of cases and controls during spirometry.

P value is 0.0158.

The above figure represents that 26 control having FVC >90% and in cases only 15 have FVC >90%, 6 control having FVC <70% and 18 cases having FVC <70%. Results are significant as p value is 0.015896.

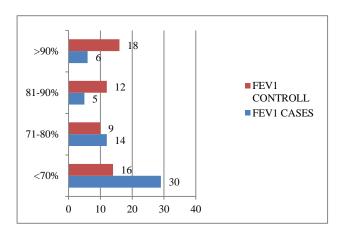


Figure 2: FEV1 of cases and controls during spirometry.

P value is 0.004991.

The above figure shows that FEV1 >90% of 18 control and 6 cases while FEV1 <70% of 30 cases 16 control.

Table 3 shows that for cases FEV1/FVC is 72.3%, which indicate that obstructive or mixed (obstructive and restrictive) type of pulmonary dysfunctions. In addition, for control it was 81.42%, which exist, in the normal range.

Table 3: Comparison of spirometry findings among cases and controls.

Spirometric variables	Cases	Controls
Mean FEV1 (in liters)	2.35	3.42
Mean FVC (in liters)	3.25	4.2
Mean FEV1/FVC	72.3%	81.42%

Table 4: Odds ratio for restrictive and obstructive dysfunction of lungs among cases and control.

	Restrictive		Obstructive	
	dysfunction		dysfunction	
	Present	Absent	Present	Absent
Cases	14	41	23	32
Contorl	6	49	7	48
	Odds ratio=2.82		Odds ratio=4.71	

Table 4 shows that odds ratio for Restrictive dysfunction are 2.82 times higher in cases as compared to control and odds ratio for obstructive dysfunction are 4.71 times higher in cases as compare to control.

Majority of cement workers had obstructive type (42.30%).

Proportion of impaired pulmonary function. Cases 61.53% Control 23.07%.

The prevalence of respiratory symptoms higher in exposed group than in the control group in this study (63% vs. 35%), probably due to inhalation of cement dust.

DISCUSSION

In our study, there were no significant differences in the major confounding variables of demographic, cigarette smoking between the exposed and unexposed subjects. The levels of inhalable cement dust observed in the current study are higher in exposed ones, findings similar to other reports. Mwaiselage et al found such association in a cross-sectional study among 120 exposed and 107 unexposed workers at a Tanzanian cement factory.⁴

Siyoum et al designed a study to determine prevalence of respiratory symptoms and associated factors among cement factories workers and compared it with the control group in Ethiopia. The odds of developing respiratory symptoms among cement factory workers were 7.6 times more than civil servants when adjusted for major confounders.⁵

The results of this study show reduced lung capacities and especially airflows in the exposed group in comparison with the unexposed group, In study of Nagoda et al also shows that the prevalence of respiratory symptoms was higher in exposed group than in the control group in this study (63% vs. 35%), probably due to inhalation of cotton dust in textile factory. The mean

values of PEFR, FVC (3.2 \pm 0.24 L), and FEV1 (2.68 \pm 0.5) of exposed group were lower than those of the control group.⁶

The lung function parameters FVC, FEV1 and FEV1% are lower in value among exposed workers compared with unexposed workers. This is consistent with the finding of a study in Turkey on 126 workers exposed to tobacco dusts and 55 controls, significant decrease was seen in FEV1, peak expiratory flow rate (PEFR) and maximal mid-expiratory flow (MMEF) in the subjects exposed to tobacco dusts in comparison with the control group.⁷

Based on the duration of exposure, cement warehouse workers were divided into 3 groups, less than 5, 5–10 and greater than 10 years. Their results showed a significant decrease in FVC and FEV1 with increased duration of occupational exposure to cement dust, clearly for more than 10 years of exposure.

We cannot be sure that there is no exposure among the control workers, while they carried out personal dust monitoring for respirable dusts and reported dust exposure among the control group. Also our results may have been influenced by some other limitations. Individuals susceptible to adverse respiratory effects from cement dust may have changed their task and therefore dropped out of the exposed group. Finally, lung function tests were performed during the working day that could cause a cross-shift effect of the cement dust in some workers. Yet, we believe that the validity of our findings is strengthened by the elimination of the effect of confounding variables, accessing to workers' preemployment examinations to make assure they did not have previous respiratory diseases and the carefully chosen controls. A more detailed respiratory hazard assessment in the cement factory is proposed as a future study.

CONCLUSION

This study demonstrates reduced lung function and increased prevalence of both acute as well as chronic respiratory symptoms as well as among high dust exposed cement production workers than among the less exposed controls.

Study revealed Obstructive pattern (42.3%) in exposed workers on spirometry and restrictive pattern (23.07%) in exposed workers.

The results support the hypothesis that dust exposure in the cement production industry lead to respiratory symptoms and lung function changes.

Recommendation

Sensitization of contractor for the safety measure of cement handler workers should be directed by the responsible authority at must. Implication of regulations regarding safety measures seeks joint hands by occupational health experts and government.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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