

Assessment of Ventilation and Diffusion Studies of Flour Mill Workers in Nagpur Urban

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Abstract: ***Aim and objectives:** 1) To assess the effect of exposure to flour dust on respiratory symptoms. 2) To study lung function of flour mill workers by diffusion and ventilation studies. **Methodology:** Statistical analysis was conducted using unpaired t test. The level of analysis was established at a level of $P < 0.05$. The overall mean pulmonary function data were correlated against the duration of exposure on Flour Mill Workers in Nagpur Urban only those were included who were willing to participate. Total flour mill operators (100) and equal number of controls were included, after explaining about the purpose of the study. Persons in the age group 19-55 years were included in the study and were randomly selected from different locations covering all parts of Nagpur city. **Statistical Analysis:** Statistical analysis was conducted using unpaired t test. The level of analysis was established at a level of $P < 0.05$. The overall mean pulmonary function data were correlated against the duration of exposure. **Results:** The values of FVC (L), FEV1 (L), FEV1 (%), FEV1/FVC (%), FEF25-75 (%), MEP, MVV, VC, DLCO and TV were significantly decreased as $P < 0.05$ in flour mill workers as compared with their matched controls. However, no significant differences were observed in MIP between the groups. The mean duration of exposure in flour mill workers was 14 years. **Conclusion:** During the study it was observed that a large number of flour mill workers suffered from the problems of restrictive defect and air flow obstruction. The decreased in peak expiratory flow rate was also in the severe to moderate range. This indicates reduction in pulmonary function efficiency among flour mill workers.*

Keywords: Diffusion and Ventilation, Prevalence, Urban area

1. Introduction

The work environment may seriously influence the person's health and safety if exposure occurs unchecked. The flour mill workers are highly exposed to harmful hazards in their work environment such as dust. Dust is regarded as a significant agent and perceived as a frequent cause of respiratory system illness. Occupational respiratory diseases are usually caused by extended exposure to irritating or toxic substances that may cause acute or chronic respiratory ailments. The occupation related lung diseases are most likely due to the deposition of dust in the lungs and are determined by type of dust, the duration, of exposure and concentration and size of air borne dust in breathing zone. Flour mills generate dust, which gets air borne and thus, get inhaled by the operator, during entire period of running the flour mill. Flour dust has a varied composition including particles of husk, cuticular hairs, and pollen grains. The occupation related lung diseases are important aspect of clinical medicine. Spirometry plays a significant role in the diagnosis and prognosis of these diseases and describes the effects of restriction or obstruction on lung function. In view of fact that flour dust puts the workers in jeopardy, the present study was designed to investigate the impact of flour dust on the lung function and further to reduce possible health risks in flour mill worker by providing information on hazards of flour dust.

Aim and Objectives

- 1) To assess the effect of exposure to flour dust on respiratory symptoms.
- 2) To study lung function of flour mill workers by diffusion and ventilation studies.

2. Patients and Methods

This study was carried out at flour mills in all parts of Nagpur city. There were total 100 flour mill workers (non-smoker) and 100 healthy control subjects (non-smoker) of similar anthropometric parameters and socio-economic status. Controls are persons who are not exposed to flour dust and non-smoker from general population.

Inclusion criteria: Persons in the age group 19-55 years were included in the study and were randomly selected from different locations covering all parts of Nagpur city and working in flour mill for 8-10 hrs. and non-smoker.

Exclusion criteria: Subjects with gross clinical abnormalities of the clinical abnormalities of the vertebral column, thoracic cage, neuromuscular diseases, known cases of gross anemia, diabetes mellitus, chronic bronchitis, emphysema, bronchial asthma, tuberculosis, ischemic heart disease, malignancy, drug addicts subject who had undergone vigorous exercise, abdominal or chest surgery and subject with history of respiratory tract infections within the previous 6 weeks were excluded from the study.

Self-designed study questionnaire was administered to them and the parameters of their pulmonary function were measured by CPX ULTIMA PFT MACHINE(8).

3. Discussion

There were total 100 flour mill workers (non-smoker) and 100 healthy control subjects (non-smoker) of similar anthropometric parameters and socio-economic status. Tlco ($P < 0.05$) was decreased significantly and rest of the parameters were decreased insignificantly in flour mill workers as compared to control subjects.

R Kapoor, K K Mahajan(15), R K Marya in their study found that, Tlco, Kco (Tlco/Va), Va, Vc and Dm measured in 25 flour mill workers (non-smoker 9, smoker 16) and 50 healthy control subjects (25 non-smoker, 25 smoker) of similar anthropometric parameters and socio-economic status. Tlco ($P < 0.05$) was decreased significantly and rest of the parameters were decreased insignificantly in flour mill workers as compared to control subjects. Statistically significant reduction was seen in smoker workers only in Tlco ($P < 0.05$) and its component Dm ($P < 0.05$) as compared to smoker control subjects. Further it has been observed that less duration of flour dust exposure (5 years) in all flour mill workers and smoker flour mill workers caused negligible fall in Tlco, whereas longer duration of flour dust exposure (5 years) in both the groups caused highly significant fall in Tlco ($P < 0.01$) which was contributed to by highly significant fall in Dm ($P < 0.001$).

Duke, 1935; Cullinum et al., 2001; Smith et al., 2001; Karpinski, 2003, this study confirms that flour mill workers have a higher prevalence of respiratory symptoms than unexposed control subjects.

Musk et al., 1990; Karpinski, 2003(4); Meo, 2004(2) Schwartz et al., (1995), reported that grain mill workers had significantly reduced spirometric measures of air flow FEV1, FEV1/FVC, and FEF25-75%. MEP, DLCO, MEO, (2004) found a significant decrease in the mean values of FVC, FEV1, PEP and MVV; this impairment increased with duration of exposure in the flour mills.

Statistical Analysis: Statistical analysis was conducted using a unpaired t test. The level of analysis was established at a level of $P < 0.05$. The overall mean pulmonary function data were correlated against the duration of exposure.

Table.1

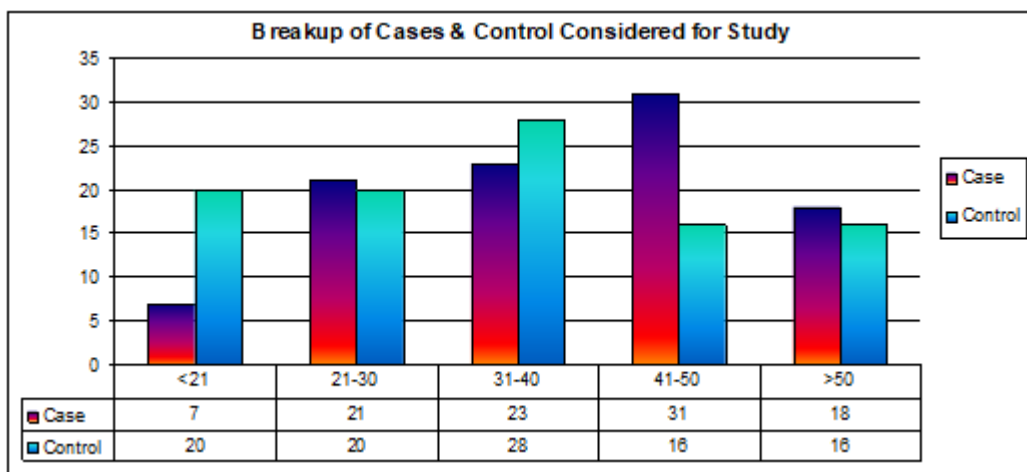


Table 2: Comparison of the overall lung function parameters between flour mill workers and control subjects

Sr. No.	Parameter	Flour Mill Workers	Control	P Values
		Mean±SEM	Mean±SEM	
1.	FVC (L)	2.72±0.43	2.95±0.33	0.0001
2.	FEVI (L)	2.21±0.52	2.50±0.43	0.0001
3.	FEV1(%)	80.16±8.34	84.08±6.42	0.0003
4.	FEV1/FVC (%)	80.18±8.40	84.32±7.27	0.0003
5.	FEF 25-75 (%)	3.67±1.02	4.33±0.88	0.0001
6.	MIP	115.78±19.52	121.82±8.04	0.2222
7.	MEP	6.45±1.21	7.54±1.23	0.0001
8.	VC (L)	3.18±0.40	3.42±0.36	0.0001
9.	PEFR (Per Sec.)	379.35±48.67	412±31.33	0.0001
10.	DLCO (Co mm/min.)	24.80±2.73	37.15±4.78	0.0001

4. Results

Respiratory symptoms such as cough, expectoration, wheezing, and shortness of breath, were significantly ($p < 0.0001$) higher among exposed workers as compared to unexposed. The data of the pulmonary function test show declines in the FVC, VC, FEF 25-75%, FEV1/FVC, and MEP, DLCO, and PEFR indices of the flour mill workers as compared to the control group.

5. Conclusion

Among the people of India, unawareness of occupational health hazards and risks is observed to be unusually high in Flour mill workers in Nagpur city like flourmill workers elsewhere. They were at an increased risk of developing pulmonary symptoms, a strong association exists between exposure to flour dust and the prevalence of respiratory symptoms and functional impairments of the lungs. The result has implications for improved dust control measures in the flourmill workers.

Based on above conclusion, following recommendations are made for the safety of flour mill operators:

- It is recommend that there should be suppression and control of dust. Therefore, the emission sources of the particulate should be of the most special attentions and

Table 1: Percent Reduction in the Clinical Parameters

Sr. No.	Parameter	$\frac{\text{Case}}{\text{Control}} \times 100$	% Reduction*
1.	FVC (L)	92.00	7.79
2.	FEVI (L)	88.40	11.16
3.	FEV1 (%)	95.23	4.76
4.	FEV1/FVC (%)	95.00	4.90
5.	FEF 25-75 (%)	84.75	15.24
6.	MEP	85.54	14.45
7.	VC (L)	92.98	7.12
8.	PEFR (Per Sec.)	91.99	8.23
9.	DLCO (Co mm/min.)	64.86	35.13

* % reduction = (Control – Case) / Control x 100

needed to be highly controlled by means of using more powerful system that control the emitted flour dust.

- It is also recommend that all flour mill workers should introduce dust exhaust system into the workplace.
- It is recommend that the flour mill workers should use masks during working hours.

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