

EFFECT OF FLOUR DUST ON PULMONARY FUNCTIONS IN FLOUR MILL WORKERS IN MARATHAWADA REGION

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Abstract: Background and Objectives: Due to industrialization and ineffective pollution control measures indoor air pollution is major health problem in developing countries. Flour dust occurs across the range of food industries, its exposure induce acute or chronic respiratory problems. This study is aimed to compare the effect of flour dust on the lung functions of male flour mill workers with healthy subjects not exposed to flour dust. **Method:** We evaluated 30 flour meal workers in the age group of 20-50 years. 30 age and sex matched healthy subjects non exposed to dust were taken as controls. The PFT's were carried out with a computerized spirometer "Med-Spiror". The various data was collected, compiled, statistically analyzed and valid conclusions were drawn. **Results :** The present study results showed a significant decrease in the mean values of FVC (Forced vital capacity), FEV₁(Forced expiratory volume in first second), FEV₁% (FEV₁/FVC percentage), FEV₂₅₋₇₅%(Mean forced expiratory flow during the middle of FVC), PEF (Peak Expiratory flow rate) and MVV(Maximum voluntary ventilation) in flour mills workers as compared to controls. **Conclusion:** Flour dust causes chronic bronchial irritation which is responsible for the obstructive as well as restrictive type of pulmonary impairment of lung functions.

Key words: Flour dust, Flour Mill Workers, Medspiror, Pulmonary Function Tests(PFT)

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Introduction:

Lung diseases are most common among occupational diseases. Occupational diseases are caused by a pathological response of the patient to their working environment. ¹ Flour dust is heterogeneous substance with respiratory sensitizing properties. ² It is a complex organic dust with a large diversity of antigenic or allergic components. The antigens involved are wheat flour proteins, flour parasites, silica, fungi, insects or technical additives such as enzyme. ³ Flour dust exposure causes impairment of lung functions, conjunctivitis, allergic and baker's asthma, wheezing, febrile reactions, grain fever, lung fibrosis, rhinitis, allergic alveolitis, impairment of lung function, and chronic obstructive pulmonary disease. Subjects with workplace exposure to organic dust have high prevalence of respiratory diseases. ⁴

In occupational respiratory diseases, spirometry one of the most important diagnostic tool. Pulmonary function tests have been beneficial in the early recognition of pulmonary dysfunctions in patients considered to be

normal on the basis of clinical and radiological examination. In view of fact that flour dust puts the workers health into jeopardy, this study was designed to see the effect of flour dust on lung function.

Material and Methods:

30 non-smoker male flour mill workers in the age group of 20-50 years working in the flour mill for more than two years with daily exposure of 8-10 hours, and 30 healthy non-smoker, non-exposed male subjects in the same age group, not suffering from any respiratory and cardiovascular diseases were evaluated for dynamic lung functions. This study was carried out in the. This study was carried out in the Department of Physiology, SRTRGMC Ambajogai.

In all the subjects a detailed history including history of smoking, occupational history and general physical examination was done. The research protocol was approved by local ethical committee of our institute. Informed consent was obtained from each subject prior to inclusion in the study.

Pulmonary function tests were carried out by computerized MEDSPIROR by two maneuver⁵

FVC maneuver: Subjects were asked to take deep breath and execute fast forceful expiration in the mouth piece of equipment while closing the nose.

MVV manoeuvre: Subjects were asked to respire as rapid as and as deep as possible, for 12seconds into the mouthpiece of equipment.

Statistical method: Standard error of difference between two means (z test) was used for statistical analysis.

RESULT:

As in the observation table no I FVC, FEV₁, FEV₁%, FEF25-75%, PEFR and MVV shows significant decline in flour mill workers as compared to normal non exposed controls.

Table No. 1

Parameters	Controls (Mean± S.D.)	Flour mill workers (Mean± S.D.)	Z value	Significance
Age (yrs)	35.63± 4.72	34.63± 6.10	0.74	NS
Weight (kg)	59.93± 9.55	58.16± 7.48	0.80	NS
Height (cms)	162.93± 5.09	162.43± 2.93	0.47	NS
FVC(lit)	2.83± 0.51	2.06± 0.34	7.00	S
FEV ₁ (lit)	2.47± 0.54	1.24± 0.36	10.16	S
FEV ₁ %	86.37± 8.60	61.73± 15.51	7.6	S
FEF25-75% (lit/sec)	3.26± 0.95	1.40± 0.42	9.94	S
PEFR(lit/sec)	5.29± 1.26	2.39± 0.51	7.84	S
MVV(lit/min)	92.96± 13.88	75.67± 8.24	5.86	S

NS- Non significant

S- Significant

DISCUSSION :

In this study our result showed decline in FVC, FEV₁, FEV₁%, FEF25-75%, PEFR and MVV. These findings are consistent with Sultan A.Meo¹, Dr. Sukhjinder K. Dhillon² and Anupriya Deshpande et al⁶. Awad el Karim MA et al⁷ observed decrease in FVC and FEV₁ while DA Schwartz et al⁸ revealed significant reduction of FEV₁, FEV₁% FEF 25-75% in flour meal workers as compared to normal. G Corzo and R Naveda⁹ reported lower values of FEV₁% PEFR and FEF25-75%.

Flour dust contains particles from numerous cereal grains (wheat, barley, corn rye) and may contain a large number of contaminants including silica, fungi and their metabolites (aflatoxin), bacterial endotoxin, insects, mites, mammalian debris and various chemical additives such as pesticides and herbicides⁴. These substances cause inflammatory reactions in broncho pulmonary system. This might be the reason of decreased value of FVC and FEV₁. Significant decline in FVC suggest restrictive lung impairment. ²There may be formation of specific IgE antibodies that lead to immunological reaction; this causes a direct liberation of broncho constrictor substances causing airway obstruction that leads to decrease in FEV₁%. Decreased FEV₁% shows that exposure to dust causes early obstructive lung impairment.³

When dust particles are inhaled scavenger cells like macrophages dissolve dust by surrounding it but if there is too much of dust, the scavenger cells cannot completely clear the dust. Hence dust particles lodge in and irritate the lungs, setting up an inflammation in the small airways of lung. The inflammation heals by fibrosis which causes thickening of lining of airway leading to decrease in FEF25-75%.⁶

Decrease in PEFR is significant in case of flour mill workers suggesting involvement of larger airway¹⁰. Accumulation of flour dust in the lung airways impairs the phagocytic efficiency of alveolar macrophages and also affects mucocilliary performance. The irritation by dust probably leads to hypertrophy of mucosal cells resulting in increased secretion of mucus and

formation of mucosal plug which causes obstruction of exhaled air.⁴

MVV also showed a highly significant decline in flour mill workers as compared to controls. MVV reflects the function of the entire ventilatory apparatus and depends upon the compliance of the thoracic wall and lungs, airway patency and muscular force⁵. MVV is considered to be a good guideline of the mechanical efficiency of the lungs. So decreased value of MVV indicates that grain dust lowers the mechanical efficiency of lungs.

Thus flour dust causes the obstructive as well as restrictive type of pulmonary impairment of lung functions.

Conclusion:

In this study the pulmonary functions, FVC, FEV₁, FEV₁%, FEF_{25-75%}, PEFR and MVV were decreased in flour mill workers as compared to controls. This favors obstructive as well as restrictive type of lung disorders in subjects exposed to flour dust. So particular emphasis should be given to pre-employment and periodic medical check-up of workers. Flour mill must be well ventilated with adequate dust exhaust system and workers should be advised to use tight facemasks during working hours as a routine and maximum necessary measures to control air pollution should be taken.

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