THE STUDY OF EFFECT OF FOOD DUST ON PULMONARY FUNCTIONS OF FOOD INDUSTRY WORKERS

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Abstract: Background: In India, around 20 million workers are involved in food industry. With rapid industrialization of the developing world, food dust induced lung diseases are poised to become a global health problem. Aims & Objective: To evaluate and compare the lung functions in subjects exposed to food dust with unexposed once (control groups) and to find out the correlation between duration of exposure with observed respiratory parameters. **Materials and Methods:** The present cross sectional study was conducted in McCain with the help of SPIROLAB II (MIR). A total of 200 individuals, 100 food industry workers and 100 healthy volunteers were included in this study. **Results:** The average FEV1/FVC ratio in food industry workers was 79.07 ± 9.73, which was significantly lower (p<.0001) as compared to unexposed subjects 98.04 ± 3.30. When the FEV1/FVC ratio was studied in correlation with duration of exposure, it was observed that the reduction in FEV1/FVC ratio showed a significant (p<0.01) positive correlation with exposure time**. Conclusion:** In our study an attempt was made to compare pulmonary function between unexposed controls and exposed food industry workers. We must focus on health conditions of the human involving in the manufacturing process and environmental conditions.

KEY WORDS: Spirometer; FEV1/FVC Ratio; food industry Workers

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Introduction:

Food dust is a hazardous substance; it is a respiratory sensitizer and is known to cause allergic rhinitis and occupational asthma among bakers and millers. Asthma arising from workplace exposure to cereal flour (bakers' asthma) is one of the commonest types of occupational asthma[1]. It is also an irritant and may give rise to short term respiratory, nasal and eye symptoms or it may provoke an asthmatic attack in individuals with pre-existing disease and also lead to chronic bronchitis. The respiratory health effects have been documented in workers exposed to a variety of dusts in small and large-scale industries, which generate dust during their production process. The diseases of the respiratory system induced by occupational dusts are influenced by the type of dust, dose, duration of exposure and genetic factors. Occupational diseases are caused by a pathologic response of the patients to their working environment .In India, around 20 million[2] workers are involved in food industry. With rapid industrialization of the developing world, food dust induced lung diseases are poised to become a global health problem.

The present study was undertaken to evaluate and compare the lung functions in subjects exposed to food dust (study group) with unexposed once (control group) and to find out the correlation between duration of exposure with observed respiratory parameters. Measurement of dynamic lung functions is more important than that of static lung volumes. Now it is well recognized that 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 and in the differential diagnosis of patients with a known pulmonary disease.

Material and Methods:

The present cross sectional study was conducted in McCain food industry in Mehsana district, Gujarat where they process raw material of fast food. In a total of 200 individuals, 100 food industry workers

and 100 healthy volunteers (non smokers) were included in this study. In healthy subjects a detailed history including history of smoking, and general physical examination was done. Persons having asthma, chronic infections of lungs, having persistent cough. And treated recently for any respiratory illness were excluded from healthy group.. Subjects with previous history of lung disease or similar exposure were excluded from our study in healthy volunteers. The members of group were selected randomly. Then respiratory parameters were evaluated using computerized SPIROLAB II (MIR). Then FEV_1/FVC ratio, FEF_{25-75} as well as maximum voluntary ventilation data were collected. The analysis of the results was done by student t test were found to be significant. $p < 0.05$

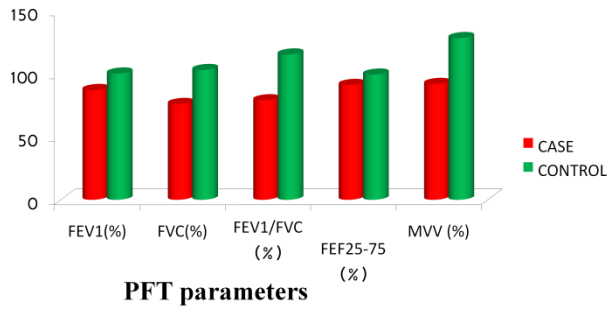
Result:

The average FEV1/FVC ratio in food industry workers was 79.07 ± 9.73, which was significantly lower (p<.0001) as compared to unexposed subjects 98.04 ± 3.30, which is shown in following table.

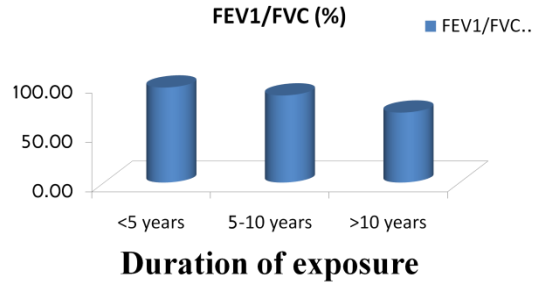
Parameters	Case		control	
	Mean	SD	Mean	SD
Age (years)	29.96	5.26	28.48	6.65
Height (cm)	168.93	7.19	64.86	8.13
Weight (kg)	65.71	9.56	62.8	8.04
FEV_1 %	87.23	16.63	100.32	13.89
FVC % of normal	76.12	14.66	103.12	17.74
FEVI/FVC %	115.48	4.63	79.07	9.67
FEF_{25-75} %	91.24	22.62	99.48	21.75
MVV L/min	92.07	17.64	128.52	24.54

Also FEV1, FVC, $FEF_{25-75,}$ MVV were significantly reduced in study group as compared to control group. When the FEV1/FVC ratio was studied in correlation with duration of exposure, it was observed that the reduction in FEV1/FVC ratio showed a significant (p<0.01) positive correlation with exposure time.

In the following graph comparison is shown between case and controls for the values given in the tabular form in the above table for FEV_1%, FVC%, FEV_1/FVC%, FEF_{25-75}%, MVV%. In the graph after the following graph FEV_1/FVC% is compared with duration of exposure, which supports the above mentioned results.



Graph 1



Graph 2

Discussion:

By evaluating various lung function parameters like FVC, FEV1, PEFR and MVV, it is usually possible to diagnose the underlying Pathophysiology of various lung diseases. Our study showed decrease in lung functions in food industry workers as compared to control group. The underlying mechanism of air way obstruction in food industry workers may be due to the formation of specific IgE leading to immunological reactions which can be immediate, late or dual[3] or materials being employed cause a direct liberation of broncho constrictor substances[4].Decrease in FVC and FEV1 may be due to obstructive impairment which further increases with increase in number of years of exposure. Some previous studies also showed decrease in FEF25-75 as collaborated by our study. They are as follows.

A study done by Dhillon S K et al[5] on flour mill workers for lung volume and capacities showed that significant decrease in the mean values of FVC, FEV1, PEFR, FEF25-75 and MVV and stratification of results showed a dose response of years of exposure in flour mills on lung functions[6]. In another study Mohammadien H A et al found similar results of impairment of lung functions in their study in food industry workers[7] and got significant decline in FEV1%, PEFR, FEF25-75 and MVV in workers. Das PK, Jha N in their study found overall reduction in FVC, FEV1, PEFR, FEF25-75% and MVV. FEV1/FVC was within the normal range in food industry workers[8]. Analysis of exposure data identified that mixers and weighers from large bakeries had the highest exposures to both inhalable dust and fungal alpha-amylase among the different categories of bakery workers ($p<.01$) in a study performed by Elms J, Beckett P, Griffin P et al[9]. So decreased values of MVV in flour mill workers indicates that grain dust causes decreased mechanical efficiency of lungs[10] , it is found in a study done by Bose S, Roohi F and Agarwal B in same kind of industries

Conclusion:

In our study an attempt was made to compare pulmonary function between unexposed controls and exposed food industry workers. All the respiratory parameters were reduced significantly in exposed individuals compared to unexposed individuals suggesting of obstructive pattern of pulmonary diseases. We must focus on health conditions of the human involving in the manufacturing process and environmental conditions. MVV is considered to be a good guideline of the mechanical efficiency of the lungs..

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