THE STUDY OF PULMONARY FUNCTION TESTS IN FOOD INDUSTRY WORKERS

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Abstracts: **Background & objectives:** Occupational health hazards are one of the leading causes of deaths worldwide. Food industry workers are at increased risk of chronic lung disease with prolonged exposure. The present cross sectional study was aimed at finding effects of food dust on pulmonary functions working in food industry. **Methods:** The present cross sectional study was conducted in McCain food industry in which 244 food industry workers were undergone pulmonary function testing using Helios 702 software. **Results:** The results are consistent with both obstructive and restrictive pattern of lung disease as observed FEV1%, FVC%, FEF25-75%, MVV values are decreased as compared to their predicted value while FEV_1/FVC% ratio is increased. MVV values also deteriorate along with the duration of exposure. **Interpretation &conclusion:** These results indicate that food industry workers are at increased risk of developing chronic lung disease.

Key Words: Spirometer, FEV_1/FVC% ratio, food industry workers

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Introduction:

Occupational lung disease is a great burden on our health system. Over 20 million people in India working in different industries are exposed to occupational health hazard in one or other way[1]. Food industry is one of them. The industrial food dust is well known risk factor of chronic lung disease. It can have an immunological reaction that can cause airway obstruction[2]. Prolonged exposure to food dust can affects respiratory functions. Asthma arising from workplace exposure to cereal flour (bakers' asthma) is one of the commonest types of occupational asthma[3]. 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 present study was conducted in food industry workers to evaluate their dynamic lung functions and compared with their predictive values. The pulmonary function test is a useful tool in aiding the diagnosis of lung disease along with the clinical and radiological evaluation.

Material and Methods:

The present cross sectional study was carried out in food industry workers of MaCain food industry, mehsana district, Gujarat which is making raw materials for fast food. 244 workers were undergone detailed clinical history, general and systemic examination. Their anthropometric measurements like age, height and weight were recorded. The subjects having asthma, chronic lung disease, previous history of acute or chronic lung infection, persistent cough, history of chronic smoking were excluded from our study. All the subjects were selected randomly and undergone pulmonary function test by Helios 702 PFT software. The results obtained were compared with their predicted values as per the age, height and weight of the subject. The data obtained were analysed statistically by graphpad instat online student t test calculator.

Result:

The FEV_1, FEV_3 and FVC values are reduced as compared to their predicted value while FEV_1/FVC% ratio is increased as shown in the table -1 and graph 1 Table - 1 also shows decrease in FEFR, $FEF_{25-75\%}$, $FEF_{0.2-1.2}$, $FEF_{25\%}$, $FEF_{50\%}$, $FEF_{75\%}$ as well as MVV values as compared to their predictive values. These results are statistically significant as analysed in graphpad instat online t test calculator.

Reduction in MVV values with duration of exposure showed positive correlation which was statistically significant while FEV1/FVC ratio was non-significant with duration of exposure as shown in table-2 and graph-2.

Table- 1 Comparison of respiratory parameters with their predicted values

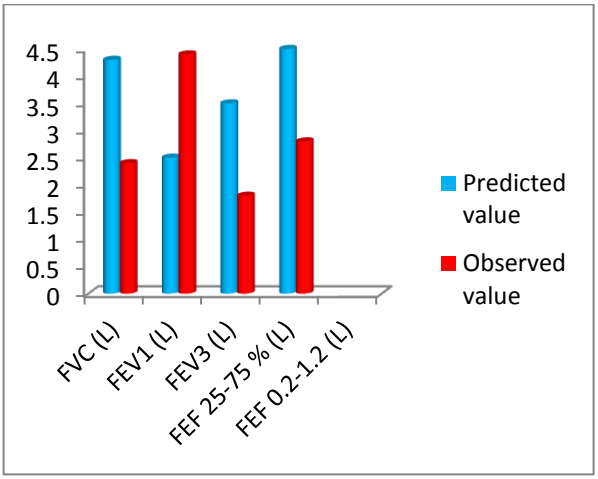
Parameters	Predicted value	Observed value	% predicted
	Mean ± SD	Mean ± SD	Mean ± SD
Age(Years)	-	30.95 ± 8.18	-
Height(Cm)	-	168.60 ± 6.89	-
Weight (Kg)	-	65.02 ± 10.67	-
FVC (L)	3.51 ± 0.37	2.74 ± 0.53	78.44 ± 14.57
FEV1 (L)	2.96 ± 0.33	2.58 ± 0.48	87.45 ± 16.75
FEV3 (L)	3.40 ± 0.36	2.74 ± 0.54	80.82 ± 15.00
FEFR (L/sec)	9.02 ± 0.67	6.21 ± 1.65	68.93 ± 18.05
FEF 25-75 % (L/sec)	4.31 ± 0.40	3.74 ± 1.07	86.77 ± 24.18
FEF 0.2-1.2 (L/sec)	7.43 ± 0.67	5.24 ± 1.54	70.96 ± 21.06
FEF 25%	7.98 ± 0.39	5.62 ± 1.54	70.45 ± 18.95
FEF 50%	5.83 ± 0.36	4.15 ± 1.19	71.19 ± 20.18
FEF 75%	3.06 ± 0.36	2.23 ± 0.80	73.13 ± 26.11
FEV_1/FVC %	84.44 ± 2.39	94.33 ± 6.49	111.73 ± 7.73
MVV (L/min)	138.67 ± 10.77	102.63 ± 23.58	74.01 ± 16.31

FVC-forced vital capacity, FEV1- forced expiratory volume in 1st second, FEV3 – forced expiratory volume in 3seconds, FEFR-forced expiratory flow rate, FEF-forced expiratory flow, MVV-maximum voluntary ventilation

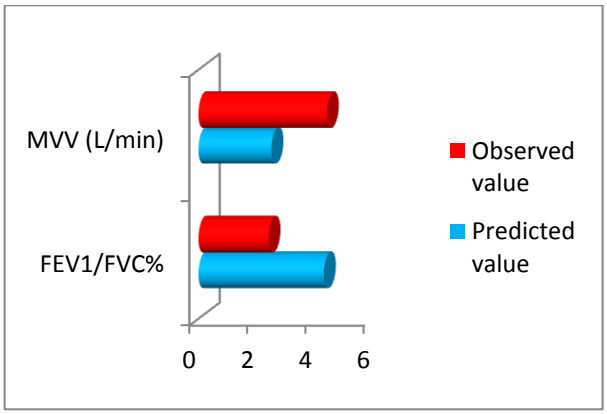
Table-2 Comparison of MVV and FEV1/FVC % ratio according to the duration of exposure

		Parameters	
		MVV L/min	FEV1/FVC %
		Mean ± SD	Mean ± SD
Duration of exposure	<5years	91.20 ±9.56	110.77 ±8.50
	5-10 years	74.11 ± 3.68	112.33 ± 7.86
	>10 years	56.52 ±9.46	112.11 ± 6.71

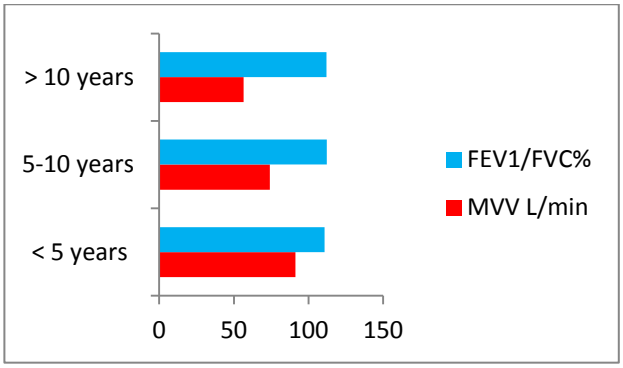
Graph- 1: Comparison of observed & predicted values of FEV_1, FEV_3, FVC, $FEF_{25-75\%}$ and $FEF_{0.2-1.2}$



Graph-2 Comparison of observed and predicted values of MVV and FEV_1/FVC% ratio



Graph-3 Comparison of MVV and FEV1/FVC % ratio according to the duration of exposure



Discussion:

The computerised pulmonary function test is used to diagnose the type and cause of lung disease. Observed respiratory parameters are compared with their predicted values which are computed based on their age, height and weight. The present cross sectional study was aimed to assess different respiratory parameters in workers of food industry. The results are consistent with obstructive pattern of lung disease as FEV_1, FEV_3 and FVC values are reduced. Also decrease in FEFR, $FEF_{25-75\%}$, $FEF_{0.2-1.2}$, $FEF_{25\%}$, $FEF_{50\%}$, $FEF_{75\%}$ values suggests small airways obstruction. However increase in FEV_1/FVC% ratio suggests restrictive pattern of lung disease. Decrease in MVV values observed in this study is seen in both obstructive and restrictive lung disease. The airflow obstruction in workers may be due to immunological reaction to the food dust producing IgE antigen-antibodies complexes which blocks the airway or due to direct liberation of brochoconstrictor substances against the irritant dust.

Paresh Prajapati et al[4] studied in food industry workers found decrease in FEV1, FVC, FEV1/FVC, PEFR and MVV values in exposed individuals compared to unexposed. They also found that severity of respiratory impairments increases with duration of exposure.

Patil SN et al[5] studied the effects of sugarcane dust in exposed and unexposed workers. PFT parameters like FEV1, FVC, FEV1/FVC, PEFR and MVV values were decreased in exposed group which shows some lung dysfunction.

Shamssain MH et al[6] studied in flour processing male bakery workers found that FEV_1, FVC, FEV1/FVC%FEFR, $FEF_{25-75\%}$, $FEF_{0.2-1.2}$ were reduced in exposed workers compared to unexposed

Dr.Sukhjinder K. Dhillon et al[4] studied in flour mill workers that there is 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.

Zuskin E, Kanceljaket al[7], Kolopp-Sarda MN et al[8], Bulat P, Myny K et al[9], Jeffrey P, Griffin P et al[10], Morrison DC et al[11], Bose S, Roohi F et al[12]also found the respiratory dysfunctions in exposed individuals.

Conclusion:

In the present study, attempt was made to evaluate the respiratory parameters of workers working in food industry in the environment of food dust. The results found are suggestive of both obstructive and restrictive pattern of lung disease. We must focus on health condition of exposed individuals as well the working environment.

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