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Research Article

A Study of Lung Function Abnormalities in Workers of Rice Mills

***Sukhjinder K Dhillon, Roopam Bassi and Harkirat Kaur**
Department of Physiology, Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar
**Author for Correspondence*

ABSTRACT

The present cross-sectional study with a comparison group was carried out to evaluate Pulmonary function tests VC,FEV1, FEF (25-75%), PEFR in Rice mill workers. These values were compared with the values obtained in clinically healthy non-smokers of the same age group .This study includes 400 rice mill workers and equal number of individuals in comparison group. On comparison it was found that there was highly significant ($p<0.001$) decline in FVC, FEV1, PEFR and non- significant decline ($p>0.05$) in FEF (**25-75%)** in rice mill workers as compared to control group. The values of respiratory parameters go on decreasing with increase in number of years of exposure to rice husk.

Key words: Pulmonary functions, rice mill workers, forced vital capacity, forced expiratory volume in first second, forced expiratory fraction, peak expiratory flow rate, vital capacity.

INTRODUCTION

Occupational respiratory disease can be defined as an acute or chronic disorder that arises from the inhalation of air-borne agents in the work place. Subjects with workplace exposure to organic dust have high prevalence of respiratory diseases (Oxman et al., 1993). Many industrial processes produce air-borne contaminants and their most common route of absorption is by inhalation. Industrial dust inhalation over a long period leads to proliferative and fibrotic changes in the lungs (Boyd, 1977). A large number of studies have been undertaken to assess the effect of dust on lung functions in various occupations. Reduction in ventilatory functions is reported in cotton workers (Gupta and Gupta, 1986), coal miners (Hankinson et al., 1977) and grain elevators (Bernard et al, 1984). 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. A large number of workers are engaged in Rice mills in Punjab so it is necessary to evaluate health hazards in this group of workers.

MATERIALS AND METHODS

The present study was conducted at the Rice mill's premises. 400 non-smoker industrial workers in the age group of 20-50 years from Rice mills from Amritsar District were taken. In addition 400 healthy non-smoker, non-exposed subjects in the same age group from the residents of Amritsar were taken, which served as control group. Their occupational history, smoking habits and physical findings were noted. Persons having asthma or chronic infections of lungs having persistent cough or treated recently for any respiratory illness were excluded. Pulmonary function test values FVC, FEV1, FEF (25-75%) , PEFR were noted. The data collected was analysed and compared with the available literature. The ventilatory tests were carried out with a computerized spirometer 'Medspiror'.It was designed to be used with electromechanical pneumotach. Volume detection was done by pneumotach sensor and flow detection by volume differential method. Its overall accuracy is within ± 1% and its range for volume is 0 to 10 liters and for flow is 0 -20 liters/sec. Tests were performed in the laboratory and at the mill's premises. Body surface area was calculated using Dubois formula.

RESULTS AND DISCUSSION

Physical Parameters

There was no significant difference between the mean age, height, weight and B.S.A of rice mill workers as compared to control group as shown in Table No.1.

FVC: Table number 2 shows the mean, S.D. of FVC in rice mill workers and control group as 1.30±0.30 and 2.60±0.75 respectively. There was a highly significant decline in FVC in rice mill workers when compared with that of control group, as shown by the p value. ($p<0.001$). The mean and S.D. of FVC in rice mill workers having 0-5, 6-10 and >10 years of exposure was found to be 1.68±0.11, 1.47±0.06 and 1.09±0.22 respectively and showed a highly significant decline as compared to that of control group and progressive decline in FVC with increase in no of years of exposure which was highly significant, as shown in table number

3, 4 and 5.

FEV1: Table no. 2 shows the mean, S.D. of FEV1 in rice mill workers (1.30±0.30) and control group (2.22±0.55). There was a highly significant decline in FEV1 in rice mill workers when compared with that of control group, which is shown by the p value. ($p<0.001$). There was a highly significant decline with increase in number of years of exposure as shown in Table No.3, 4 and 5.

PEFR: Table number 2 shows the mean, S.D. of PEFR in rice mill workers (4.29±0.83) and control group (5.94±1.78) and decline was highly significant, which is shown by the p value ($p<0.001$). The mean and S.D. of PEFR in rice mill workers having 0-5 years, 6-10years and more than 10 years of exposure was found to be 4.82±0.67, 4.57±0.40 and 3.97±0.88 respectively. The decline was highly significant in case of workers having more than 10 years of exposure as shown in Table No.5.

FEF (25-75%): (Mean forced expiratory flow during the middle half of Forced Vital Capacity)

The mean and S.D. values of FEF (25-75%) in rice mill workers and control group were found to be 2.82±0.77 and 2.89±1.11 respectively as shown in Table no.2.There was a non-significant decline in FEF (25-75%) in rice mill workers as compared with that of control group. Table no. 3, 4 and 5 showed that there was progressive decline in FEF (25-75%) in workers with increase in number of years of exposure though statistically non-significant which is shown by the p value.($p>0.05$).

Table 1: Showing Anthropometric Measurements

Parameters	Rice mill workers	Control
AGE(Years)	33.14±9.02	35.23±8.51
Height(cm)	166.40±7.74	164.35±6.56
Weight(kg)	63.88±8.35	67.09±8.78
BSA(m^2)	1.71±0.14	1.73±0.13

Table 2: Showing Mean, Standard Deviation, T Value and P Value with Statistical Significance of Respiratory Parameters between Rice Mill Workers and Control Group

Units	Parameters	Rice mill workers		Control group		t value	P value	Sig.
		M	S.D.	M	S.D.			
Liters	FVC	1.30	±0.30	2.60	±0.75	16.13	<0.001	HS
	FEV1	1.30	±0.30	2.22	±0.55	14.72	<0.001	HS
Liter/sec	PEFR	4.29	±0.83	5.94	±1.78	8.42	<0.001	HS
	FEF 25-75	2.82	±0.77	2.89	±1.11	0.52	>0.05	NS

Table 3: Showing Mean, Standard Deviation, T Value and P Value with Statistical Significance of Respiratory Parameters between Rice Mill Workers with 0-5 Years of Exposure and Control Group

Units	Parameters	Rice mill workers 0-5 years of exposure n=84		Control Group n=400		t value	P value	Sig.
		M	S.D.	M	S.D.			
Liters	FVC	1.68	±0.11	2.60	±0.75	5.61	<0.001	HS
	FEV1	1.68	±0.10	2.22	±0.55	4.49	<0.001	HS
Liter/sec	PEFR	4.82	±0.67	5.94	±1.78	2.85	<0.05	S
	FEF 25-75	3.07	±0.56	2.89	±1.11	0.73	>0.05	NS

Table 4: Showing Mean, Standard Deviation, T Value and P Value with Statistical Significance of Respiratory Parameters between Rice Mill Workers with 6-10 Years of Exposure and Control Group (6-10 Years of Exposure N=92)

Liters	FVC	1.47	±0.06	2.60	±0.75	7.23	<0.001	HS
	FEV1	1.47	±0.06	2.22	±0.55	6.54	<0.001	HS
Liter/sec	PEFR	4.57	±0.40	5.94	±1.78	3.67	<0.001	HS
	FEF 25-75	2.99	±0.53	2.89	±1.11	0.42	>0.05	NS

Table 5: Showing Mean, Standard Deviation, T Value And P Value With Statistical Significance Of Respiratory Parameters Between Rice Mill Workers With More Than 10 Years Of Exposure And Control Group (More Than 10 Years Of Exposure N=224)

Liters	FVC	1.09	±0.22	2.60	±0.75	14.75	<0.001	HS
	FEV1	1.09	±0.22	2.22	±0.55	14.76	<0.001	HS
Liter/sec	PEFR	3.97	±0.88	5.94	±1.78	7.79	<0.001	HS
	FEF 25-75	2.65	±0.89	2.89	±1.11	1.39	>0.05	NS

HS: *Highly Significant* $p<0.01, <0.001$
S: *Significant* $p<0.05$
NS: *Non-significant* $p>0.05$

DISCUSSION

The study showed decrease FVC in rice mill workers as compared to controls. FVC goes on decreasing with increasing duration of exposure to rice husk dust (Singh et al, 1988). The decrease in FVC may be due to much more changes to the bronchii and elastic component of lungs resulting in restrictive type of lung impairment (Mathur et al, 1999). Decrease in FEV1 shows that exposure to dust causes early obstructive pulmonary impairment which further increases with increase in number of years of exposure (Rao et al, 1991). This may be due to release of air borne endotoxin which may cause inflammatory reaction in the bronchopulmonary system (Boss et al, 1997). Some previous studies (Kapoor et al, 1989) also showed decrease in FEF (**25-75%)** as collaborated by our study.

Decrease in PEFR is probably due to hypertrophy of mucosal cells due to irritation by grain dust and smoke resulting in the increased secretion of mucous and formation of mucosal plugs which cause obstruction to the exhaled air (Taytard et al, 1988). Workers exposed to area of maximum dust concentration are more vulnerable to impairment of expiratory flow (Zodpey et al, 1998).

Decrease in various lung function parameters in rice mill workers may be due to exposure to industrial dust, poor ventilation, non-use of face masks and lack of proper exhaust facility (Deacon et al, 1998). This exposure to industrial dust causes occupational air way obstruction which occurs due to chronic bronchitis occurring due to chronic irritation of air ways (Corzo and Naveda, 1998).

Thus concluding the discussion it can be seen that spirometric parameters in rice mill workers showed lower values than in the corresponding control subjects. The difference is statistically significant indicating that the air pollution at work site accelerated decline in lung functions. So workers should have periodical clinical and spirometric evaluation and those showing significant impairment in ventilatory functions should be readjusted in other sections of the industry where exposure to industrial dust is negligible. 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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