SHORT COMMUNICATION

SOME OBSERVATIONS ON PULMONARY FUNCTION TESTS IN RICE MILL WORKERS

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S. K. SINGH, S. D. NISHITH, G. S. TANDON, N. SHUKLA AND S. K. SAXENA

Department of Physiology, K G's Medical College, Lucknow - 226 003

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Summary : A study was carried out to determine the effects of rice husk dust on pulmonary functions in Rice mill workers. The study population consisted of 150 male Rice mill workers from 6 Rice mills with 50 controls of similar age, sex, ethnic group and agricultural work background. Twenty eight Rice mill workers showed obstructive, whereas eight workers showed restrictive type of pulmonary impairment. The results show that the duration of exposure of Rice husk dust is the workers is related to the degree of decline in FVC, FEV₁, FEV₃, PEFR and MVV. This could be attributed to allergic inflammatory reactions of pulmonary tissue due to Rice husk dust.

The decline in FVC indicate restrictive pulmonary impairment whereas decline in FEV₁, FEV₃, PEFR alongwith other flow rates indicate obstructive pulmonary impairment. The observations in this study indicate that obstructive pulmonary impairment is more prevalent than restrictive pulmonary impairment in Rice mill workers.

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| Key words : | pulmonary | function tests | | | | rice mill workers | | |
|-------------|-----------|----------------|------------------|------|-----|-------------------|--------------------|--|
| | FVC | FEV1 | FEV ₃ | PEFR | MVV | | Plusiel Pharman 24 | |

INTRODUCTION A AND A AND

Early recognition of the damage to pulmonary tissue due to industrial dust exposure provides an important clue to ensure their good health, safety and increased productiveness. Respiratory exposures to potentially immunotoxic dusts occur in a variety of occupations especially in those that generate air-borne vegetable dusts. Acute and chronic respiratory effects of grain dust exposures can include such responses as Farmer's lung (11), Grain-Fever Volume 32 Number 2

syndrome (4), Chronic bronchitis (5) or asthma (2). Environmental assessment of grain facilities showed the presence of biologically active endotoxins. This has been shown by Olenchock *et al.* (10). The Gram negative bacterial endotoxins can elicit profound immunotoxic and immuno-modulating effects *in vitro* and *in vivo* (9.1) and therefore can exacerbate adverse pulmonary reactions to grain dust. Pulmonary functions were studied in workers having occupational exposure to tobacco dust by Viegi (12). He reported a decline trend in forced end expiratory flow according to smoking habits and work duration. Elkarim (7) exhibited a significant drop in FEV₁ and FVC in the workers exposed to grain and flour dusts. Decrease in ventilatory capacity ranging from 200 ml to 800 ml were found in workers exposed to Barley dust (8). Long duration of exposure to tale dust showed decline in lung function in workers (3).

The present study has been undertaken to study the pulmonary function tests in Rice mill workers.

MATERIAL AND METHODS

The group under study consisted of all workers employed in 6 Rice mills of Lucknow. All together there were 150 male subjects. As controls, 50 workers employed as farmers in an agricultural work station in the same state were selected. The controls were of the same sex and ethnic group and from a similar agricultural work background but without exposure to Rice husk dust.

Modern med-spiror, manufactured by Med. Systems (P) Ltd., Chandigarh was used to determine the forced expiratory spirogram in both the groups.

The following parameters were studied :

- (1) Forced Vital Capacity (FVC)
- (2) Forced expiratory Volume in One second (FEV₁)
- (3) Forced expiratory volume in three seconds (FEV_2)
- (4) Peak expiratory flow rate (PEFR)
- (5) Maximum Voluntary ventilation (MVV)
- (6) Mean forced expiratory flow during the middle half of the FVC(FEF_{25~75}%)

All these tests were performed in standing posture. Each subject was asked to exhale into the mouth piece of spirometer as forcibly as possible to measure FVC, FEV_1 , FEV_3 and PEFR. The procedure was repeated 3 times and the highest reading was taken for calculation. 154 Singh et al. dooi if ni me'l noitonn'i ymnomial

Next the subject was asked to ventilate into the mouth piece as forcibly and as quickly as possible for 10 seconds to measure M.V.V. During the measurements nostrils of the subjects were closed.

In each subject the age, height, weight and duration of exposure to Rice husk dust was recorded. Each subject was thoroughly screened for any active pulmonary lesion and those found suitable were actually selected for the study.

is ventilatory capacity ranging from 200 (ZTJUZARm) were found in workers exposed to

There was no significant difference between the mean age, height and weight of the subjects (31.5 years, 162 cm, 53.7 kgs) and the controls (32.4 years, 164.4 cm, 57 kg). The mean exposure period in Rice mill workers is 7.9 years with a standard deviation of 3.4. 57.33% of the workers were having the duration of exposure varying between 1 to 5 years 10.67% of the workers were belonging to exposure group of 6 to 10 years. 17.33% of the workers were having an exposure period varying between 11 to 15 years 14.67% of the workers were having the exposure period of 16 years or more.

Table I shows that the observed values of pulmonary function tests are significantly low in Rice mill workers as compared to that of unexposed control subjects. FVC, FEV₁, FEV₃, PEFR, FEF_{25~75}% and MVV are much low in Rice mill workers as compared to that of

| Pulmonary function tests | | monary function tests | Controls $(n = 50)$ | | Rice (n | Rice mill workers ($n = 150$) | |
|--------------------------|------|-----------------------|--|-------|----------------|------------------------------------|----------|
| | | | Mean ± | S. D. | Mean | ± S. D. | |
| 1 | - | FEF 25-75% 1/sec | 3.05 | 0.75 | onO ni on 2.60 | 0.82 | (O) 5.3 |
| 2 | - | FVC, ml | 3480 | 372 | 3182 | 520 boonof | 4.4 |
| 3 | - | FEV1, ml | 2900 | 352 | 2580 | Peak ex s15 tory flo | 4.9 |
| 4 | - | FEV ₃ , ml | 3480 | 372 | 3182 | 520 | (2) 4.4 |
| 5 | - | PEFR l/min | 520 520 520 510 510 510 510 510 510 510 510 510 51 | 40.4 | 470 | 1070-8 00-14 | (3) 6.25 |
| 6 | - de | MVV l'min | 105.7 | 14.00 | 91.0 | 18.8 | 23 |

 TABLE I : Ovserved values of pulmonary function tests in Rice mill workers and unexposed control subjects.

t > 2 are significant

t < 2 are not significant

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unexposed control subjects. Table II shows that the prevalence of obstructive type of pulmonary impairment is more frequent in the Rice mill workers who are having an exposure period of 16 years or more, 31.8% of Rice mill workers having an exposure period of 16 years or more, exhibited obstructive type of pulmonary impirment, whereas the incidence is only

 TABLE II : Prevalence of obstructive pulmonary impairment in unexposed controls and Rice mill workers.

| Exposure group (years) | $\begin{array}{c} Controls\\ (n = 50) \end{array}$ | | Rice mill (n = | workers 150) |
|--------------------------------------|--|--------------|-------------------|-----------------|
| or lightedirthe order blumps and To- | No. | % | No. | % |
| 0 - 5 | I massages alon | allowing of | 11 | 12.79 |
| 6 - 10 | | | 4 | 25.00 |
| 11 - 15 | | | 6 | 23.07 |
| 16 or more | i smendra of ant | ny functions | declige in pulpon | 31.8 |
| Total | 2 | 4% | 28 | 18.66% |

12.79% in the Rice mill workers, having an exposure period between 1 to 5 years. Table III shows that the prevalence of restrictive type of pulmonary impairment is also more frequent

 TABLE III : Prevalence of restrictive pulmonary impairment in unexposed controls and Rice mill workers.

| Exposure group (years) | $\begin{array}{c} Controls\\ (n = 50) \end{array}$ | Rice mil (n = | ll workers 50) |
|------------------------|--|------------------|--------------------|
| | No. % | No. | % |
| this stute - 17 - FEV | more in persons with greater height. In | 2 | 2.32 |
| 6 - 10 | | 1 | 6.25 |
| 11 - 15 | | 2 | 7.69 |
| 16 or more | · · · · · · · · · · · · · · · · · · · | 3 | 13.6 |
| Total | 1 2% | 8 | 5.33% |

in the workers who are having much longer exposure period. Table IV shows highly significant negative correlation between duration of exposure of Rice husk dust with decline in

 TABLE IV : Showing correlation coefficient (r) values between height, duration of exposure of Rice husk dust and pulmonary function tests in Rice mill workers.

| Pulmonary function tests | Height | Duration of exposure |
|--------------------------|----------------------|----------------------|
| FVC | 0.50 | -0.72 |
| FEV1 | 0.62 | -0.76 coiles |
| FEV ₃ | 0.50 | -0.72 |
| PEFR | 0.52 | -0.68 |
| MVV | 0.20 and in the 0.20 | -0.35 |

r > 0.4 are statistically significant (p<0.05)

r > 0.5 are highly significant (p<0.01)

FVC, FEV_1 , FEV_3 and PEFR, whereas the decline in MVV was not much significant. Further, it shows that the height of mill work rs is found to be positively correlated with FVC, FEV_1 , FEV_3 and PEFR but no significant correlation was observed between height and MVV.

DISCUSSION

It is evident from Table IV that the duration of exposure to Rice husk dust in the workers is related to decline in FVC, FEV_1 , FEV, and PEFR. This could be attributed to Rice husk dust causing damage to bronchial passages along with damage to the elastic component of alveolar walls. These results are in agreement with those of Damodar *et al.* (3), who reported decline in pulmonary functions due to exposure to talc dust.

The fall in FVC indicates restrictive lung changes and fall in FEV_1 , PEFR and other flow rates indicate obstructive lung changes. The observations in this study indicate, that although obstructive pulmonary impairment is more frequent, both types of changes are present in the Rice mill workers. It is contended that Rice husk dust contains some airborne endotoxin which may cause inflammatory reaction in bronchopulmonary system. Airborne endotoxin is commonly present in a rice production commune (10).

It is well known that the height is positively related with vital capacity as the inner volume of thoratic cage is more in persons with greater height. In this study FVC, FEV_1 FEV₃, PEFR have been found to be directly related with height in rice mill workers.

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