Occupational exposure and pulmonary function of jute mill workers in Sunsari, Nepal

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ABSTRACT

Most workers of building, pottery, timber, food and mine industries suffer from non-specific lung diseases and ventilatory disorders. There are many such industries operative in Sunsari, Nepal and so far no study has been reported on pulmonary function of jute mill workers of this region, who are also exposed to dust as other workers in similar types of industries. A brief clinical sheet regarding age, occupational particulars, smoking habits and presence or absence of respiratory symptoms was recorded for each worker. Spirometric parameters were recorded using an electronic spirometer. The group consisted of 95 male workers with mean age 28.43± 7.58 yrs, weight 53.77± 8.70 kg and height 164.83± 6.82 cm. The study indicated an overall reduction in FVC, FEV1, PEFR, FEF25-75% and MVV. FEV1/FVC was within the normal range. Further division of workers into smokers and non-smokers, showed comparatively more decline in PEFR, FEF 25.0-75.0% and FEV1/FVC in smokers. From this study, it can be concluded that exposure of jute dust leads to combined types of spirometric deficit revealing restrictive or obstructive diseases.

Keywords: Pulmonary function, workers, spirometry, Jute dust exposure.

INTRODUCTION

Industrial dusts are known to cause an increased morbidity and mortality among exposed population all over the world.[1-3] Most of the workers engaged in building, pottery, fabric, timber, food and mine industries suffer from non-specific lung diseases and ventilatory disorders.[4-5] There are many such industries situated in Sunsari district of Nepal and so far no study was undertaken. The present study was conducted to evaluate the pulmonary function of jute mill workers and examine the relationship with smoking in this environment, which were also exposed to industrial dust as other workers in similar type industries.

METHODS

Ninety five male workers of Arihant multifibre, Sonapur, Sunsari district, 18-57 yrs of age and ninety four male employees, 19-58 yrs of age of B.P.Koirala Institute of Health Sciences(BPKIHS), Dharan were randomly selected. A brief clinical sheet regarding age, occupational particulars like duration of dust exposure, smoking habit and presence or absence of respiratory symptoms were recorded. Weight was recorded in kg. height was measured in cm without shoes while standing erect. Pulmonary function parameters were recorded using an electronic spirometer(Medspiror, Medsystems,Chandigarh). The spirometer was supplied with software which made correction for age, sex, weight, height and ambient temperature to given parameter. The test was performed with nose closed by a nasal clip. The best of three readings were considered for analysis. The statistical analysis was performed using Student's t-test of mean and ±SD values.

RESULTS

The mean age of workers was 28.43± 7.58 yrs and mean weight and height were 58.77± 8.70 kg and 164.83± 6.82 cm respectively. The mean age of control subjects was 29.84± 8.57 yrs and mean weight and height were 56.04± 7.24 kg and 163.33± 5.87 cm. respectively (Table-1). The duration of jute exposure varied from less than 6 months (10.5%) to more than 60 months (16.8%)

Table-1: Physical characteristics of workers and control subjects

Parameters	Control (n=94)		Workers (n=95)	
	Mean	± SD	Mean	± SD
Age (yrs)	29.84	8.57	28.43	7.58
Weight (kg)	56.04	7.24	53.77	8.70
Height (cm)	163.33	5.87	164.83	6.82

Table-2: Duration of jute dust exposure

Duration of exposure(months)	No. of workers	%
? 6 months	10	10.5
> 6- ? 12	8	8.4
> 12- ? 36	24	25.2
> 36 - ? 60	37	38.9
> 60	16	16.8

Table-3: Major respiratory symptoms

Chief complaints	No.	%
Chest pain	33	34.7
Cough with sputum	11	11.58
Dry cough	7	7.37
Nasal catarrh	3	3.16
Breathlessness	3	3.16

(Table-2). Out of 95 workers, 31 were smokers (32.63%) and 64 were non-smokers 1.93 and 3.16% had nasal catarrh. Some of them also complained of breathlessness (2.11%) (Table-3). FVC (forced vital capacity), FEV1 (forced expiratory volume in 1st second), PEFR (peak expiratory flow rate), FEF25-75% (peak expiratory rate at 25% and 75% of FVC), FEV1/FVC (ratio between forced expiratory volume in 1st second and forced vital capacity) and MVV (maximum voluntary ventilation) ranged from 0.98-4.38 L (mean 2.59± 0.69), 0.12-3.54 L(mean 2.25± 0.64), 1.30-9.6 L/sec (mean 5.54±1.93), 0.53-7.0 L/sec (mean 3.24±1.21), 3-100% (mean 88.88±17.33) and 33-152 L (mean 84.68±24.45) respectively in workers. FVC, FEV1, PEFR, FEF25-75% , FEV1/FVC and MVV ranged from 2.0-4.6 L (mean 3.33± 0.40), 1.67-3.6 L (mean 2.84± 0.37), 5.60-10.30 L/sec (mean 8.75± 0.77), 2.74-5.11 L/sec (mean 134.79± 11.48) respectively in control subjects (Table-4). In workers, all pulmonary function parameters except FEV1/FVC were significantly reduced when compared to the values of control subjects.

Among smokers, FVC, FEV1, PEFR, FEF25-75.0%, FEV1/FVC and MVV varied from 1.4-24.38 L (mean 2.70± 0.66), 1.0-23.54 L (mean 2.99± 0.58), 1.80-9.20 L/sec (mean 5.28± 1.90), 0.67-7.07 L/sec (mean 3.19± 1.19), 3.0-1005 (mean 87.03± 17.10) and 49.0-52.0 L (mean 86.26± 25.55) respectively. Among the non-smokers parameters varied from 0.98-4.06 L (mean 2.54± 0.7), 0.12-3.54(mean2.23± 0.67), 1.30-100 L/sec (mean 89.78± 17.38) and 33.0-138 L (mean 83.92± 23.87) respectively (Table-5). In smokers mean PEFR, FEF25-75 % and FEV1/FVC were significantly low when compared to non-smokers.

Table-4: Pulmonary function parameters of workers(n=95) and control subjects(n=94)

Parameters	Control		Workers		P value
	Mean	± SD	Mean	± SD	
FVC (L)	3.33	0.40	2.59	0.69	< 0.005
FEV1 (L)	2.84	0.37	2.25	0.64	< 0.005
PEFR(L/sec)	8.75	0.77	5.45	1.93	< 0.005
FEF25-75%	4.32	0.42	3.24	1.21	< 0.005
FEV1/ FVC(%)	84.72	2.34	88.88	17.33	NS

Table -5: Pulmonary function parameters of Smoker (n=31) and Non-smoker (n=64) workers

Parameters	Non-smokers(n=64)		Smokers(n=64)		P value
	Mean	± SD	Mean	± SD	
FVC (L)	2.54	0.7	2.70	0.66	NS
FEV1 (L)	2.23	0.67	2.99	0.58	NS
PEFR(L/sec)	5.54	1.93	5.28	1.90	< 0.001
FEF25-75%	3.32	1.21	3.09	1.19	< 0.001
FEV1/ FVC(%)	89.78	17.38	87.03	17.10	< 0.001
MVV (L)	83.92	23.87	86.26	25.55	NS

DISCUSSION

The main objective of this study was to evaluate the effect of jute dust exposure on pulmonary function in workers of Arihant multifibre, Sonapur, Sunsari district and examine the relationship with smoking habit. Determination of pulmonary function parameters revealed that all variables, except FEV1/FVC were significantly reduced in workers. Similar type of result was found by Rastogi *et al* in saw mill workers in 1989 and in silica exposed workers in 1990.[6-7] Lung function values recorded in mill workers exposed to wood dust showed a significant reduction in mean MMF, PEFR and FEF 25.0% for both smokers and non-smokers with the exception of FEV1/FVC.[8] In this study a combined type of Spirometric deficit revealed restrictive or obstructive disease. This view is also supported by the evidence that chief complaints among workers were chest pain, cough with sputum, dry cough, breathlessness and nasal catarrh. Becklake *et al* found similar type of result in 1996.[9] Occupational exposure may also cause reversible early airway obstruction. The lung function values, recorded for smokers, in present study is similar with the findings of other investigators.[10-12]

This study indicated an overall reduction in ventilatory capacity, in particular FVC, FEV1, PEFR,

FEF25-75 % , MVV and higher percentage of chronic respiratory symptoms in jute mill workers .Exposure to jute dust leads to combined type of spirometric deficit revealing obstructive or restrictive disease. Smoking in such occupational environment may lead to further deterioration of lung function. Engineering control, industrial hygiene and health education are mandatory for dusty activities.

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